TEAM TIOGA
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ECONOMIC DEVELOPMENT & PLANNING | INDUSTRIAL DEVELOPMENT AGENCY | LOCAL DEVELOPMENT CORPORATION

Tioga County Industrial Development Agency
July 10, 2019 • 4:30pm•
Ronald E. Dougherty County Office Building
56 Main Street, Owego, NY 13827
Agenda

Call to Order and Introductions

Attendance
IDA Board Members
Roll Call: R. Kelsey, J. Ceccherelli T. Monell, A. Gowan, K. Gillette, M. Sauerbrey, E. Knolles
Absent:
Excused:
Guests: C. Curtis, C. Haskell

Privilege of the Floor: W. Walsh
Huntington Creek Background Report

Approval of Minutes:
A. June 5, 2019 Regular Meeting Minutes

Financials
A. Balance Sheet
B. Profit & Loss
C. Transaction Detail; Cash Accounts Only
D. 2nd Quarter Operating Income & Expense

Project Updates: C. Curtis
A. NYS Senate Investigations and Government Operations Committee Information and Document Request submitted 6/27/2019
B. V&S water & sewer extension; TCIDA Owego Utilities Capital Project #132,906 financial assistance application submitted 6/17/2019
C. 96 Smith Creek Road Demolition Complete
   1. Photo
   2. Photo
   3. Photo
D. Campville Fire Department declined purchase offer

New Business: C. Curtis

A. DEC Permit – Emergency Beaver & Dam Removal
B. Southern Tier 4th Wave – Funding Request
C. Authorities Budget Office Policy Guidance Issued June 3, 2019
D. Easement Request Lodestar Energy
    1. Map
    2. Proposed Contract
E. ED&P - Economic Development Specialist
    1. TCIDA Contribution Requested
    2. Memo to ED&P Legislative Committee

Old Business: C. Curtis

A. Public Authority Accountability Act (PAAA)
    1. Audit Committee Report: R. Kelsey, A. Gowan
        a. NYS Comptroller Audit Summary of Findings Meeting scheduled July 11th
        b. Audit RFP distributed 6/26/2019; proposal requested by 8/31/2019
    2. Governance Committee: J. Ceccherelli, A. Gowan, R. Kelsey
        a. Committee Assignments – Audit Committee & Loan Committee
        b. Attendance Review
        c. E. Knolles Acknowledgement of Fiduciary Duties
    3. Finance Committee: R. Kelsey, A. Gowan, K. Gillette
        a. Signature Cards

PILOT Updates: C. Curtis

A. Owego Gardens II
    1. Sales Tax Exemption

Correspondence: C. Curtis

A. Permission granted 6/27/2019 by S. DiBernardo to submit NYS Senate Investigations and Government Operations Committee report via email investigations@nysenate.gov
B. Email response

Motion to move into Executive Session pursuant to Public Officers Law Section 105

Next Meeting: Wednesday August 7, 2019

Adjournment

Huntington Creek Background Report

SUBMITTED TO
Tioga County Soil and Water Conservation District

APRIL 2019

Huntington Creek Background Report

SUBMITTED TO
Tioga County Soil and Water Conservation District
183 Corporate Drive
Owego, NY 13827

PREPARED BY
Inter-Fluve Engineering
501 Portway Avenue, Suite 101
Hood River, OR 97031

In partnership with

Integrated Aquatic Sciences
79 Evans Lane
Lake Placid, NY 12946

and

Fuss & O'Neill, Inc.
1550 Main Street, Suite 400
Springfield, MA 01103

APRIL 2019

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1. Introduction

The Susquehanna River is a nationally important river as one of the longest rivers on the east coast and a major source of freshwater to Chesapeake Bay. It flows for approximately 460 miles through three states, beginning in upstate New York. The Upper Susquehanna watershed is located in the Allegheny Plateau region and encompasses approximately 7,500 square miles, including Tioga and Broome Counties and the Village of Sidney in Delaware County. Sidney is located along the mainstem of the Susquehanna in the Susquehanna Great Bend sub watershed, which also covers a portion of Broome County. Also located in Broome County is the confluence with the Chenango River, a major tributary. Primary tributaries in Tioga County are Owego Creek and Catatonk Creek.

The Regional Susquehanna River Initiative project was conceptualized through the New York Rising Community Reconstruction (NYRCR) Tioga community planning process following widespread flood devastation along the Susquehanna River and its tributaries in 2011. The area was affected by both Tropical Storm Irene and, shortly after, Tropical Storm Lee which delivered intense rainfall onto the already saturated watershed. Costly impacts included loss and damage of homes and businesses, loss and damage of utility infrastructure, road closures and washouts, and stream bank erosion affecting agricultural productivity.

The Tioga County Soil and Water Conservation District (TCSWCD) has secured U.S Department of Housing and Urban Development (HUD) Community Development Block Grant-Disaster Recover (CDBG-DR) funding, administered through the NY Rising Community Reconstruction (NYRCR) Program of the New York State Governor's Office of Storm Recovery (GOSR), to identify sustainable flood mitigation measures for seven priority watersheds within the Tioga, Broome, and Sidney communities.

This report focuses on the Huntington Creek watershed and has been developed by the Inter-Fluve Engineering team, including partners Fuss & O'Neill and Integrated Aquatic Sciences. The purpose of this report is to summarize our assessment of current conditions, describe flood-related vulnerabilities, and identify opportunities for both infrastructure and natural systems options for mitigating flood impacts and increasing community resilience while maintaining or improving aquatic habitat.

1.1 CLIMATE CHANGE IN NEW YORK

Since the turn of the century, global annual-average temperature has increased by 1.8°F with most of that change occurring since the 1980s (USGCRP 2017). The global scientific community agrees that human activities and the accelerated release of greenhouse gases since industrialization are the primary drivers of recently observed global temperature rise. This rise in temperatures has occurred more quickly than any time in the past 1,700 years, and additional warming is predicted even if greenhouse gas emissions are immediately substantially reduced.

Globally, the impacts of climate change on sea level, water resources, agricultural productivity, weather patterns, energy use, ecology, and human health are already being realized with significant consequences.

In New York State, increasing flood risk is one of the major climate change concerns. As reported in the recent Draft New York State Flood Risk Management Guidance (NYS DEC 2018), there were 3,312 individual flood event occurrences reported in New York between 1960 and 2012 with property damage exceeding $3.8 billion. The period between 2010 and 2012 in particular was one of concentrated incidents with 287 reported flood events affecting 48 out of 62 counties and resulting in $1.1 billion in property damage. The latter does not include all losses associated with Hurricanes Irene and Sandy which caused many billions of dollars of damages and in the case of Sandy, resulted in the loss of 53 lives in the state (CDC 2013).

Studies have anticipated a shift toward more extreme precipitation events and higher peak flood flows in the years to come. In the Northeast, the amount of precipitation falling in the heaviest storm events increased by over 70% between 1958 and 2010 (Horton et al. 2014). Flash flooding is an ongoing problem in Tioga County with impacts felt as recently as August 15, 2018 when as much four inches of rain fell within a 24-hour period (NWS 2018). Under current climate change projections, flooding and flood-related impacts in the County are likely to intensify. Adaptation is necessary to avoid increasingly significant impacts.

1.2 HUNTINGTON CREEK

Huntington Creek is a tributary of Owego Creek, which itself is a tributary of the Susquehanna River (Figure 1). The entire Huntington Creek watershed sits within the town of Owego, NY. The watershed is small (1.95 square miles), but has high relief, with a maximum elevation of 1,621 feet and an outlet at 810 feet (Figure 2). The mainstem of Huntington Creek is fed by three primary tributaries, henceforth referred to as the first, second, and third branches. The mainstem, including the first branch, is approximately 2.5 miles long. The second [referred to as Allen Glen Creek in a previous report (USC 2018b)] and third branch are approximately 0.8 and 0.6 miles long, though in all cases the channel is poorly defined in the headwaters, making precise measurement difficult. Additional flow inputs include numerous small drainage channels that are typically dry but convey significant water and sediment during high-intensity precipitation events. Huntington Creek is an intermittent stream that typically runs dry at some point in the summer months.

Figure 1. Huntington Creek watershed location map. 2014 aerial imagery from NYS GIS Clearinghouse.

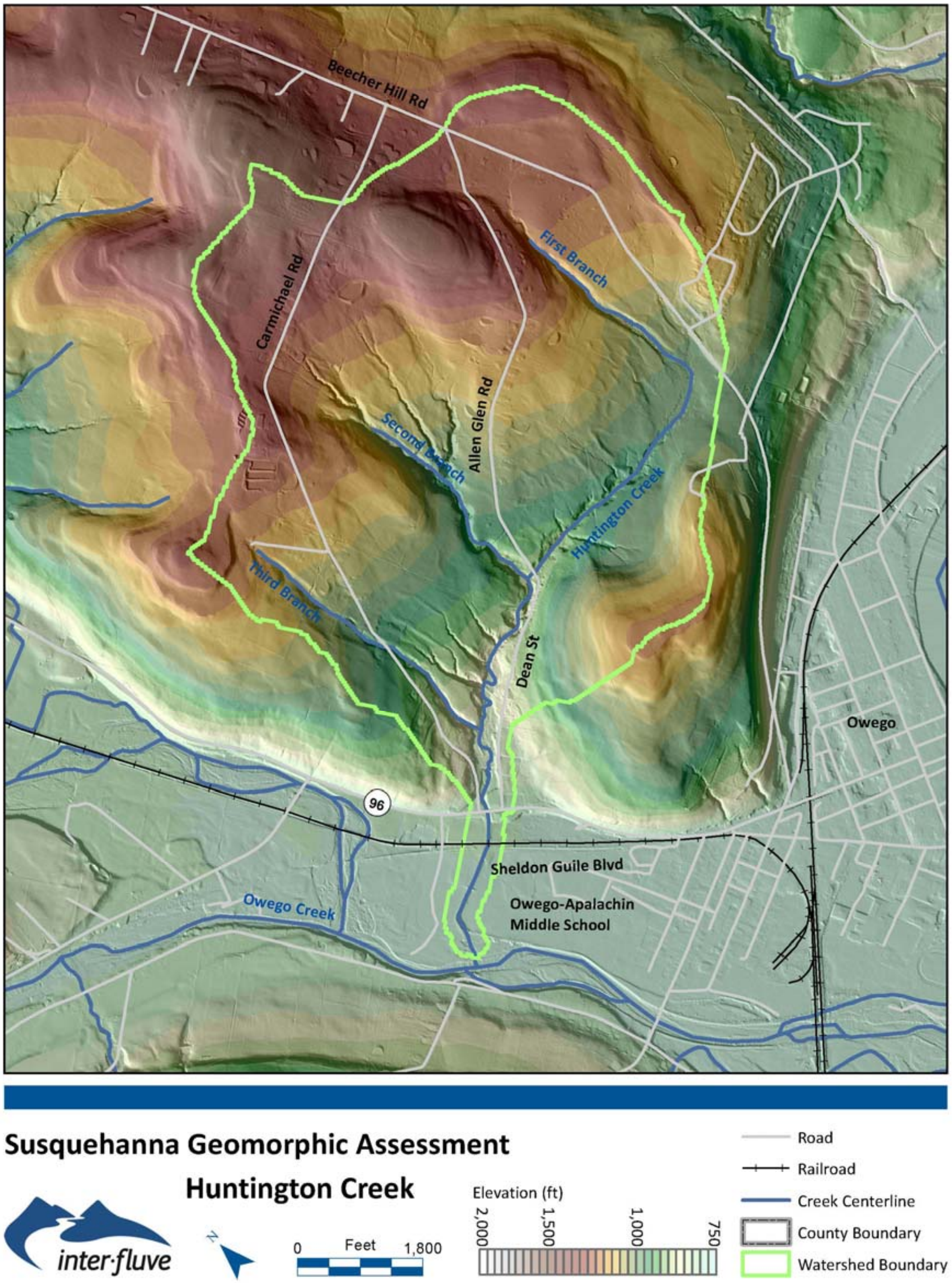

Figure 2. Digital elevation model (DEM) of the Huntington Creek watershed

In recent years, the watershed has experienced several instances of extreme flooding, most notably during Tropical Storm Lee in September 2011. Flood impacts in the watershed were severe and included intense erosion, debris blockage, and culvert failure in upland areas and substantial sediment deposition and inundation in low-lying areas. A deteriorating historic timber and stone dam located upstream of Route 96 was severely damaged in 2011 and was subsequently removed. The project was completed in 2013 and involved removing the structure and stabilizing the stream channel and banks to reduce sediment delivery and prevent a headcut from moving farther upstream (USC 2018b).The flood and damage history of the watershed is discussed in more detail in the Huntington Creek Background Report (USC 2018b) and the Tioga County Multi-Jurisdictional Hazard Mitigation Plan (Tetra Tech 2012, 2018). Other notable impacts in the Huntington Creek watershed include damages at the Owego Apalachin Middle School and High School and associated athletic fields located on the low-lying floodplain near the confluence of Huntington and Owego Creeks (Figure 1). Estimated damages to district property, including these and other facilities, was estimated at $30M (Tetra Tech 2012).

1.3 GOALS AND OBJECTIVES OF THE STUDY

The primary goal of the project is to increase resilience to flooding and flood-related impacts within the Huntington Creek watershed. Objectives include:

1. Utilizing and restoring natural watershed processes that help mitigate flooding and flood-related impacts by reducing flood peaks and moderating sediment loads;
2. Adapting infrastructure, watershed management approaches, and land-use practices and policies to work with natural processes to improve resilience;
3. Improving public awareness and acceptance of the need to adapt and the critical role of natural watershed processes;
4. Supporting implementation of the Chesapeake Bay TMDL through water quality improvements, specifically reductions in nutrient and sediment loads; and
5. Improving ecological health of the watershed.

2. Existing Data Review

Our technical approach began with developing an understanding of landscape context, including watershed history and the role flood and geomorphic processes have played in shaping conditions to date. Additional consideration was given to understanding what trajectories these processes may have on shaping future conditions. This context provides a framework for identifying proactive flood mitigation measures tailored to the Huntington Creek watershed. The following sections summarize our findings based on a review of existing information. In Section 3, we provide additional insight gained during field assessments.

2.1 CLIMATE

A general description of the region's current climate has been provided in existing background reports for the Huntington Creek and Apalachin Creek watersheds (USC 2018a,b) and is summarized briefly here. The County has a humid continental climate characterized by warm summers and cold winters. Average low temperatures dip to 15°F in the winter and 60°F in the summer, and average highs reach 29°F in the winter and 78°F in the summer. Average annual precipitation as rainfall is 39 inches, and average annual snowfall is 83 inches.

Precipitation totals in Tioga County, part of ClimAID Region 3, Southern Tier, is are projected to increase between 4 and 10% by the 2050s and 6 to 14% by the 2080s (baseline of 35 inches, middle range projection) (Horton et al. 2014). It is anticipated that the additional precipitation will be delivered via more intense storms rather than distributed evenly over time.

2.2 GEOLOGY AND GEOMORPHOLOGY

Many of the processes and unique issues discussed in this report can be partly attributed to the geologic history of the region. During the Devonian Period (415 million years ago), the North American land mass was situated close to the equator, and much of North America was inundated by warm, tropical seas. These depositional environments trapped large volumes of fine-grained sediment along with the skeletons of marine organisms, which are evident in the abundant fossils that can be found in the area's rocks today (Craft and Bridge 1987). Over time, and with subsequent mountain building events heat and pressure transformed these deposits into broad, flat-lying beds of sandstone and siltstone that make up the region's present-day bedrock geology. The modern Allegheny Plateau was uplifted during the end of the Paleozoic era (320-250 million years ago).

Erosion of the plateau since that time has generated the landscape that exists today. While the plateau was initially flat lying, surface irregularities, regional slopes, and climate combined to initiate the formation of the drainage (stream channel) network that is still evolving today. The plateau has not eroded evenly but rather it has been dissected by the drainage network, which focuses runoff and erosional processes along stream beds and banks, sculpting the present-day topography out of the former plateau. The consistent elevation of the hilltops in the region (all around 1600 feet) is an attribute common to dissected plateaus and represents the elevation of the pre-dissection plateau surface.

This evolution of the landscape has also been influenced by periodic ice ages during which continental ice sheets surged over the region, flowing north to south. The most recent glaciation ended approximately 12,000 years ago, with ice retreating from New York beginning approximately 18,000 years ago. The flowing ice preferentially followed river valleys like the Susquehanna and its larger tributaries, eroding the large river valleys while blocking off the smaller tributaries with ice dams. This resulted in broad and gently sloped mainstem river valleys with steep side tributary valleys filled with glacial till.

The surficial geology of the watershed reflects its glacial history with till dominating upland areas and glacial outwash and more recent alluvial deposits occupying the Owego Creek valley floor. Both till and alluvial deposits are composed of thin, platy clasts derived from the region's siltstones and sandstones which break apart along shallow bedding planes. Refer to the previous background report (USC 2018b) for a discussion of the soils found in the watershed and maps of bedrock and soils.

The Huntington Creek watershed can be broken into two broad regions: the steep uplands and the low-relief valley floor at the confluence with Owego Creek (Figure 3). The steep uplands, which include the three branches and the upper portion of the mainstem are characterized by steep and confined channels with small or nonexistent floodplains. Average slopes along the upland branches are on the order of 7 to 9% (Table 1), with higher slopes occurring locally and along smaller tributaries. The combination of high slope and confinement is capable of generating flood flows with sufficient velocity and depth to erode and transport the abundant sediment present in surficial deposits, as well as dislodge/abrade and transport the highly erodible bedrock.

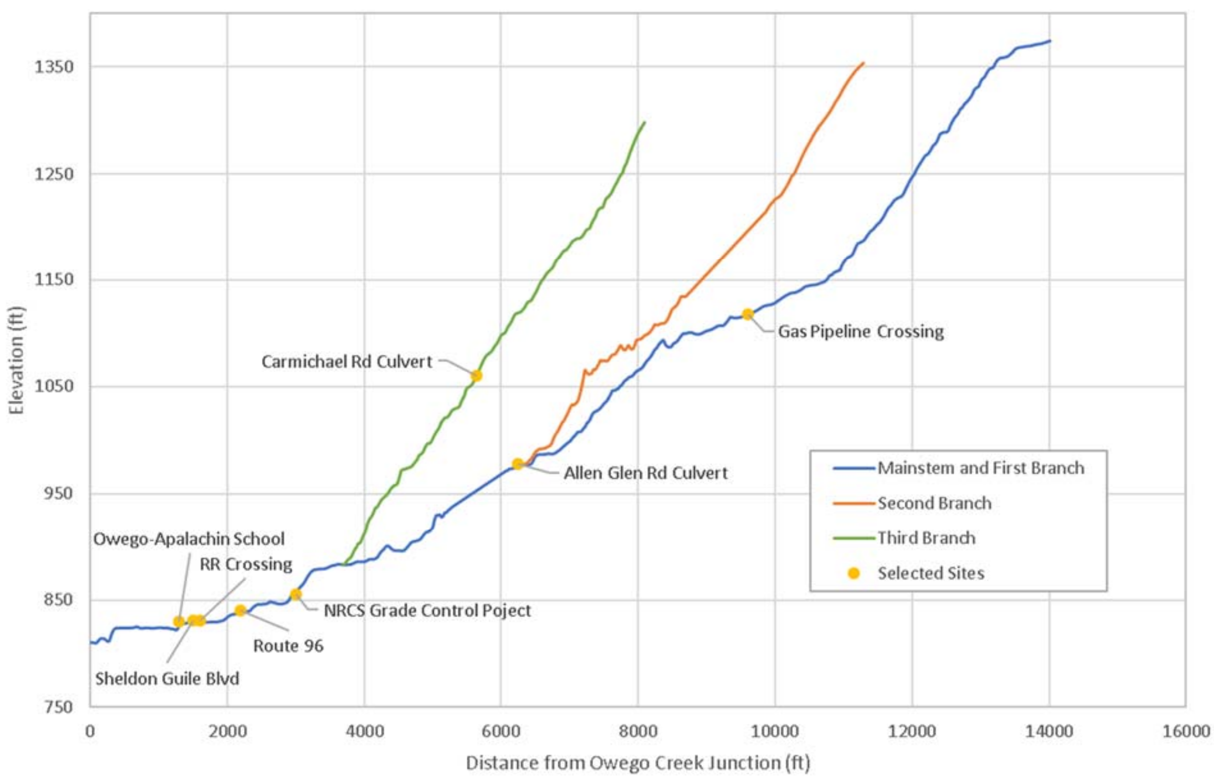

Figure 3. Longitudinal profile of Huntington Creek, including first, second, and third branches. Several locations discussed in this report are shown along the profiles for reference.

Along the mainstem of Huntington Creek, the average slope varies from approximately 5% upstream of Route 96 to 2% on the Owego Creek floodplain downstream of Route 96 (Table 1). The abrupt transition to a lower slope on the broader valley floor results in a substantial reduction in sediment transport capacity and subsequent deposition. Historically, sediment deposited at the mouth of Huntington Creek formed a broad alluvial fan deposit that can be seen on topographical maps. The creek's path across the fan was likely dynamic and possibly multi-threaded, shifting location and configuration frequently in response to depositional events. Sometime before 1937 (the earliest available aerial imagery), the creek was channelized to set its alignment and allow for development on the alluvial fan and Owego Creek floodplain.

Table 1. Average slopes along primary channels in the Huntington Creek watershed

Stream channel	Average slope (ft/ft)
First branch	0.08
Second branch	0.08
Third branch	0.09
Mainstem upstream of Route 96	0.05
Mainstem downstream of Route 96	0.02

2.3 LAND COVER AND LAND USE

A discussion along with maps of land cover types in the Huntington Creek watershed is provided in a previous background report (USC 2018b). The report describes the major land cover as forest (approximately 70%) with agricultural cover types over approximately 22% of the watershed. Our review of historical aerial imagery suggests that this reflects current conditions and that the watershed's history is more varied. Historical aerial photos show that in the first half of the 20th century the watershed was almost entirely cleared and used for agricultural production (Figure 4). Potential impacts of historical deforestation are discussed in Section 2.4.

Publicly available data sources show no existing conservation easements or other protected areas in the watershed with the exception of a small (1.3 acre) parcel of parkland owned by the school district and located at the confluence of Huntington and Owego Creeks.

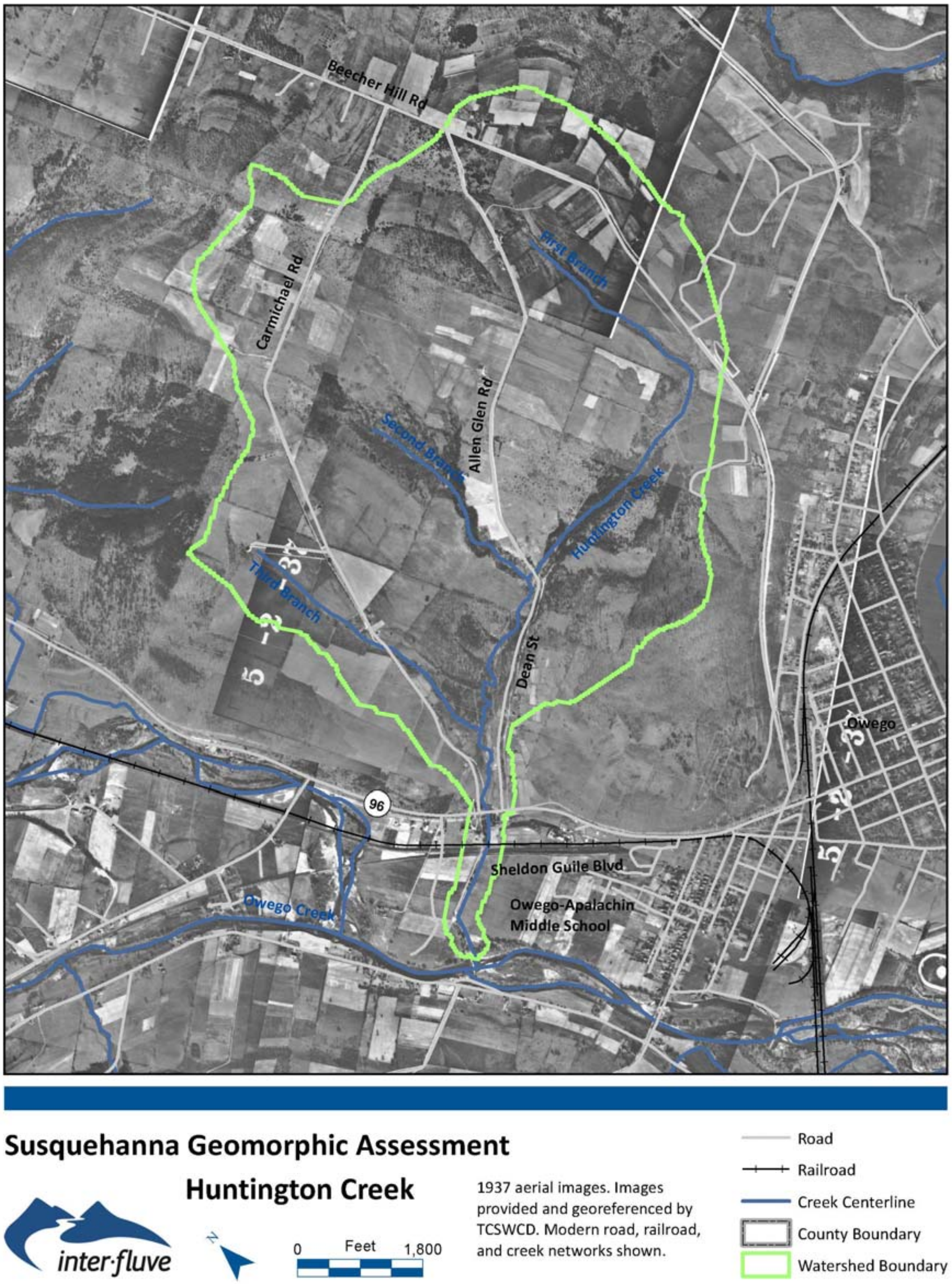

Figure 4. Map of the Huntington Creek watershed with 1937 aerial imagery. In contrast to today, most of the watershed was under agricultural production.

2.4 HYDROLOGY

In 2013, Woidt Engineering prepared a hydraulics and hydrology report for Huntington Creek. As a part of their analysis, flood discharges were modeled for storm events ranging from 2- to 100-year recurrence intervals, or 50% to 1% annual probabilities of occurrence. To provide an additional estimate, we used USGS StreamStats, which estimates peak flows for a range of recurrence intervals using regional regression equations derived from stream gage data. The results are presented in Table 2. Because the two approaches differ, the results are not in agreement however, viewed together they provide a more robust estimate of the range of potential peak flood discharges.

Table 2. Estimated discharges for Huntington Creek

Recurrence Interval of Peak Storm Runoff (Woidt Engineering 2013) or Peak Flood Discharge (StreamStats)	Woidt Engineering (2013) (cfs)	USGS StreamStats (cfs)
2 years (50% annual chance)	253	186
10 years (10% annual chance)	628	467
50 years (2% annual chance)	1295	819
100 years (1% annual chance)	1702	992

Floods in Huntington Creek can be intense and sudden, or “flashy”. The flashiness of the system is a function of the intense rainstorms that occur in the region in combination with watershed characteristics. Thin soils underlain by restrictive fragipan saturate quickly, and the steep slopes allow water to flow rapidly via shallow subsurface pathways and over the land surface to the channel. This rapid runoff response is capable of producing large and damaging floods. Forest and other dense vegetation cover can help to moderate this response by intercepting rainfall, protecting soil from erosion and thinning, and providing roughness that slows surface runoff. Historical deforestation (as evident in the 1937 photo above) would have contributed to rapid runoff and associated impacts. Another factor contributing to the flashiness of the system is the road and road drainage network within the watershed. Carmichael Road runs along the northern boundary of the watershed, and Dean Street and Allen Glen Road have been constructed within the narrow Huntington Creek valley. The roads are generally steep and generate runoff that is either delivered directly to channels or is routed into equally steep drainage ditches that quickly discharge into channels.

The runoff characteristics of the Huntington Creek watershed are particularly vulnerable to the increasing rainfall in the region as a result of climate change. As such, there is a high likelihood of more frequent and more intense flood events occurring in the future.

2.5 EXISTING FLOOD MAPPING AND MODELING

Federal Emergency Management Agency (FEMA) flood mapping has not been done on Huntington Creek. FEMA maps of Owego Creek show much of the property of the Owego-Apalachin Middle and High School campus being inundated in during events with a 1% annual chance of occurrence (Figure 5).

2.6 WATER QUALITY

Water quality within a watershed is important for maintaining aquatic biota as well as providing a potential drinking water source. Diminished water quality can be caused from point sources, such as a direct discharge from a pipe, or nonpoint sources, such as flow coming off of agricultural lands. Waterbody Inventory/Priority Waterbodies List (WI/PWL) is a statewide inventory of the water quality for all waterbodies in New York. The most recent one for the Owego Creek watershed, which includes Huntington Creek, was updated in 2009 and indicates minor impacts for Owego Creek and minor tributaries such as Huntington Creek. Suspected impairments include silt and sediment and elevated temperatures due to channel modification and streambank erosion (NYS DEC 2009).

A Total Maximum Daily Load (TMDL) was established for the Chesapeake Bay in December 2010 by the US EPA; the New York portion includes 6,250 square miles of the upper Susquehanna River watershed (NYS DEC 2013). Load reduction goals for phosphorus, nitrogen, and sediment were determined for the upper Susquehanna River watershed in New York as part of the TMDL and includes targets of 9.28 million pounds per year (mpy), down from 10.72 mpy for nitrogen; 0.67 mpy, down from 0.96 mpy for phosphorus, and 293 to 322 mpy, down from 332 mpy for sediment by 2025 (NYS DEC 2013). As part of the final TMDL, New York developed a Phase I Watershed Implementation Plan (WIP) detailing how and when the state would meet its pollution allocations. A Phase II WIP was completed in 2013 and provides milestones for achieving load reductions by 2025, with controls in place by 2017 that will achieve 60% of the load reductions from 2009 loads. A Phase III WIP will be finalized in 2019. To reduce loading of the three parameters, New York is assessing load reductions among wastewater, stormwater, and agriculture with the greatest effort on agriculture reductions because they represent the greatest controllable load that is generally most cost effective to mitigate (NYS DEC 2013).

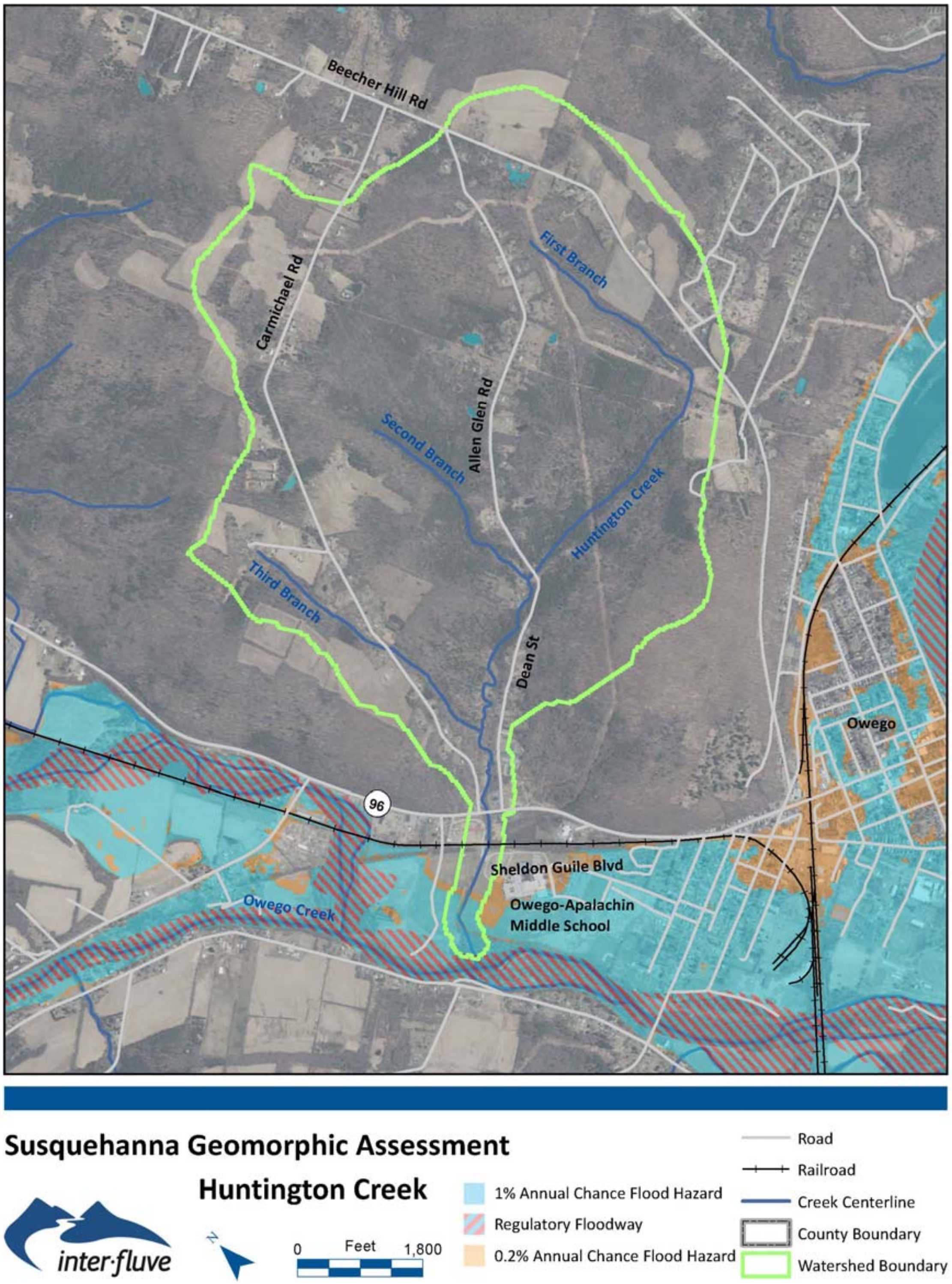

Figure 5. FEMA flood mapping for Owego Creek at the Huntington Creek confluence. 2014 aerial imagery from NYS GIS Clearinghouse.

Although loading estimates are for the entire New York portion of the Susquehanna River, several options are highlighted within the Phase II WIP to achieve additional required pollution reductions that align with recommendations to improve flood resiliency in the Huntington Creek watershed. These include improvements in storm water management practices, including green infrastructure, implementation of road-side ditch maintenance practices that reduce erosion and allow stormwater to infiltrate into the ground in rural areas, and continued stream restoration and stabilization projects to reduce erosion (NYS DEC 2013).

2.7 ECOLOGY

While Owego Creek is classified as a trout stream, C(T), the tributaries to Owego Creek downstream of the confluence with Catatonk Creek are classified as C, which are not suitable for trout. A biological assessment of Owego Creek was conducted in 2003 as part of the State rotating integrated basin studies (RIBS) biological screening at the Route 17C ballfield location (closest location to Huntington Creek) with results indicating non-impacted conditions (NYS DEC 2009). For projects conducted in Huntington Creek, permitting and work schedules will not be as stringent because this section is not considered a trout stream.

Based on the New York State Department of Environmental Conservation (NYS DEC) Environmental Resource Mapper, there are no state mapped freshwater wetlands identified within the watershed. The National Wetlands Inventory (USFWS) shows several small freshwater ponds and one 0.4-acre freshwater forested/shrub wetland near the eastern boundary of the watershed off of East Beecher Hill Road.

Records available from the New York Natural Heritage Program (NHP) indicate occurrences of rare plants and animals. We searched the NHP database via NYS DEC's Nature Explorer for the Town of Owego and identified the presence of five rare animals and eight rare plants (Table 3). These species may be present throughout the watershed, and potential impacts of projects should be considered and mitigated against in design and construction phases.

In addition to understanding unique habitats and rare or protected species, our review of existing data included the presence of invasive species. One in particular, the hemlock wooly adelgid (HWA), has the potential to change the forested landscape in the headwaters of Huntington Creek. The HWA attacks hemlock trees, feeding on the stored starches in the tree, which severely damages the canopy of the tree by interrupting the flow of nutrients to the twigs and needles. Tree health declines over time and mortality usually occurs within 4 to 10 years (NYS DEC 2016). HWA has been identified in Tioga County, and there are efforts underway to slow the spread to additional locations. Hemlock trees are a critical component of local forests, and loss of this species would temporarily expose riparian areas to the potential for stream warming and increased erosion resulting from a lack of root structure to stabilize hillslopes and stream banks, and would completely alter the forest species composition over the long term. For example, Japanese knotweed could easily invade under these conditions.

Table 3. Recorded rare, threatened, and endangered species in the Town of Owego, New York

Common name	Scientific name	Type	Group	Distribution	Year last documented	State protection status
Blackchin Shiner	*Notropis hertodon*	Animal	Fish	Recently Confirmed	1992	
Cobra Clubtail	*Gomphus vastus*	Animal	Dragonflies and Damselflies	Recently Confirmed	2009	
Comet Darter	*Anax longipes*	Animal	Dragonflies and Damselflies	Recently Confirmed	2016	
Spatterdock Darner	*Rhionaeschna mutata*	Animal	Dragonflies and Damselflies	Recently Confirmed	1988	
Yellow Lampmussel	*Lampsilis cariosa*	Animal	Mussels and Clams	Recently Confirmed	1997	
Ambiguous Sedge	*Carex amphibola*	Plant	Flowering Plants	Possible but not Confirmed	1920	Endangered
Bent Sedge	*Carex styloflexa*	Plant	Flowering Plants	Historically Confirmed	1898	Endangered
Cat-tail Sedge	*Carex typhina*	Plant	Flowering Plants	Historically Confirmed	1905	Endangered
Jacob’s Ladder	*Polemonium vanbruntiae*	Plant	Flowering Plants	Possible but not Confirmed		Rare
Porter’s Reed Grass	*Calamagrostis porteri ssp. porteri*	Plant	Flowering Plants	Historically Confirmed	1920	Endangered
Southern Wood Violet	*Viola hirsutula*	Plant	Flowering Plants	Historically Confirmed	1900	Endangered
Sweet-scented Indian Plantain	*Senecio suaveolens*	Plant	Flowering Plants	Historically Confirmed	1898	Endangered
Violet Wood Sorrel	*Oxalis violacea*	Plant	Flowering Plants	Historically Confirmed	1920	Threatened

Note: Comprehensive field studies have not been conducted in most areas and this list and would need to be confirmed with on-site surveys.

2.8 EXISTING PLANS AND POLICIES

In recognition of the need for building resilience to the impacts of climate change including flooding, Governor Cuomo signed into law the Community Risk and Resiliency Act (CRRA) in 2014. The Act will result in guidance for considering and managing future risk, developing natural resilience, and adapting local laws. State guidance on natural resiliency measures is expected to be available for public review in early 2019.

Locally and in response to the Disaster Mitigation Act of 2000, the Tioga County government and local municipalities maintain a Hazard Mitigation Plan (HMP) that is “designed to improve planning for, response to, and recovery from, disasters” and facilitates disaster relief funding (Tetra

Tech 2012). The HMP covers potential hazards likely to arise within Tioga County, and a major focus of the plan is flooding because it is one of the most-costly disaster types that have historically and cumulatively affected the county. The HMP lists 43 significant flood events in the period from 1950 to 2011, including 28 flash floods and 15 major floods. Each municipality and some school districts have their own chapter within the plan outlining specific hazard mitigation actions. A five-year regulatory update of the plan was completed in 2018 and is currently available in draft form (Tetra Tech 2018). The Town of Owego and Village of Owego chapters do not specifically identify major floods in Huntington Creek (Tetra Tech 2018).

The Town of Owego has several existing regulatory tools to locally enforce hazard mitigation including building codes, zoning ordinances, and a stormwater management program (SWMP) plan and ordinance [refer to Section 9.10 of Tetra Tech (2018)]. The County's stormwater management plan was updated for 2015-2020 period and includes the six minimum control measures required based on the Federal Stormwater Phase II Rule (1999) and was developed to comply with the NYS DEC general permit for stormwater discharges from Municipal Separate Storm Sewer Systems (MS4s) (Broome-Tioga Stormwater Coalition 2015). The plan is focused on reduction of contaminants in stormwater however, lacks a component focused on reductions in stormwater to increase resiliency. With regard to zoning, the Town of Owego Zoning Ordinance includes an article (XVI) to address flood damage protection by requiring a permit to develop in areas of special flood hazard defined as the 100-year floodplain as shown on the existing Flood Insurance Rate Map. The Village of Owego also has floodplain regulations that identify areas of special flood hazard where development is limited (Village of Owego Code Chapter 117).

2.9 PREVIOUS STUDIES

In 2013, Woidt Engineering & Consulting of Binghamton, New York, prepared a report on the hydrology and hydraulics of Huntington Creek. The study focused on flood impacts near Owego Apalachin Middle and High School and explored a range of flood mitigation strategies. The recommended approach was to implement a combination of measures including augmenting existing grade control structures upstream of Route 96 to help capture debris, construct a compound channel between Route 96 and the Sheldon Guile Boulevard culvert, and set back the berms along the channel downstream of Sheldon Guile Boulevard. The report also recommended further study in upland reaches to identify source areas of coarse sediment and potential stabilization projects.

2.10 TIOGA COUNTY SWCD STREAM PROGRAM

The Tioga County SWCD stream program provides a range of services to landowners and municipal agencies with the main goals of balancing the need for environmental protection with private property rights, use and safety; and assisting municipalities and landowners in environmentally sensitive maintenance, repair, and construction work on or near stream channels, and reducing costs while ensuring safety and stability. The SWCD works toward these goals by providing the following services:

- **Monitoring and Mapping of Stream Issues** – The SWCD database of stream observations allows quick assessment of priority sites if funding becomes available, and provides a record of site conditions against which to check for damage after disaster events.
- **Education and Outreach** – From one-on-one discussions with landowners to formal training sessions for municipal employees, SWCD helps communities understand stream processes which is the first step in cost efficiently addressing and solving problems.
- **Technical Assistance/Advice** – SCWD works with landowners and municipalities to find safe, sustainable, and cost-effective solutions to difficult problems.
- **Permit Assistance** – Strong relationships with environmental regulators and full knowledge of the regulations allows the SWCD to facilitate an efficient permitting process.
- **Grant Writing and Administration** – With no consistent form of funding available, the SWCD is creative and aggressive at finding available funding to address the priority issues the county faces.
- **Design Work and Engineering** – SWCD staff have the ability to do engineering work and planning for stream projects and find creative, cost-effective solutions. The SWCD has developed working relationships with local engineering firms that are able to provide engineering services and review on an as-needed basis.
- **Construction Oversight** – The SWCD assists private landowners, the Tioga County Department of Public Works, and municipalities in making on-site decisions during construction in response to changing field conditions and to ensure that ensure that projects are constructed as designed.
- **Hazard Mitigation Planning** – The SWCD is the coordinator for the Tioga County Multi-Jurisdictional Hazard Mitigation Plan. The role involves coordinating plan maintenance and updates and assisting municipalities and the County with moving forward on named mitigation projects.
- **Culvert Inventory, Analysis, and Design** – The SCWD assists municipalities with culvert design so that new installations meet regulations and requirements for capacity and aquatic connectivity.
- **Flood Response** – SWCD respond quickly to assist municipalities, private landowners, and the County with all of the above in flood recovery situations. Streamlined emergency authorization permit work, evaluation of sites, and assistance with construction oversight are three examples of typical flood response services.

In addition and integral to the above goals and services, the SWCD provides training for local contractors and municipal highway departments through the Post Flood Emergency Stream Intervention Program (ESI). This is a three-day course developed by the Delaware County SWCD and adopted and adapted by the NYS DEC and the Upper Susquehanna Coalition to train contractors and municipal workers on post flood response in streams. The program focuses on identifying priority sites (i.e., where to work and where not to work), what type of work should be done, and how to do that work in the most environmentally sensitive and physically sound way possible. The training consists of both classroom and field components. The SWCD has conducted a number of ESI trainings in the past and plans to continue offering these trainings as time, resources, and interest allows. For more information on the ESI program in general visit http://www.u-s-c.org/html/Streamteam.htm.

3. Field Assessment

A team of three Inter-Fluve geomorphologists assessed the watershed on October 15 and 16, 2018. All photos included in this report were taken on those dates unless otherwise noted. For parts of both days, Mike Jura of the TCSWCD joined the team in the field. During the assessment, the team walked the entire length of the mainstem and the three branches. Along the way, we collected photos, observations, and measurements in Survey123 by ESRI, a customizable data collection app that stores field data in a geotagged and tabulated form. A blank copy of our field data collection form is provided in Appendix A. Unless otherwise noted, photos included in this report were taken on October 15 or 16, 2018.

The complete dataset has been provided to the county in GIS format. The following sections provide a summary of the trends documented in the field. River stations are provided as distances in feet from the confluence with Owego Creek as shown in Figure 3.

Fuss and O'Neill assessed 10 culverts in the watershed. The results of the culvert assessment are provided in Appendix B.

3.1 UPLAND CHANNELS – HUNTINGTON CREEK MAINSTEM AND BRANCHES

As described in Section 2.3, the watershed is defined by the contrast between steep, narrow upland channels, including the upstream reaches of the mainstem and the three surveyed branches, and the more gently sloped mainstem channel downstream of the Route 96 crossing on the Owego Creek floodplain. Upland streams are by nature closely connected with hillslopes and may or may not have small associated floodplains.

Observations from throughout the Huntington Creek watershed consistently suggest that its stream channels have relatively recently experienced widespread lowering of bed levels. The evidence includes perched culverts, head cuts, formerly flood-prone areas stranded above current bankfull levels, and gullying along small drainage channels. The result is that flood flows are generally focused in relatively deep channels without access to potential floodplain areas or exposure to the roughness that would be afforded by the forest floor. Furthermore, in-channel roughness is limited to course gravel, cobbles, and bedrock ledges with features such as large wood and dense, woody root networks that provide substantial habitat opportunity largely absent. Disconnection of the channels from the forest floor means that vegetative cover on the bank slopes is generally poor and the bank material is vulnerable to fluvial erosion as well as mass failure. Forest cover in the uplands is typically hemlock-beech type with sparse shrubs along the forest floor. Figure 6 shows a representative upland channel.

The steep, narrow channels of the upper mainstem and first, second and third branches are capable of transporting large volumes and calibers of sediment. Upland areas of watersheds are naturally source areas of sediment, and sediment transport is often supply limited (i.e., the hydraulic capacity exceeds the supply of mobile sediment). In the Huntington Creek watershed, the nature of the channels described above has created a positive feedback loop whereby the channels can hold deep flows, which generate high shear stresses on the beds and promote further erosion and lowering of bed levels. In addition to the high hydraulic transport capacity, the local bed material is particularly mobile due to its platy shape and high surface area to mass ratio. Observations from the field suggest that the above combination of factors result in frequent mobilization of all of the bed material present in the upland channels (Figure 7). In places, the channel is scoured to bedrock with little deposition (Figure 8). In between the bedrock reaches, depositional forms include riffles and bars. We carried out pebble counts (i.e., measurement of 100 randomly selected particles) on some of the gravel bars present, focusing on areas where the bed appeared free from recent disturbance by machines and from the hydraulic influences of culverts or other structures. The median grain size of bed material at sampled sites along the second and third branches is approximately 2 inches. At one site located at the junction of the third branch and the mainstem, the median grain size is approximately 4 inches.

Figure 6. A representative reach of the second branch. Flow level indicators suggest that bankfull width and depth through this reach are approximately 15 feet and 2 feet, respectively. Slope is approximately 7%. The channel sits well below the floodplain.

Figure 7. A clast greater than 1 foot in diameter (intermediate axis) that was recently mobilized in the first branch of Huntington Creek and pinned beneath a small piece of wood. Imbrication of the bed indicates that the bed material is generally mobile.

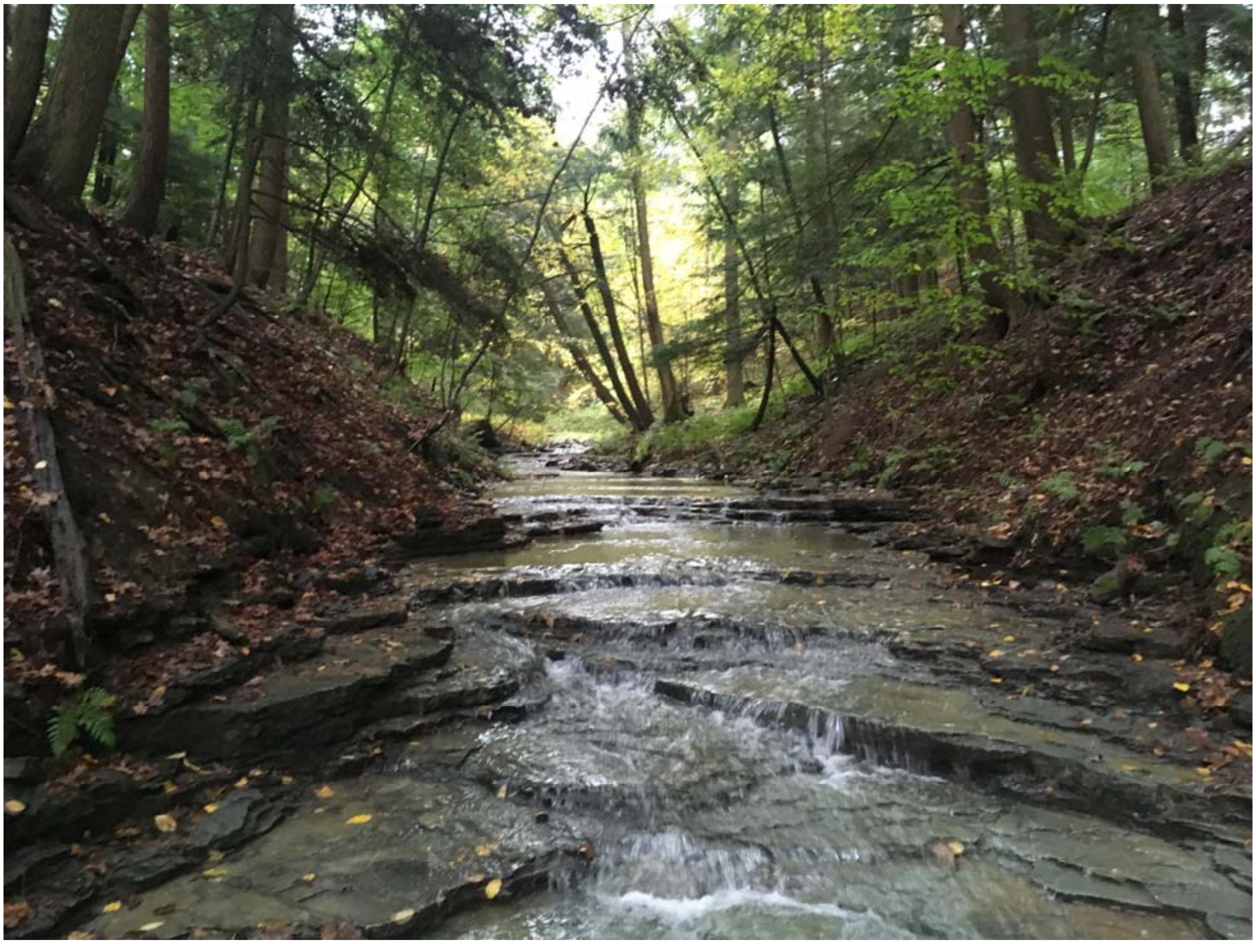

Figure 8. Looking upstream at a bedrock reach on the upper mainstem of Huntington Creek

While the current condition is generally as describe above, there are rare locations where the channel is better connected to the forest floor and overbank flow occurs more regularly. This improved condition from the perspective of flood detention was consistently observed in reaches immediately upstream of large woody debris jams in the channel where local gradients were reduced (Figure 9). Generally, jams appeared to have been initiated by a fallen tree that is large enough to span the channel and be anchored in place by its root wad or wedged into the channel (Figure 9). Once wedged across the channel, the tree traps sediment and smaller woody debris. This recruitment of additional material bolsters jams into relatively stable features that are self-sustaining; if the original wood piece was to degrade, often the material that had subsequently been added to the jam will maintain the structure.

Where channels are more closely connected to the forest floor, trees growing at the tops of the banks are more effective at forming jams and at stabilizing the full extent of the bank slope. The latter occurs through added cohesion (i.e., resistance to failure) and shielding soil from fluvial forces.

The channel locations with these log jams have greater in-channel habitat opportunities than elsewhere. The log jams initiate localized scour, producing deep pools that provide shaded cover and low-velocity resting areas for aquatic species. Elsewhere, the primary habitat opportunities vary with bed substrate, with gravel and cobble reaches providing modest habitat complexity, but bedrock reaches only providing deep pool habitat with minimal cover in some locations.

The downstream boundary of the steep, upland channels is currently defined by a grade control project constructed by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) (Figure 3). The project consists of a series of large boulder weirs spanning the channel. Voids are present between the boulders such that low flows are entirely sub surface and the reach forms a complete barrier to aquatic organism passage. The disturbed area around the project has been colonized by Japanese knotweed.

Figure 9. Rare example of a large woody debris jam in the channel along the second branch tributary to Huntington Creek. In this instance, a single channel-spanning piece of wood initiated a jam by trapping sediment and other woody debris. Approximately 200 cubic yards of sediment are retained as a result of this single structure. The difference in bed elevation across the jam is approximately 2.5 feet.

3.2 LOWER HUNTINGTON CREEK MAINSTEM

In the lower reaches of Huntington Creek, downstream of approximately Route 96, the channel has a lower gradient and the channel dimensions more closely match anticipated bankfull conditions. The channel's ability to transport sediment diminishes as a result of the lower gradient; grain-size data collected in the field support the observation of reduced flow competence with a median grain size in the channel near the high school (river station 1200) of approximately 1 inch versus the 2- to 4-inch median sizes documented in upland channels. Substantial deposition through this transitional reach further reduces channel capacity and the capacities of the railroad and Sheldon Guile Boulevard crossings. Although an attempt is made to maintain channel capacity through localized periodic dredging of the channel, it is common that the bed level in the channel at the crossings sits above the groundwater level of the surrounding floodplain. This situation may exacerbate the intermittent nature of the stream, causing the channel to run dry more often during periods of low flow than under natural conditions.

The hydraulic analysis conducted by Woidt Engineering (2013) suggests that runoff generated from storm events with greater than a 5-year return period (20% annual chance) overtop the banks upstream of the railroad crossing. This is thought to be the location of overtopping responsible for past flooding at the Owego Apalachin Middle and High School. At the time of the Woidt Engineering study, the capacity of the Sheldon Guile Boulevard twin culvert was greater and equivalent to an approximately 50-year return period (2% annual chance) storm runoff. In the downstream channel along the athletic fields (Figure 10), the left bank contained flows up to the runoff generated by a 100-year storm event (1% annual chance), but overbank flow occurred along the right bank during events exceeding the runoff generated by a 10-year storm event (10% annual chance). These results reflect only a snapshot of the field conditions at the time of the Woidt Engineering study but do provide an indication of the relative capacities of the channel at various locations.

The aquatic habitat in this part of Huntington Creek is minimal due to the historic straightening and the ongoing dredging activities. The creek is laterally confined and large wood absent; therefore, there are no opportunities for geomorphic and habitat complexity to develop. The habitat that does exist is limited to a few pools that have minimal cover.

3.3 HUMAN ALTERATIONS AND IMPACTS

The primary human impacts in the upper reaches of Huntington Creek are the legacy of deforestation, continued maintenance of cleared areas for agriculture, and the presence of steep roads and road ditches that constrain the mainstem, reduce flow access to the forest floor, collect and funnel runoff into the channels, and require numerous culverted crossings (see USC 2018b for map). All of the above factors likely contribute to the trend of lowering bed levels observed in the upland portions of the watershed. Although the watershed has been largely reforested in recent decades, wood remains generally absent from the channel. Field and anecdotal evidence suggest that active removal of wood from the channel is widespread in response to the perception that downed wood causes channel instability, reduces channel capacity, and blocks road crossings.

Figure 10. Looking downstream along mainstem of Huntington Creek as it flows toward Owego Creek across the Owego Creek floodplain (river station 1200). Through this reach, the bankfull width and depth are approximately 40 feet and 2.5 feet, respectively. Slope is approximately 2%.

Near Route 96 and downstream to the confluence with Owego Creek, land around Huntington Creek is more intensely developed. In addition to numerous closely spaced road crossings, the Owego Apalachin School District has constructed a bus depot at the top of the right bank and farther downstream a school and athletic fields are located on the Owego Creek floodplain. The channel from Route 96 through the Sheldon Guile Boulevard culvert is made up of vertical wooden and concrete walls with no floodplain habitat. There is minimal riparian buffer, the channel is dredged on an ongoing basis, and dredged material has been piled up to form berms at the tops of the banks along the creek downstream of Sheldon Guile Boulevard.

4. Discussion

Our review of existing information combined with our field observations strongly suggest that under purely natural conditions the steep, forested streams of the Huntington Creek watershed would be sites of long-term incision but that naturally occurring large woody debris jams would help to control grade, moderate the sediment producing effects of large flood events, and regulate rates of bed level lowering. Watershed changes including deforestation, road construction, field and road drainage, and active management of channels by dredging and removing large wood have combined with increasing hydrology and resulted in more rapid runoff and rates of bed level lowering than would be anticipated under natural conditions.

The upper reaches of the mainstem of Huntington Creek and its tributaries are characterized by steep channels that occupy narrow valleys incised into readily erodible glacial deposits and bedrock. Bed material ranges from sand to boulders, and all sizes up to the largest clasts appear to be mobilized during large flow events. This is unique in that in other systems, large boulders might be more stable and only sporadically mobilized, helping to maintain bed levels. However, the geology of the Huntington Creek watershed consists of sedimentary rocks that break apart along shallow bedding planes resulting in flat clasts that are subject to relatively high lift forces and thus frequent mobilization. In rare instances where the banks are forested and the channel left to evolve naturally, large wood that falls into the channel creates jams, or natural dams, that trap sediment and control upstream bed levels. Observed differences in bed levels upstream and downstream of jams were between one to three feet. The larger the wood (i.e., the more mature the forest), the more effective it is at forming a jam. Where large wood is absent, channels appear more disconnected from the forest floor often with head cuts progressing upstream to artificial grade controls such as culverts, resulting in substantial perching, undermining, and grade differences upstream and downstream of the structures.

The recently published National Large Wood Manual (USBR and ERDC 2016) provides a wealth of information on the role of large wood in stream geomorphology and ecology. Section 4.2.5 in particular focuses on the role of large wood in dissipating flow energy, capturing sediment, and limiting down-cutting or incision of small headwater streams. As referenced in the manual, a conceptual model by Schumm et al. (1984) is useful for understanding the various stages of channel evolution associated with incision (Figure 11). Type I channels are in a state of dynamic equilibrium where sediment transport is balanced by sediment supply and the channel bankfull capacity approximates a 50% annual chance flood with high magnitude flows spreading out across overbank areas. Stream bed incision or lowering leads to an increase in channel capacity and shear stresses on the bed surface (Type II), which exacerbate incision rates until banks become unstable and the channel widens (Type III) or natural or artificial downstream grade controls prevent further down-cutting. Type III channels may exhibit lateral movement or multi-threaded conditions as the channel adjusts to the increased supply of sediment from the banks. The transition to Type IV is marked by sediment deposition within the widened channel; return to a single-threaded channel with more stable bars, riffles, and pools; and formation of new overbank areas at a lower elevation. Type V is similar to Type 1 but with the bankfull channel established at a lower elevation.

Field observations suggest that upper reaches of the mainstem of Huntington Creek and its tributaries are currently in stages exemplified by channel types II and III. For sites in these early stages of the evolution process, it may be possible to reverse or arrest the effects of incision and re-establish a Type I channel (USBR and ERDC 2016). Where channel widening has already begun, restoration design should take the risk of widening into account.

Huntington Creek downstream of Route 96 is naturally a lower gradient channel flowing over an alluvial fan formed by the delivery of sediment eroded from the upper reaches of the watershed and deposited on valley floor occupied by Owego Creek. Under natural conditions, Huntington Creek would meander laterally across the fan, possibly comprising numerous channels and continuing to efficiently deposit its sediment load in a natural fan shape. Lateral movement of the channel under current conditions has been restricted by river walls, bridges and associated bank erosion countermeasures, and channelization. The channel has been straightened and flanked by berms. Without access to the alluvial fan, the substantial load of coarse sediment carried by the creek is deposited within the channel bed. This process raises the bed level and reduces channel capacity, exacerbating flood impacts. Thus, both local management approaches along the mainstem and tributary conditions including rapid runoff and high rates of sediment delivery contribute to flooding and flood-related impacts along this stretch of Huntington Creek.

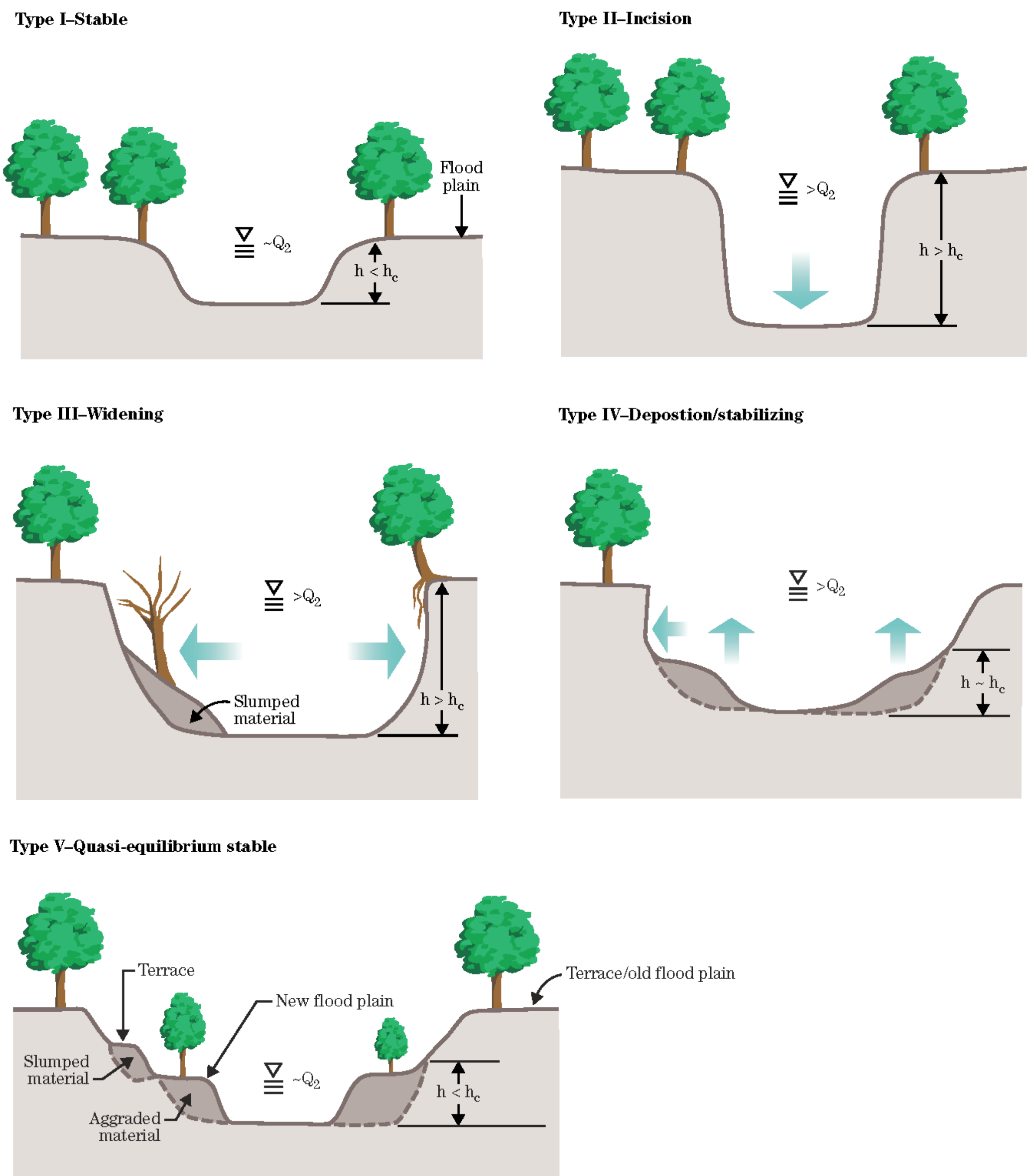

Figure 11. Conceptual model of incision channel evolution by Schumm et al. (1984). Reprinted from USDA-NRCS (2008).

5. Flood Mitigation Approach and Alternatives

Sustainable flood resiliency can only be achieved by understanding the processes governing the watershed and applying solutions that works within that framework. We recommend an approach to increasing resilience to flooding and flood-related impacts that focuses on restoring natural watershed function to the greatest extent possible. Generally, that means reforesting tributaries and allowing natural recruitment and functioning of large wood elements; reducing the impacts of roads on valley width and watershed hydrology; where they cannot be eliminated, upgrading road crossings to withstand extreme flood events and the passage of sediment and debris; and allowing for active channel migration and alluvial fan deposition along the downstream, low-gradient reaches of Huntington Creek.

We have developed two lists of potential projects based on the above recommendations: One focused on site-specific, on-the-ground construction projects (Table 4) and one capturing other types of projects (Table 5). No single project will resolve the issues facing the Huntington Creek community, but implemented together, these projects represent a comprehensive approach that is expected to have a measurable effect. Recommendations from Fuss & O'Neill (see Appendix B) have been incorporated into these lists.

A map of site-specific construction projects is provided in Figure 12. At each site, a project number has been assigned based on the distance of the site from the mouth of the stream (e.g., Ht3-2700 is located 2,700 feet upstream along the third branch from its confluence with the mainstem Huntington Creek). For each project that involves treatment over an extended length of the channel, the project number and location marker is set at the downstream limit of treatment; the corresponding project description in Table 4 provides the distance that the treatment extends upstream of that point. Unless otherwise noted, photos included in this section were taken on October 15 or 16, 2018.

Construction projects have been developed with reference to the environmental review guidance published by GOSR for CDBG-DR funded projects in the NY Rising Community Reconstruction Program. Each project has been assigned a project type that describes the approach to mitigating flood impacts and increasing community resilience. Many projects could fall into more than one category; the chosen category reflects the primary elements of the project. The project types are:

- **Riparian Management** – Channel and floodplain restoration and/or enhancement, including creation or enhancement of wetlands, riparian buffers, and other features to slow flow, increase flood conveyance capacity, and capture sediment;
- **Bank Stabilization** – Bioengineering bank stabilization to slow bank retreat, protect existing infrastructure, and reduce input of coarse sediment at identified point sources;
- **Floodplain Reconnection** – Measures to reconnect the channel with its floodplain such as berm removal, floodplain regrading, or installation of bioengineering measures to raise the channel bed and restore a functional channel-floodplain relationship, increase floodplain conveyance capacity, and slow flood flows;

- **Grade Control** – Sustainable and ecologically sensitive bed stabilization to arrest channel bed erosion and/or protect structures or infrastructure;
- **Barrier Removal** – Removal of barriers that cause backwater effects and prevent aquatic organism passage;
- **Crossing Improvement** – Road crossing improvements to increase hydraulic capacity, improve road user safety, increase resilience and reduce risk of failure, and improve aquatic organism passage;
- **Road Relocation/Closure** – Relocation or closure of roads or sections of roads as a more sustainable alternative to repeated culvert and road repairs;
- **Structure Removal** – Removal, relocation, flood-proofing, or raising flood-impacted and at-risk structures;
- **Upland Land Management** – Implementation of best management practices in upland areas to slow overland flow and increase infiltration;
- **Green Infrastructure** – Green stormwater infrastructure to reduce surface water flooding;
- **Policy** – Regulatory or policy creation or changes to preserve undeveloped areas, move development out of the floodplain, and encourage sustainable and resilient design; and
- **Public Education** – Opportunities to education the public and municipal bodies on watershed processes and sustainable watershed management to reduce flood risk and improve resilience.

We recognize that the project lists are by nature incomplete in that they do not cover all possible actions that could be taken at every site within the watershed. These project examples have been provided as a starting point for prioritization given available funding. Many of the projects described could be implemented more widely as future opportunities arise.

In subsequent phases of design and construction, potential impacts to the rare plant and animal species present in the watershed should be considered in more detail and mitigation measures developed where necessary. Future updates to the project lists and project designs should also incorporate the guidance for considering and managing future risk, developing natural resilience, and adapting local laws that is currently being developed by NYS DEC under the CRRA.

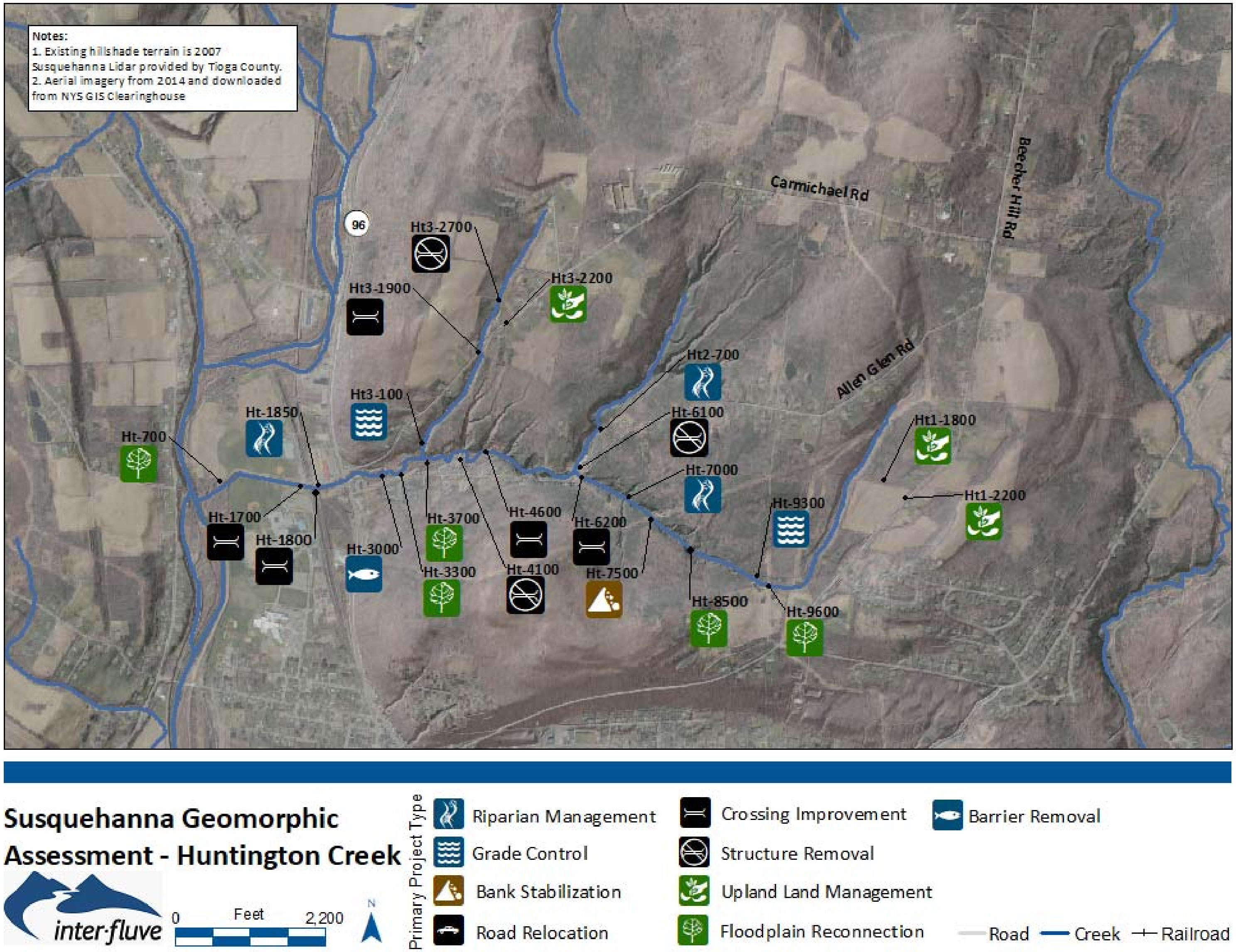

Figure 12. Map of site-specific potential flood mitigation and resilience construction projects. Refer to Table 4 for descriptions.

Table 4. List of potential flood mitigation and resilience alternatives – Site-specific projects

Project number	Type	Description	Photo or image reference
Ht-9600	Floodplain Reconnection	Floodplain wetland, rare in the watershed, is present immediately upstream of project site. Install engineered large wood and/or rock to raise grade level, improve protection at natural gas pipeline crossing, and enhance flood storage in the natural wetland. Treatment would start a short distance downstream of the pipeline crossing and extend upstream for approximately 200 feet. Valley is broad; treatment would be focused in channel.	Figure 13
Ht-9300	Grade Control	Downstream limit of lower gradient headwater reaches. Location of small knickpoint. Install engineered large wood and/or rock to establish grade control, control headcutting, and encourage reconnection of the channel to its floodplain. Length of treatment would be approximately 100 feet. Valley is broad; treatment would be focused in channel.	Figure 14
Ht-8500	Floodplain Reconnection	Low-gradient reach with opportunity to utilize storage potential along the valley floor. Install engineered large wood spanning the channel and valley to raise grade level and reconnect the channel to its floodplain. Length of treatment would be approximately 500 feet.	-
Ht-7500	Bank Stabilization	Stripping of woody vegetation for power lines and a plunge pool at the downstream end of a bedrock-controlled reach have resulted in scour and undermining of the banks and bank failure and erosion. Lay back the banks to a more stable slope and stabilize the toes of the banks using bioengineering techniques involving large wood and/or rock and native seeding and planting. Bank length is approximately 100 feet.	Figure 15
Ht-7000	Riparian Management	Two small tributaries deliver runoff and inputs of coarse sediment and silt. Install engineered large wood along both drainages to slow surface runoff, promote infiltration, trap coarse sediment, and promote settling of silt.	Figure 16
Ht-6200	Crossing Improvement	Existing Allen Glen Road crossing appears undersized and is in extremely poor condition with headwalls missing, wingwalls near collapse, and signs of erosion of the road embankment. The existing concrete apron is perched at the downstream end. Replace crossing with an appropriately sized open-bottom structure to reduce flood risk, minimize blockage by woody debris, reduce risk to road users, and facilitate aquatic organism passage.	Figure 17

Project number	Type	Description	Photo or image reference
Ht-6100	Structure Removal	Existing culvert at private access to winery located at a bend in the creek appears undersized and is in extremely poor condition with missing headwalls and misaligned wingwalls. May represent a safety hazard. Multiple crossings over Huntington Creek and the second branch within a short distance of one another have a large cumulative effect on local flow and sediment transport dynamics. Replacement of the culvert would likely be expensive (see Appendix B) and would not resolve the issue of multiple crossings in close proximity. Remove the culvert and upgrade the pedestrian crossing over the second branch to allow for vehicular traffic between the existing parking lot off of Allen Glen Road and the winery and private residences. The new structure should be appropriately sized to minimize blockage by woody debris during large flood events. Restore the reach through the former crossing site, creating a new creek-side amenity.	Figure 18
Ht-4600	Crossing Improvement	Replace apparently underfit culvert at private access off of Dean Street with an appropriately sized open-bottom structure to reduce flood risk, minimize blockage by woody debris, and improve user safety	Figure 19
Ht-4100	Structure Removal	Site is located in a natural zone of deposition where a small channel draining the northern hillside empties into Huntington Creek. Vegetation has been removed, the creek has been straightened, secondary channels have been filled, and a private access bridge has been installed. Activity has reduced channel sediment storage potential, reduced the creek's natural ability to process sediment, and increased the susceptibility of the banks to erosion. Historically, landowner used private crossing immediately upstream (Ht-4600) to access parcel. Revert to shared crossing by removing the bridge, which is in poor condition, and reinstating access via the improved culvert at Ht-4600. Restore to multi-threaded channel with functional floodplain. Project length is approximately 300 feet.	Figure 20
Ht-3700	Floodplain Reconnection	Site is multi-threaded with proximal floodplain. Install engineered large wood spanning the channel and valley to raise grade level, enhance detention of flood flows in overbank areas, and help trap coarse sediment. Length of treatment would be approximately 300 feet.	Figure 21
Ht-3300	Floodplain Reconnection	Site is downstream of the third branch, which delivers large volumes of coarse sediment to the creek. Install engineered large wood spanning the channel and valley to raise grade level, enhance detention of flood flows in overbank areas, and help trap coarse sediment. Length of treatment would be approximately 300 feet. The work would include invasive plant treatment/removal (Japanese knotweed) and seeding and planting native riparian species.	Figure 22

Project number	Type	Description	Photo or image reference
Ht-3000	Barrier Removal	Site of a relatively recent NRCS grade control project. Substantial voids exist in large rock used to construct grade control structure resulting in poor habitat quality, barrier to aquatic organism passage, and subsurface flow during low flow. Monitor the site over the anticipated lifespan of the project, review effectiveness, and weigh options for mitigating fish passage issues. Consider reconstructing grade control in a more ecologically sensitive manner. Future work should include invasive plant treatment/removal (Japanese knotweed) and seeding and planting native riparian species.	Figure 23
Ht-1850	Riparian Management	Site is located in a natural zone of deposition between Route 96 and Sheldon Guile Boulevard. Channel is laterally constrained, experiences substantial deposition on the bed, and requires regular dredging to maintain conveyance capacity. Remove walls and berms, widen floodplain, and allow channel to migrate laterally. Length of reach is approximately 400 feet.	Figure 24
Ht-1800	Crossing Improvement	Raise and lengthen the railroad crossing to improve conveyance capacity and accommodate a wider channel and floodplain	Figure 25
Ht-1700	Crossing Improvement	The current alignment of the Sheldon Guile Boulevard bridge restricts floodplain width along Huntington Creek. The existing box culvert crossing is undersized and choked with sediment. Relocate/realign the section of Sheldon Guile Boulevard between the bus station and crossing to allow for widening of channel and floodplain (Ht-1850). Raise and replace crossing to improve conveyance and accommodate a wider channel and floodplain.	Figure 26
Ht-700	Floodplain Reconnection	Creek has been straightened and constrained by berms. Remove berms to encourage more frequent inundation of adjacent floodplain and provide space for channel to migrate laterally. Initiate recovery by re-meandering the channel along a more natural alignment. Reconstruct a berm set back from the channel to help protect the school from flooding from Huntington Creek. Consider location and orientation of berm that would not adversely interfere with flooding from Owego Creek.	Figure 27
Ht1-2200	Upland Land Management	Regrade incised road ditch along East Beecher Hill Road. Divert flow into neighboring fields at regular intervals to reduce peak flows and promote infiltration.	Figure 28
Ht1-1800	Upland Land Management	Roughen, fill, or block channel that drains field to slow surface runoff and promote infiltration	Figure 29
Ht2-700	Riparian Management	Install large wood along a steep, incised channel leading through the forest from Allen Glen Road to slow surface runoff and promote infiltration	Figure 30

Project number	Type	Description	Photo or image reference
Ht3-2700	Structure Removal	Existing culvert along a private field access off of Carmichael Road appears undersized and is perched with a deep scour hole and incised channel downstream. The culvert is currently serving as grade control for upstream reaches. Replacement of the cuilvert would likely be expensive (see Appendix B). Remove the culvert and utilize alternative routes off of Carmichael Road that do not require crossing the creek. Install engineered large wood and/or rock in the downstream reach to establish grade control, reduce the risk of headcutting, and moderate sediment supply. Length of treatment would be approximately 200 feet.	Figure 31
Ht3-2200	Upland Land Management	Implement drainage improvements along Carmichael Road to slow runoff and reduce erosion. Repair road ditches and install ditch relief culverts where opportunities exist to divert flow onto fields and thus promote infiltration. Include adequate erosion protection at culvert outlets.	-
Ht3-1900	Crossing Improvement	Existing culvert beneath Carmichael Road appears to severely restrict high flows and is in extremely poor condition with a collapsed outlet structure. The downstream channel is severely incised. Install a riffle grade control structure immediately downstream to raise grade level at the crossing. Replace the culvert with an appropriately sized structure at a lower elevation to reduce flood risk and risk to road users. Combine with grading and installation of engineered large wood upstream of the culvert to reduce the risk of headcutting and moderate sediment supply. Implement after Ht3-100.	Figure 32
Ht3-100	Grade Control	The third branch between the confluence and Carmichael Road shows evidence of continued downcutting along the channel bed and drainage channels leading from the road. Bedrock is exposed along the bed in numerous locations. Regrade the banks to a more stable angle where possible and install engineered large wood and/or rock to stabilize the bed, raise grade level, and moderate coarse sediment supply. Length of treatment would be up to 1,500 feet.	Figure 33

Figure 13. Broad floodplain at pipeline crossing at Ht-9600. Photo taken March 6, 2019.

Figure 14. Small knickpoint at downstream limit of treatment reach Ht-9300

Figure 15. Looking upstream at bedrock control forming upstream limit of treatment reach Ht-7500. Note open canopy and steep, erodible bank toe on river right (left side of photo).

Figure 16. Small channel entering Huntington Creek at Ht-7000

Figure 17. Looking upstream at Allen Glen Road crossing at Ht-6200

Figure 18. Looking upstream at culvert beneath private access at Ht-6100

Figure 19. Private access at Ht-4600

Figure 20. Looking upstream at cleared area around private access at Ht-4100. Note small drainage channel entering channel from river right (left side of photo).

Figure 21. Channel and floodplain at Ht-3700

Figure 22. Looking downstream at Ht-3300

Figure 23. A portion of the NRCS grade control project at HT-3000. Note large boulders and lack of surface flow over the structure. Photo taken June 14, 2018.

Figure 24. Huntington Creek between Route 96 and Sheldon Guile Boulevard at Ht-1850

Figure 25. Looking downstream at the railroad crossing at Ht-1800

Figure 26. Sheldon Guile Boulevard crossing at Ht-1700

Figure 27. Looking downstream along Huntington Creek between Sheldon Guile Boulevard and the confluence with Owego Creek (Ht-1200)

Figure 28. Field along East Beecher Hill Road at Ht1-2200

Figure 29. Small channel draining field at Ht1-1800

Figure 30. Small channel through forested floodplain at Ht2-700

Figure 31. Private field access at Ht3-2700

Figure 32. Carmichael Road culvert at Ht3-1900

Figure 33. Looking upstream along the incised third branch near Ht3-100. Photo taken March 6, 2019.

Table 5. List of potential flood mitigation and resilience alternatives – Other projects

Project number	Type	Description
Ht-A	Public Education	Expand and formalize training and resources for the public and county and municipal staff that focus on flood resilience and natural systems solutions and management practices that support watershed resilience. Examples of specific areas of focus are the benefits of natural watershed processes such as large wood recruitment and the benefits of minimizing dredging activity. Among other sources of information and ideas are Vermont's Rivers and Roads and Flood Ready Vermont programs, or Maine Audubon's Stream Smart program.
Ht-B	Public Education	Establish a watershed group to help guide implementation efforts, assist with fundraising, raise awareness about critical issues, educate the public, and lead stream improvement and clean-up projects.
Ht-C	Green Infrastructure	Encourage county departments and municipalities to exceed minimum requirements for incorporating green infrastructure and other stormwater BMPs into stormwater infrastructure planning and capital projects, as well as into comprehensive planning and other town/village/county planning documents.
Ht-D	Public Education	Conduct flood and erosional hazard mapping along Huntington Creek. Develop interactive mapping to display results for current and future conditions. Identify evacuation routes and procedures. Host the map on a county website and advertise its availability.
Ht-E	Policy	Review zoning ordinances and strengthen floodplain protection, erosion control, and stormwater treatment requirements. Example potential ordinances include but are not limited to: • A No Adverse Impact (NAI) ordinance; • Fluvial erosion hazard zoning to prevent development on highly erodible streambanks; • Riparian buffer ordinance or zoning provision to restrict development within 100 feet of streams (see resources at https://www.dec.ny.gov/chemical/106345.html); and • An ordinance to allow transfer of development rights from properties located in the floodplain to properties located in upland areas. New York State Department of State (NYS DOS) in cooperation with the Department of Environmental Conservation (NYS DEC), through the Community Risk and Resiliency Act, is expected to publish Model Local Laws Concerning Climate Risk. Review the model laws when available and consider adopting relevant ordinances. See https://www.dec.ny.gov/energy/102559.html
Ht-F	Riparian Management	Establish conservation easements to protect and restore priority riparian corridors, wetlands, and forested areas. Support the program with a study that prioritizes parcels for easement acquisition.
Ht-G	Riparian Management	Establish and advertise a stream buffer program to assist private landowners in developing and implementing planting plans
Ht-H	Structure Removal	Establish a fund to support continued participation in the FEMA buyout program and facilitate additional buyouts of properties vulnerable to flooding and erosional hazards. Allow these spaces to revert to natural floodplain.

Project number	Type	Description
Ht-I	Upland Land Management/ Green Infrastructure	Systematically inventory roadway drainage issues and opportunities for green infrastructure and other stormwater BMPs in the watershed. Opportunities likely include green infrastructure retrofits associated with buildings, parking lots, and driveways, particularly around the Owego Apalachin Middle and High School, and drainage improvements and low-cost linear BMPs within roadway rights of way. Review existing guidance documents (e.g. Vermont Stormwater Management Manual) and adopt/adapt as fitting.
Ht-J	Public Education	Current stormwater management education efforts focus on reducing pollutant loads. Expand the scope of the Broome-Tioga Stormwater Coalition public education and outreach efforts and www.waterfromrain.org website to also highlight the flood resilience benefits of reducing stormwater discharges. Emphasize and better incorporate information on green practices to reduce runoff such as water efficient landscaping, rain gardens, and rain barrels. Review existing stormwater BMP guides for homeowners and small businesses such as those available from the Vermont Department of Environmental Conservation (see resources at https://dec.vermont.gov/watershed/cwi/green-infrastructure). Adopt/adapt guides for use in public education efforts.
Ht-K	Public Education	Numerous informal ATV trails and crossings exist within the watershed. Educate private landowners about sustainable ATV trail construction and usage, including maintaining a riparian buffer and minimizing crossings.
Ht-L	Public Education	Hold workshops and circulate the New York State Forestry Voluntary Best Management Practices for Water Quality BMP Field Guide to landowners harvesting timber
Ht-M	Structure Removal	Investigate alternative locations for the Owego Apalachin Middle and High School athletic complex
Ht-N	Public Education	Via the New York State Hemlock Initiative, partner with NYS DEC and Cornell University Cooperative Extension to hold a Hemlock Woolly Adelgid (HWA) workshop to educate public and private landowners and managers on the importance of hemlock trees in local forests, the threat presented by HWA, and how landowners can identify and manage HWA infestations
Ht-O	Public Education	Run a campaign to promote local electronic waste recycling programs and consumer obligations under New York law
Ht-P	Public Education	Use the opportunities created by implementation of projects Ht-700 through Ht-1850 to educate and involve students. Example projects and teaching aids include: • Inclusion of students in tree and shrub planting as part of the restoration efforts; • Use of the site as an outdoor classroom with pre- and post-construction lessons and comparative studies; • Involvement of students in monitoring efforts to document post-construction geomorphic conditions and changes, water quality, and biodiversity; and • Installation of interpretive signage at the replaced bridge and restored floodplain area with engaging graphics that explain the process and benefits of stream and floodplain restoration.

6. Prioritization and Recommendation

We have ranked the site-specific projects in Table 4 according to seven metrics closely tied to the study goals and objectives:

- Flood risk – Attenuation (potential for project to attenuate floods);
- Flood risk – Damage reduction (potential for project to reduce property damage associated with inundation or erosion);
- Stream corridor infrastructure risk (potential for project to reduce risk to infrastructure located in the stream corridor and reduce risk to infrastructure users);
- Erosion/ channel stability (potential for project to improve stream stability and reduce sediment input);
- In-stream ecological benefit (potential for project to improve in-stream habitat and reduce barriers to aquatic organism passage);
- Riparian ecological benefit (potential for project to improve the quality of habitat within the wider riparian corridor); and
- Public education value.

Possible scores of 1, 5, and 9 were assigned for each metric with the first four metrics above assigned twice the weight of others for a total possible score of 99. One additional point was added to each total to provide a final score out of 100 possible points. The top scoring projects are highlighted in the summary table (Appendix C).

Implementation considerations such as cost, complexity, and land ownership will also likely play into project selection; therefore, estimated cost ranges and notes on implementation have been included with the prioritization results. Estimated costs have been provided for the purpose of comparison at the screening level and not as estimates of actual project costs. The screening level cost banding shown includes estimates of the anticipated design and construction efforts but excludes other elements such as permitting and cost of land or easement acquisition unless otherwise noted. Construction costs are based on review of costs for similar items in past projects and applicable reference cost data, have been adjusted for prevailing wage, and include a 30% contingency to account for uncertainty around scope, changing market factors, actual date of implementation, and other unknowns at this early stage.

Overall, we recommend that projects aimed at reducing peak runoff, increasing flood storage, and storing flows in the upper watershed be implemented as a priority. Doing so will help increase the effectiveness of downstream modifications to the channel or infrastructure. Grade control and stabilization projects and projects in the downstream reach of the creek (i.e., Ht-700 through Ht-1850) should be implemented prior to replacing restrictive culverts that may currently be holding back flow and substantial volumes of sediment, specifically undersized culverts acting as local grade control for upstream channels. However, culverts in critical condition should be closely monitored and replacement expedited to avoid substantial damages, losses, or harm to the public. Finally, grade control projects should be implemented from downstream to upstream, with downstream grade control established before upstream projects are undertaken in order to avoid undermining. In general, project phasing should be planned to mitigate potential downstream and upstream impacts of particular projects.

Based on the results of the prioritization, the above phasing considerations, and the funds currently available for implementation, we recommend proceeding to conceptual design with one of the following projects or packages of projects. By packaging a number of projects together, it is likely that cost savings may be achieved in both the design and construction phases. The recommended options are:

- Ht-9600 and Ht-9300 – These projects would help to attenuate flows and improve retention of coarse sediment in the upper watershed;
- Ht-4600 and Ht-4100 – These projects would enhance floodplain function and improve resilience, channel stability, and aquatic connectivity along the mainstem Huntington Creek; or
- Ht3-100 – This project would help establish grade control, improve channel stability, and improve retention of coarse sediment along the third branch. Implementing this project would facilitate future improvement of the Carmichael Road crossing (Ht3-1900).

All of the above options would deliver immediate benefits while funding is sought for other more public-facing, higher ranked but also more expensive projects such as those along the lower reaches of the creek. Final selection of a preferred option will depend on feedback from project partners, landowners, and the public.

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Appendix A - Inter-Fluve Field Data Collection Form

My Survey

Site Basics

Date and Time of survey

January 2, 2019 | 10:11 AM

Location

42.120°N 76.269°W

Watershed Name

- ○ Huntington
- ○ Apalachin
- ○ Wapasening
- ○ Other (see notes)

Stream Name

Site Name

Is this a potential project site?

- [ ] Yes
- [ ] No
- [x] Unsure

Site Photos

Site Photos

Setting

Site or Reach?

- ◯ Site
- ◯ Reach

Adjacent landuse/cover

- ◯ Forest
- ◯ Shrub
- ◯ Urban
- ◯ Field
- ◯ Industrial
- ◯ Developed Open Space

Potential for flood water storage?

- ◯ Yes
- ◯ No

Stream crossing?

- ◯ Yes
- ◯ No

Existing infrastructure?

- ◯ Yes
- ◯ No

% of bank artificially stabilized

0-25% | 25-50% | 50-75% | 75-100%

Flow inputs?

- ☐ Seep
- ☐ Tributary
- ☐ Culvert outfall

Flow outputs?

- ◯ None
- ◯ Diversion

Geomorphology

Reach Planform

Reach Type (see Montgomery-Buffington table, if applicable)

Valley Confinement

Unconfined | Partially Confined | Confined | Variable (see notes)

Bankfull Width (ft)

Bankfull Depth (ft)

Bank Height (ft) (see BEHI example)

Floodplain Connectivity?

BEHI Assessment- only do if erosion risk is obviously high

Bankfull to Bank Height Ratio

Use BEHI table to enter Index Value:

Depth of Roots (ft)

Root Depth to Bank height Ratio

Use BEHI table to enter Root Depth-Bank Height Index Value:

Root Density (%)

Use BEHI Table to enter Root Density Index Value:

Bank Angle (°)

Use BEHI table to enter Bank Angle Index Value:

Surface Protected (%)

Use BEHI table to enter Surface Protection Index Value:

Bank Angle (°)

Use BEHI table to enter Bank Angle Index Value:

Surface Protected (%)

Use BEHI table to enter Surface Protection Index Value:

BEHI Total:

Estimated Near Bank Shear Stress:

- [ ] 1-Very Low
- [ ] 2-Low
- [ ] 3-Moderate
- [ ] 4-High
- [ ] 5-Very High
- [ ] 6-Extreme

Riparian Vegetation

% Bank Covered By Woody Veg:

0-25% | 25-50% | 50-75% | 75-100%

Invasives Present?

- Yes
- No

Species Present

- Hemlock
- Maple
- Poplar
- Beech
- Birch
- Ash
- Spruce
- Sumac
- Knotweed
- Ironwood
- Other (see notes)

Riparian Zone Width (# of Bankfull Channels Wide):

0 to 0.5 | 0.5 to 1 | 1 to 2 | > 2

Bed Substrate

Bed Substrate (select 1-3)

- [ ] Clay (Stick Mud)
- [ ] Silt (Mud)
- [ ] Sand (< 2 mm)
- [ ] Fine Gravel (< 8 mm; ladybug)
- [ ] Coarse Gravel (< 64 mm, golf ball)
- [ ] Cobble (< 256 mm; volleyball)
- [ ] Boulders (> 256 mm; basketball)
- [ ] Bedrock (> 4096 mm; 13.5 ft)

Embeddedness (burial of gravel, cobbles by fine sediment)

0-25% 25-50% 50-75% 75-100%

Is the bed armored (depleted of fines)?

- Yes
- No

Sediment Dynamics

Mass wasting occurring along the reach?

- ◯ Yes
- ◯ No

Dominant sediment sources:

- ☐ Fluvial
- ☐ Hillslope
- ☐ Bank Failure
- ☐ Debris Flow

Dominant sediment transport mode:

- ◯ Suspended
- ◯ Bedload
- ◯ Mix

In-stream largewood presence:

- ◯ None
- ◯ Minimal
- ◯ Moderate
- ◯ Abundant

Bars (select multiple, if applicable):

- ☐ Point
- ☐ Mid Channel
- ☐ Lateral
- ☐ Terrace
- ☐ Sand Sheets
- ☐ None

Evidence of flood impacts (select multiple, if applicable):

- ☐ Debris Jams
- ☐ Floodplain Sedimentation
- ☐ Severe Erosion
- ☐ Other (see notes)
- ☐ None

Channel Stability

Evidence of Degradation:

- ☐ Banks undercut
- ☐ Exposed "air" roots
- ☐ Leaning Trees
- ☐ Suspended Culvert
- ☐ Headcuts
- ☐ Terraces
- ☐ Armored Bed
- ☐ Perched Channel/Tribs
- ☐ Exposed pipe crossing
- ☐ Undercut bridge piers
- ☐ Incised channel
- ☐ Failed stabilization

Evidence of Aggradation:

- ☐ Buried Culverts
- ☐ Sedimetation of FP
- ☐ Sedimentation of Bars
- ☐ Reduced bridge clearance
- ☐ Fine grains covering bed
- ☐ Mid Channel Bars
- ☐ Buried Veg
- ☐ Backwatering of Trib(s)
- ☐ Channel at or above FP elev.

Evidence of Stability

- ☐ Vegetated bars or banks
- ☐ Bridges or culverts with bottom near grade
- ☐ Limited bank erosion
- ☐ Tribs entering at or near grade
- ☐ Tree roots flush with bank

Stage of Channel Evolution (see Simon, Channel Evol. Model)

- ○ Class I - Stable / Pre-modified
- ○ Class II - Channelized
- ○ Class III - Bed Incision
- ○ Class IV - Incision and Widening
- ○ Class V - Aggradation and Widening
- ○ Class VI - Quasi-equilibrium
- ○ N/A - Constructed Concrete or Rip Rap Channel

Habitat

Water Quality

- ○ Poor
- ○ Fair
- ○ Good
- ○ Excellent

Water Quality Issues

- ☐ Stormwater Runoff
- ☐ Algae
- ☐ High Water Temp
- ☐ Stagnation
- ☐ Other (see notes)

Canopy cover

- ○ None
- ○ Minimal
- ○ Moderate
- ○ Full

Instream Habitat Notes:

Recommended Actions

Potential Restoration/Resiliency Enhancements

- [ ] Enhance Floodplain Connectivity
- [ ] Reduce Floodplain Development
- [ ] Enhance Floodplain Roughness
- [ ] Enhance Channel Roughness
- [ ] Bed grade controls
- [ ] Large wood installation
- [ ] Instream habitat
- [ ] Off-channel habitat
- [ ] Dam removal
- [ ] Bridge/Culvert Replacement
- [ ] Levee removal
- [ ] Bank Stabilization
- [ ] Re-meander

Other Restoration, Describe:

Site Access/Constraints

Is the site on private or public property?

- ◯ Private
- ◯ Public
- ◯ Private/Public
- ◯ Unsure

Assess site accessibilty:

Is there a reasonable place for staging?

Note any obvious constraints:

General Notes

Notes:

Appendix B - Crossings Assessment by Fuss & O'Neill

FUSS & O'NEILL

M E M O R A N D U M

TO: Candice Constantine, Inter-Fluve Engineering

FROM: Erik Mas, PE, Rachael Weiter, EIT, Fuss & O'Neill, Inc.

DATE: April 2, 2019

RE: Regional Susquehanna River Initiative Floodplain Management and Stream Restoration Assessment and Design
Road-Stream Crossing Assessment – Huntington Creek Watershed

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1 Introduction

Inadequate or undersized road-stream crossings can be flooding and washout hazards and can serve as barriers to the passage of fish and other aquatic organisms. In the Upper Susquehanna River watershed, inadequate or undersized road-stream crossings contributed to the widespread damage to homes and businesses, transportation infrastructure, utilities, and stream channel erosion that occurred during both Tropical Storm Irene and Tropical Storm Lee in 2011.

Fuss & O'Neill assessed selected road-stream crossings in the Huntington Creek watershed in support of Tioga County Soil and Water Conservation District's Regional Susquehanna River Initiative Floodplain Management and Stream Restoration Assessment and Design project. The primary goal of the overall project is to increase resilience to flooding and flood-related impacts within the priority watersheds in Tioga County, Broome County, and the community of Sidney, including the Huntington Creek watershed. Project objectives include utilizing and restoring natural watershed processes that help mitigate flooding and flood-related impacts, combined with infrastructure-based approaches, land use practices and policy, and improving public awareness.

The assessments consisted of field surveys of individual stream crossings using established road-stream crossing assessment protocols, followed by analysis of the field data to assign vulnerability ratings to each crossing based on multiple factors including hydraulic capacity, structural condition, geomorphic risk, aquatic organism passage, transportation and emergency services, other flooding impacts, and climate change considerations. The vulnerability ratings are used to prioritize structures for upgrade or replacement. The road-stream crossing assessments were conducted in conjunction with stream channel and floodplain geomorphic assessments completed by Inter-Fluve. The results of the stream crossing and geomorphic assessments will inform the selection of infrastructure and natural system solutions to increase flood resilience in the watershed.

This memorandum summarizes the methods and results of the road-stream crossing field surveys and vulnerability assessment. Recommendations are presented based on field observations and the vulnerability assessment and prioritization process.

2 Stream Crossing Field Surveys

2.1 Selection of Crossings

Road-stream crossings to be included in the assessment were initially identified based on review of aerial imagery, flood mapping, and other local, county, or state-wide data layers. TCSWCD and the project partners also identified stream crossings where flooding has occurred or that are known or suspected flow constrictions based on recent and historical flood events. The number of crossings selected for assessment in the Huntington Creek watershed was also dictated by the available project budget and the need to assess crossings in the other priority watersheds that are included in the study.

Ten road-stream crossings in the Huntington Creek watershed were ultimately selected for field surveys and vulnerability assessment. The locations of the selected crossings are shown on the watershed map in Figure 1. Summary information on each crossing is provided in Table 1.

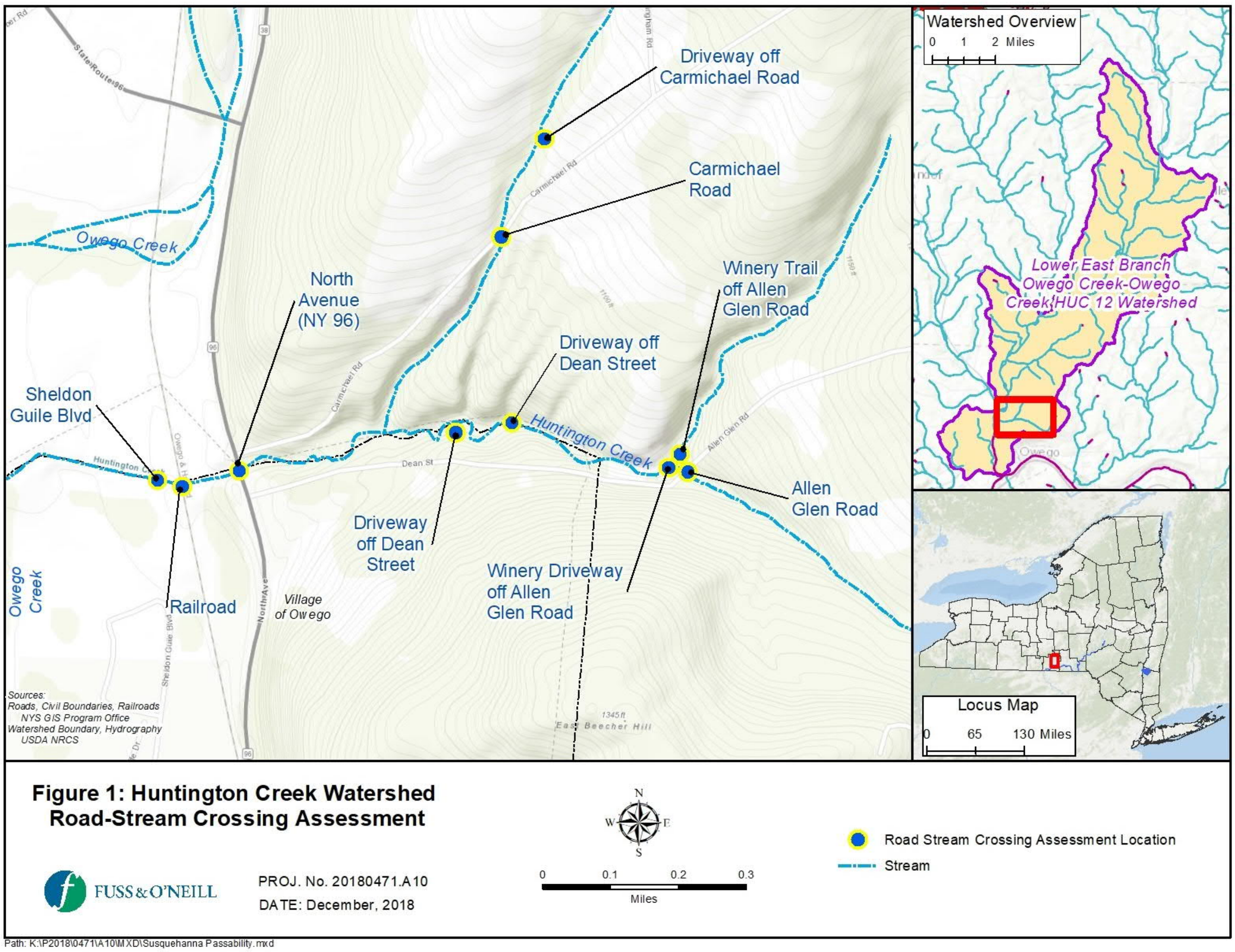

Figure 1. Road-stream crossings selected for assessment in the Huntington Creek watershed

Table 1. Road-stream crossings selected for assessment in the Huntington Creek watershed

Stream	Road Name	Description	Ownership	Road Type	Crossing Type	Structure Material
Huntington Creek	Sheldon Guile Blvd	School access road	County	Paved	Box Culvert	Concrete
Huntington Creek	Railroad	Railroad crossing	Owego & Hartford Railroad	Railroad	Bridge	Metal, Stone
Huntington Creek	North Avenue (NY 96)	Bridge between Carmichael Rd and Dean Rd	State	Paved	Bridge (State ID 1024060)	Concrete
Huntington Creek	Driveway off Dean Street (downstream)	Wood-planked bridge	Private	Driveway	Bridge	Metal, Concrete, Wood
Huntington Creek	Driveway off Dean Street (upstream)	Fill over repurposed metal tank	Private	Driveway	Culvert (round)	Smooth Metal
Huntington Creek	Winery Driveway off Allen Glen Rd	Fill over repurposed metal tank	Private	Unpaved Driveway	Culvert (round)	Smooth Metal
Huntington Creek	Allen Glen Road	Road crossing near winery entrance	County	Paved	Culvert (arch)	Corrugated Metal
Tributary to Huntington Creek	Winery Trail off Allen Glen Road	Footbridge at winery	Private	Footbridge	Bridge	Metal, Concrete, Wood
Tributary to Huntington Creek	Carmichael Road		County	Paved	Culvert (round)	Corrugated Metal
Tributary to Huntington Creek	Driveway off Carmichael Road	Farm access road	Private	Unpaved Driveway	Culvert (elliptical)	Corrugated Metal

All of the selected crossings are in the Town of Owego in Tioga County. The locations include 7 crossings of the Huntington Creek mainstem and 3 crossings of unnamed tributaries to Huntington Creek, one at the winery along Allen Glen Road and two others along or near Carmichael Road.

2.2 Field Data Collection

Field surveys of the selected crossings were conducted on October 23 and 24, 2018 using road-stream crossing assessment procedures and field data collection forms adapted from the North Atlantic Aquatic Connectivity Collaborative (NAACC) and similar standardized assessment protocols used in the northeastern U.S. In addition to the 2016 NAACC stream crossing survey protocol for assessing aquatic connectivity, the road-stream crossing survey methods used for this project also incorporated structural condition assessment protocols from the 2017 NAACC Culvert Condition Assessment Manual and collection of other field data for evaluating geomorphic vulnerability, hydraulic capacity, and potential flooding impacts to infrastructure and public services. Digital photographs were also taken at each crossing. A blank copy of the field data collection form is provided in Attachment A.

The crossing surveys were performed by a two-person field crew consisting of a water resources engineer and wetland scientist. The field crew was led by a NAACC-Certified Lead Observer; additional training was also provided for all field personnel prior to the field work. Digital field data collection methods were used to complete the crossing surveys, including a GPS-enabled tablet with a pre-loaded digital version of the field form and aerial imagery for the project locations. Field data for the project are saved and managed using an ArcGIS database and web application (Figure 2). Following the stream crossing surveys, field data were checked for quality control purposes.

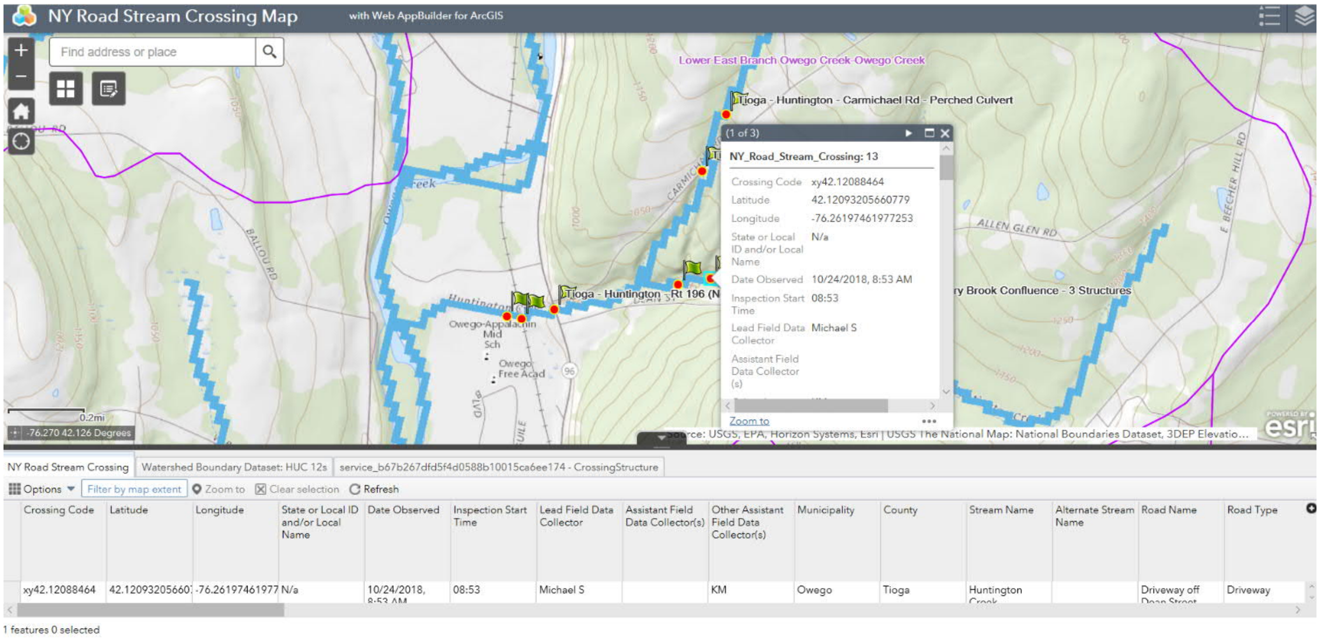

Figure 2. ArcGIS web application for Huntington Creek watershed stream crossing survey data

2.3 Crossing Survey Findings Summary

Table 2 summarizes key field data and findings of the road-stream crossing surveys for the Huntington Creek watershed.

Table 2. Summary data for road-stream crossing field surveys in the Huntington Creek watershed

Stream	Road Name	Structural Condition	Flow Constriction	Physical Barrier	Channel Erosion	Sediment Deposition
Huntington Creek	Sheldon Guile Blvd	Adequate	Yes	Partial	Channelized upstream and downstream	Significant
Huntington Creek	Railroad	Adequate	Yes	Partial	Stream channelized	Significant, lateral restriction of channel movement has led to bed deposition
Huntington Creek	North Avenue (NY 96)	Adequate	No	Partial	Upstream and downstream	Significant
Huntington Creek	Driveway off Dean Street (downstream)	Poor	Yes	Partial (debris/rock)	Upstream and downstream	Significant
Huntington Creek	Driveway off Dean Street (upstream)	Poor	Yes	Yes (lip on ends of culvert)	Upstream, downstream and embankment	Significant
Huntington Creek	Winery Driveway off Allen Glen Rd	Poor	Yes	Yes (perched outlet)	Upstream and downstream	Moderate (upstream)

Stream	Road Name	Structural Condition	Flow Constriction	Physical Barrier	Channel Erosion	Sediment Deposition
Huntington Creek	Allen Glen Road	Poor	Yes	Yes (perched outlet)	Upstream, downstream and embankment	Significant
Tributary to Huntington Creek	Winery Trail off Allen Glen Road	Adequate	Moderate	None	Upstream and downstream	Upstream, downstream, within structure
Tributary to Huntington Creek	Carmichael Road	Poor	Yes	Yes (perched outlet)	Upstream, downstream and embankment	Significant
Tributary to Huntington Creek	Driveway off Carmichael Road	Poor	Yes	Yes (perched outlet)	Stream incised upstream and downstream, embankment severely eroded	Significant

The following issues were observed at the surveyed stream crossings:

- Poor Structural Condition: many of the privately-owned stream crossings and several of the crossings carrying public roads (Carmichael Road and Allen Glen Road) were observed to be in poor condition and in need of significant repairs or replacement. Significant erosion of the crossing embankment and unstable or deteriorating wingwalls are common at many of these crossings.
- Flow Constriction: Virtually all of the assessed crossings, including the assessed culverts and bridges, are significantly narrower than the bankfull width of the stream channel and therefore appear to constrict flood flows. The hydraulic capacities of the crossings at Sheldon Guile Boulevard and the Owego & Hartford Railroad are severely reduced by the significant accumulation of sediment at these downstream locations.
- Physical Barriers: Most of the upstream private and public crossings serve as full or partial barriers to aquatic organism passage. The stream crossings along Carmichael Road and Allen Glen Road have perched outlets, while several of the private driveway crossings of Huntington Creek off of Dean Street are constructed from repurposed metal tanks, which have lips on both ends of the culverts. The downstream bridges also serve as partial barriers to aquatic passage due to reduced flow depths during low-flows as a result of the significant sediment deposition that has occurred with these crossings.
- Channel Erosion: Varying degrees of stream channel erosion were observed in the reaches immediately upstream and/or downstream of many of the assessed crossings. Efforts to repair recent channel erosion through channel grading and bank stabilization were evident at several of the surveyed locations.
- Sediment Deposition: Substantial sediment deposition was observed at the crossings in the low-gradient, lower reaches of Huntington Creek (i.e., Sheldon Guile Boulevard, railroad crossing, and NY 96/North Avenue) and generally upstream of crossings that constrict flow. The sediment deposition has reduced flow conveyance capacity, increased potential for blockage or clogging during higher flows, and potentially restricts aquatic passage during low-flow conditions.

3 Vulnerability Assessment and Prioritization

Using data from the stream crossing surveys and available GIS data, each of the assessed crossings was assessed for vulnerability to flooding and associated impacts relative to hydraulic capacity, structural condition, geomorphic conditions, aquatic organism passage, transportation services, land use, and climate change considerations. The vulnerability and impact ratings were then combined to generate an overall rating, which was used to assign a priority to each crossing for potential upgrade or replacement.

3.1 Assessment Method

The following individual assessments were performed for each stream crossing:

- Existing and Projected Future Streamflow: Estimated existing and future (climate change scenario) peak discharge for common recurrence intervals using regional regression equations developed by USGS for estimating peak flows at ungaged locations (i.e., StreamStats). Flood flows under future climate change were estimated using a design flow multiplier of 1.2 (20% increase) recommended by the New York State Department of Environmental Conservation for Tioga County in the draft Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act.
- Hydraulic Capacity: Estimated the hydraulic capacity of each road-stream crossing using standard Federal Highway Administration culvert/bridge hydraulic calculation methods following FHWA Hydraulic Design Series Number 5 (HDS-5). Bentley CulvertMaster, which employs HDS-5 methods, was used for the analysis. Hydraulic capacity was determined for a selected headwater depth, which represents that depth at which the crossing is at risk of structural failure or the roadway is at risk of overtopping, depending on crossing type and material. Manning's Equation for uniform open channel flow was used to estimate the crossing hydraulic capacity for lager structures (bridges) or where the cross-sectional area could not be approximated with CulvertMaster. A capacity ratio (defined as the ratio of estimated hydraulic capacity to the estimated peak discharge for a specified return interval) was calculated for each crossing for existing and projected future peak streamflow.
- Structural Condition: Assigned condition ratings and scores based on visual observation of the structural condition of the crossing inlet, outlet, and barrel adapted from the latest version of the NAACC Culvert Condition Assessment Manual, which was developed with input from state transportation departments throughout the Northeast and other stakeholders. The NAACC condition assessment methodology is designed as a rapid assessment tool for use by trained observers for purposes of flagging crossings that should be examined more closely for potential structural deficiencies.
- Geomorphic Impacts: Assessed the potential for crossing structures to impact geomorphic processes that might, in turn, threaten the structure itself and other adjacent infrastructure. The assessment procedure distinguishes between crossings that are: 1) not prone to and have not experienced geomorphic adjustments; 2) prone to but have not experienced geomorphic adjustments; and 3) prone to and have experienced geomorphic adjustments. The approach rates the relative likelihood that impacts could occur and the type and severity of impacts that have already occurred. Factors that were considered include stream alignment, bankfull width, degree of constriction, significant breaks in valley slope, bank erosion, sediment deposition, structure and channel slope, stream bed material, and other geomorphic parameters.

- Aquatic Organism Passage: Assessed aquatic organism passage (AOP) using the latest NAACC protocols and rating system for assessing stream continuity. The method was adapted from the NAACC Numeric Scoring System for AOP, which was developed with input from multiple experts in aquatic passability. The NAACC Numeric Scoring System methodology is designed as a quantitative but rapid assessment tool for use by trained observers. The assessment is not species-specific, but rather seeks to evaluate passability for the full range of aquatic organisms likely to be found in rivers and streams.
- Impacts to Transportation Services: Evaluated the potential disruption of transportation services resulting from single crossing failures by considering the functional classification of the roadway (i.e., level of travel mobility and access to property that it provides). Disruption of transportation services is assumed to occur if the crossing is either overtopped or washed away by flooding, as either failure mode would prohibit the use of the road-stream crossing by traffic.
- Other Potential Flooding Impacts: Assessed the potential impact to existing development, infrastructure, and land use upstream and downstream of each stream crossing in the event of failure of the crossing. A potential impact area was approximated for each crossing, having a width defined by buffering the stream centerline by a distance equal to two times the bankfull width, and a length defined as 0.5 miles upstream and downstream of the crossing. Flooding vulnerability was quantified based on the percentage of developed land cover, using 1-meter resolution land cover data for the Chesapeake Bay watershed, and the presence of upstream or downstream crossings within the impact area, as well as any infrastructure (gas, sewer, water, etc.) observed to be attached to or located within the crossing structure.

3.2 Prioritization Method

The crossing structures were assigned a relative priority for upgrade or replacement based on the results of the individual assessments and consideration of failure risk. Failure risk is defined as the product of the probability of failure of a crossing (i.e., vulnerability) and the potential consequences of failure (i.e., impacts). A crossing may be at risk if the probability of failure is high, if the consequences of failure are high, or both. An overall priority score was calculated based on the combined hydraulic risk (existing and future climate change), geomorphic risk, structural risk, and aquatic organism passability of each crossing. The combined hydraulic risk, geomorphic risk, and structural risk was weighted more heavily (approximately 90%) than aquatic organism passability (approximately 10%) given the limited high-quality fisheries habitat in the watershed. It is important to note that the crossing priority scores should only be used for relative comparisons between crossings.

3.3 Assessment and Prioritization Results

Table 3 summarizes the hydraulic risk, geomorphic risk, structural risk, and aquatic organism passability scores, as well as the relative priority score (normalized on a scale of 0 to 1) for each crossing. The detailed road-stream crossing assessment and prioritization worksheets and scores are provided in Attachment B.

Table 3. Road-Stream Crossing Vulnerability Assessment and Prioritization Results Summary

Stream	Road Name	Crossing Type	Hydraulic Risk Score (2-50)	Geomorphic Risk Score (2-50)	Structural Risk Score (2-50)	Aquatic Passability Score (1-5)	Crossing Priority Score (0-1)
Huntington Creek	Sheldon Guile Blvd	Box Culvert	20	20	25	1	0.44
Huntington Creek	Owego & Hartford Railroad	Bridge	35	21	7	1	0.63
Huntington Creek	North Avenue (NY 96)	Bridge (State ID 1024060)	8	24	16	1	0.42
Huntington Creek	Driveway off Dean Street (downstream)	Bridge	4	12	20	1	0.35
Huntington Creek	Driveway off Dean Street (upstream)	Culvert (round)	20	16	20	2	0.37
Huntington Creek	Winery Driveway off Allen Glen Rd	Culvert (round)	20	16	20	3	0.38
Huntington Creek	Allen Glen Road	Culvert (arch)	4	16	20	3	0.38
Tributary to Huntington Creek	Winery Trail off Allen Glen Road	Bridge	4	12	4	1	0.19
Tributary to Huntington Creek	Carmichael Road	Culvert (round)	12	12	15	3	0.29
Tributary to Huntington Creek	Driveway off Carmichael Road	Culvert (elliptical)	3	15	15	5	0.33

Hydraulic Risk

Half of the assessed crossings in the Huntington Creek watershed have insufficient hydraulic capacity to convey the 25-year peak flow, and three are undersized relative to the 10-year peak flow (Owego and Hartford Railroad, the upstream driveway off Dean Street, and the winery driveway off Allen Glen Road). The Owego & Hartford Railroad crossing is significantly undersized even for the 10-year return interval flood, with a 10-Year Capacity Ratio value of 0.12. Five crossings in the watershed have sufficient hydraulic capacity to pass the 100-year peak flow. The downstream crossings generally have higher hydraulic risk scores due to the greater potential for impacts to the transportation network and development in the event of crossing failure due to flooding.

Geomorphic Risk

Most of the assessed crossings were rated as having moderate to significant observed geomorphic impacts, combined with high likelihood for potential geomorphic impacts, resulting in fairly uniform geomorphic vulnerability scores. Similar to hydraulic capacity, the downstream crossings generally have higher geomorphic risk scores due to the greater potential for impacts to the transportation network and development in the event of flooding-related failure.

Structural Risk

Most of the assessed crossings in the watershed were rated as having poor or critical structural condition and therefore greater vulnerability to flooding-related failure. The Sheldon Guile Boulevard crossing received the highest structural risk score given the severe blockage at the culvert inlet and potential for impacts in the event of a flood. The Dean Street driveway crossings, the winery driveway off Allen Glen Road, and the Allen Glen Road crossing also received higher structural risk scores.

Aquatic Organism Passage

Half of the assessed crossings pose no or insignificant barrier to aquatic organism passage. The crossings at the winery driveway, Allen Glen Road, and Carmichael Road are moderate barriers, while the Carmichael Road driveway crossing is a severe barrier.

Prioritization

Overall, the Owego & Hartford Railroad crossing received the highest crossing priority score. Most of the assessed crossings in the watershed were rated as high or medium priority for potential replacement or upgrade.

4 Recommendations

Recommendations were developed for the stream crossings in the Huntington Creek watershed that were evaluated as part of this assessment. These planning-level recommendations are intended to enhance the resilience of the stream crossings and river system by withstanding extreme flood events, providing for the passage of debris during floods, and providing for passage of aquatic organisms under normal flow conditions. At several of the crossings, we also recommend channel or floodplain restoration in upstream or downstream areas along with the proposed crossing upgrades to enhance flood resilience, water quality, and aquatic habitat using a combination of natural and infrastructure-based approaches.

Planning-level cost estimates are provided for each of the recommendations. Estimated costs are presented as screening-level cost ranges for the purpose of comparing and prioritizing various alternatives and to help select a preferred alternative based on relative project benefits and costs. The planning-level cost ranges include estimates of the anticipated design and construction costs, adjusted for prevailing wage rates, and contingency. Design and construction costs are based on costs of recent similar stream crossing replacement projects in the northeastern U.S.

The following sections provide a summary of the existing issues, recommendations, and screening-level cost ranges for the stream crossings in the Huntington Creek watershed where upgrades or replacement are recommended.

4.1 Sheldon Guile Boulevard over Huntington Creek and Owego & Hartford Railroad over Huntington Creek

Existing Issues – Sheldon Guile Boulevard Crossing

- The structure is undersized (capable of passing approximately the 10-year return interval peak flow) and is choked by sediment, further reducing hydraulic capacity.
- The stream is channelized upstream and downstream of the crossing.
- The stream retaining walls upstream of the crossing are collapsed and a source of sediment to the stream.
- The crossing is located at a substantial reduction in valley slope from steeper headwaters to low-gradient open valley.
- Owego Apalachin Middle School, Owego Free Academy, Owego Elementary School, all located on Sheldon Guile Boulevard and accessible via this crossing, are not designated as emergency shelters, but may serve as emergency shelters during some non-flooding disasters. The schools would not serve as emergency shelters during floods due to their location in the floodplain.

Existing Issues – Owego & Hartford Railroad Bridge

- The structure is severely undersized (estimated capacity is approximately one-tenth of the 10-year peak flow) and clogs frequently during floods.
- Lateral restriction of channel movement by concrete and timber walls along the banks has forced all sediment deposition to occur in the streambed, reducing conveyance capacity.

Inlet of Sheldon Guile Boulevard crossing over Huntington Creek. Note sediment nearly filling culvert structures.

Outlet of Owego & Hartford Railroad bridge over Huntington Creek. Note low bridge clearance, constriction of stream by bridge abutments, and timber retaining wall lining upstream channel.

Huntington Creek channel upstream of Owego & Hartford Railroad bridge. Note leaning timber retaining wall lining stream channel on river left (right side of photo).

Huntington Creek channel downstream of Owego & Hartford Railroad bridge, looking toward Sheldon Guile Boulevard bridge. Note the concrete retaining walls lining the channelized stream.

Recommendations – Sheldon Guile Boulevard Crossing

- Replace the school access bridge structure with an appropriately-sized structure to reduce flood risk, improve public safety, and enhance aquatic passage. Consider raising the structure.
- Consider moving the bus garage entrance driveway approximately 500 feet north along Sheldon Guile Boulevard. This would allow construction of a narrower bridge and reduce the impact of flooding to the bus garage entrance. See Figure 3 for illustration of this recommendation.
- Include educational component to crossing replacement and floodplain restoration to involve and inform students and teachers and extend community outreach.

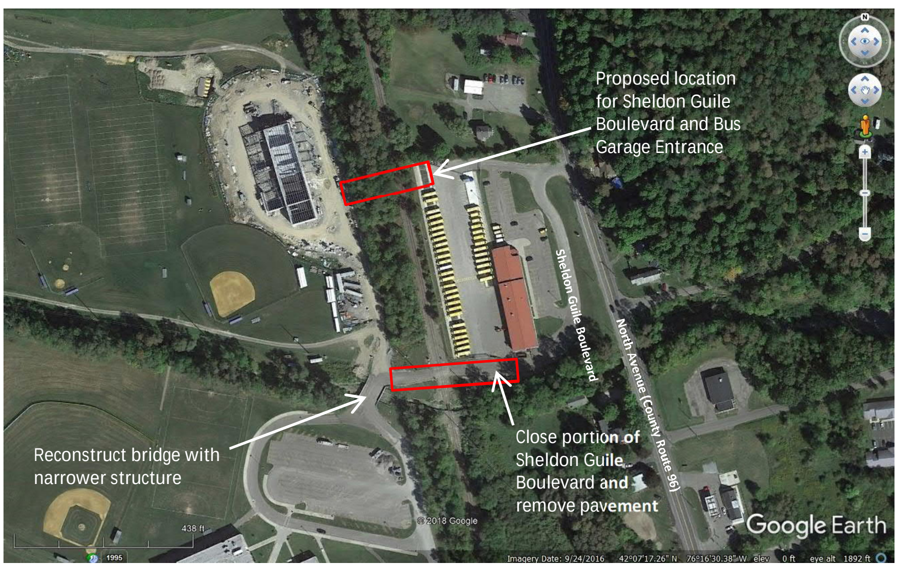

Figure 3. Proposed location for bus garage access to Sheldon Guile Boulevard

Recommendations – Owego & Hartford Railroad Bridge

- Replace Owego & Hartford Railroad bridge structure with an appropriately-sized structure to reduce flood risk, improve public safety, and enhance aquatic passage. Consider raising the structure to increase flood and debris clearance.

Recommendations – General

- Consider floodplain restoration along the streambanks downstream of the Owego & Hartford Railroad crossing to the confluence with Owego Creek.
  - Extend streambanks to reconnect floodplain, provide additional flood storage, and slow down flood flows. Consider construction of a compound channel to address both smaller, more frequent floods and larger, less frequent floods.
  - Utilize downstream areas outside of the playing fields on river left and river right (downstream of school access bridge) as additional space for floodplain restoration and natural stream migration.
- Identify and mitigate upstream sediment sources to reduce sediment inputs to the river system.

Screening-Level Cost Estimate

- Replace Sheldon Guile Boulevard Crossing: $500K - $1M
- Replace Owego & Hartford Railroad Bridge: >$1M

4.2 Private Driveway off Dean Street over Huntington Creek (downstream)

Existing Issues

- Abutments and wingwalls are in poor condition (sagging or collapsed).
- A ford crossing is located just upstream of the crossing.
- Some planks in the wooden bridge deck are deteriorated or completely rotten. Planks have been placed over the bridge deck lengthwise to support vehicles.
- Natural sediment deposition may have been modified by channel work using heavy equipment.

Private Driveway off Dean Street over Huntington Creek (downstream). Structure inlet. Note sagging abutment and displaced concrete waste block on left bank.

Private Driveway off Dean Street over Huntington Creek (downstream). Photograph of bridge deck. Note planks placed lengthwise on bridge deck to support vehicle traffic.

Private Driveway off Dean Street over Huntington Creek (downstream). Area of heavy machinery work in channel downstream of crossing structure.

Private Driveway off Dean Street over Huntington Creek (downstream). Ford upstream of crossing structure.

Recommendations

- Replace the structure with an appropriately-sized structure to reduce flood risk, improve vehicle safety, and enhance aquatic passage. Also consider removing the crossing and using the upstream ford.
- Restore the streambank with large wood, rootwads, or other nature-based solutions as appropriate to stabilize the streambed and banks and reduce impacts of previous heavy machinery work.
- Identify and mitigate upstream sediment sources to reduce sediment inputs to the river system.

Screening-Level Cost Estimate

- Replace Crossing: $150-250K

4.3 Private Driveway off Dean Street over Huntington Creek (upstream)

Existing Issues

- The crossing structure is constructed from an old, repurposed steel tank and severely constricts flow. The crossing is undersized hydraulically, with an estimated capacity less than the 10-year return interval flood event.
- The homeowner stated that the crossing has overtopped three times in the two months prior to the crossing survey. These events caused serious erosion to banks and road fill. The homeowner also indicated that they have lost at least 3 feet of driveway width on both sides of the crossing. At the time of the crossing survey, they were unable to receive deliveries of heating fuel or firewood due to the crossing's poor structural condition.
- At the crossing outlet, the road embankment slope is nearly vertical or overhanging and very unstable.
- Sediment deposition was observed in the upstream and downstream channel.

Private Driveway off Dean Street over Huntington Creek (upstream). Structure inlet. Note erosion of road along top of structure, and sediment deposition on river right.

Private Driveway off Dean Street over Huntington Creek (upstream). Close-up photograph of structure inlet. Note inadequate fill/cover material above culvert, erosion of road along top of structure, and sediment deposition on river right.

Private Driveway off Dean Street over Huntington Creek (upstream). Crossing structure outlet. Note erosion of road embankment on either side of structure.

Private Driveway off Dean Street over Huntington Creek (upstream). Streambank erosion on river left and deposition on river right, downstream of crossing structure.

Recommendations

- Replace structure with appropriately-sized structure to reduce flood risk, improve vehicle safety, and enhance aquatic passage.
- Restore streambank with large wood, rootwads, or other nature-based solutions as appropriate to stabilize streambed and banks.
- Identify and mitigate upstream sediment sources to reduce sediment inputs to the river system.

Screening-Level Cost Estimate

- Replace Crossing: $25-75K

4.4 Private (Winery) Driveway off Allen Glen Road over Huntington Creek

Existing Issues

- The crossing structure is in extremely poor condition and could threaten vehicle safety
  - o Headwalls are no longer in place, replaced by plywood scraps
  - o Wingwalls are misaligned.
- The crossing structure is constructed from an old, repurposed steel tank and severely constricts flow. The crossing structure is constructed from an old, repurposed steel tank and severely constricts flow, with an estimated hydraulic capacity less than the 10-year return interval peak flow.
- The culvert's perched outlet limits aquatic passage.
- Natural sediment deposition may have been modified by channel work using heavy equipment.

Private (Winery) Driveway off Allen Glen Road over Huntington Creek. Structure inlet. Note plywood in place of headwall and misaligned wingwalls.

Private (Winery) Driveway off Allen Glen Road over Huntington Creek. Structure outlet. Note debris and plywood in place of headwall and severely misaligned wingwalls.

Recommendations

- Replace the structure with an appropriately-sized structure (1.25 times bankfull width) to reduce flood risk, improve vehicle/public safety, and enhance aquatic passage.
- Restore the streambank with large wood, rootwads, or other nature-based solutions as appropriate to stabilize the streambed and banks and reduce impacts of previous heavy machinery work.

Screening-Level Cost Estimate

- Replace Crossing: $250-500K

4.5 Allen Glen Road over Huntington Creek

Existing Issues

- The structure is adequately sized to convey the 100-year return interval peak flow but serves as a constriction given its width relative to bankfull width.
- The perched outlet limits/prohibits aquatic passage.
- The wingwalls are in critical condition (near collapse).
- The upstream headwall is completely gone. The road appears to be supported by stacked bags of grout that were installed behind the missing headwalls when it was installed.
- Material has eroded from the road embankment, threatening the roadway integrity.
- The streambed consists of a concrete-lined channel for approximately 130 feet, extending upstream, through, and downstream of the structure.

Allen Glen Road over Huntington Creek. Structure inlet. Note missing headwall exposing embankment formed of stacked bags of grout.

Allen Glen Road over Huntington Creek. Structure outlet. Note unstable wingwall and concrete-lined streambed, eroding road embankment, and outlet drop.

Allen Glen Road over Huntington Creek. Severely unstable wingwall upstream of structure inlet.

Recommendations

- Replace the structure with an appropriately-sized structure to reduce flood risk, improve public safety, and enhance aquatic passage.
- Remove concrete lining from streambed and replace it with a more natural substrate to enhance habitat and restore natural stream processes.

Screening-Level Cost Estimate

- Replace Crossing: $250-500K

4.6 Carmichael Road over Tributary to Huntington Creek

Existing Issues

- The structure is in extremely poor condition, is somewhat undersized hydraulically, and constricts the stream from a geomorphic perspective based on its width relative to bankfull width. Sections of the outlet have broken off as erosion proceeds upstream.
- Continued failure of the structure and erosion of the streambanks threatens Carmichael Road.
- Continued mass failure of the streambanks downstream of the structure will continue to release sediment into the stream.

Carmichael Road over Tributary to Huntington Creek. Structure outlet, showing severe erosion and collapse of outlet section.

Carmichael Road over Tributary to Huntington Creek. Photograph of downstream channel. Note mass failure of slope on right bank.

Recommendations

- Replace the structure with appropriately-sized structure aligned with the stream channel to reduce flood risk, improve public safety, and provide aquatic passage.
- Restore the streambank with large wood, rootwads, or other appropriate nature-based techniques to further reduce erosion and potential for clogging.
- Consider appropriate stream gradient and grade controls for this location to accommodate the grade change.

Screening-Level Cost Estimate

- Replace Crossing: $250-500K

4.7 Private Driveway/Access Road off Carmichael Road over Tributary to Huntington Creek

Existing Issues

- The structure is adequately sized to convey the 100-year peak flow but is narrower than bankfull width and constricts streamflow.
- The perched outlet limits/prohibits aquatic passage.
- The stream is incised; channel erosion is a significant source of sediment to the stream.

Private Driveway/Access Road off Carmichael Road over Tributary to Huntington Creek. Structure inlet. Note erosion on left side of structure.

Private Driveway/Access Road off Carmichael Road over Tributary to Huntington Creek. Severely incised/eroded channel downstream of structure.

Recommendations

- Replace the structure with an appropriately-sized structure to reduce flood risk, improve vehicle safety, and provide aquatic passage.
- Restore the streambank with large wood, rootwads, or other nature-based solutions as appropriate to stabilize the streambed and banks and reduce further erosion.

Screening-Level Cost Estimate

- Replace Crossing: $250-500K

Attachment A

Stream Crossing Survey Field Data Form (blank)

FUSS & O'NEILL

Road-Stream Crossing Assessment Field Data Form

QA/QC INITIALS: ______ DATE: ______

Status ___ FINAL ___ FOLLOW-UP

CROSSING DATA

pp. 4-5

Crossing Code ______ State or Local ID/Name ______ Date ______ Start Time ______ AM / PM

Lead Field Data Collector ______ Asst. Field Data Collectors ______ End Time ______ AM / PM

Municipality ______ County ______ Stream ______

Road ______ Type ☐ MULTI-LANE ☐ PAVED ☐ UNPAVED ☐ DRIVEWAY ☐ TRAIL ☐ RAILROAD

GPS Coordinates (Decimal degrees) ☐☐.☐☐☐☐☐ °N Latitude — ☐☐.☐☐☐☐☐ °W Longitude

Location Description ______

pp. 5-7

Crossing Type ☐ BRIDGE ☐ CULVERT ☐ MULTIPLE CULVERT ☐ FORD ☐ NO CROSSING ☐ REMOVED CROSSING ☐ BURIED STREAM ☐ INACCESSIBLE ☐ PARTIALLY INACCESSIBLE ☐ NO UPSTREAM CHANNEL ☐ BRIDGE ADEQUATE

Number of Culverts / Cells ______

Photo #____ INLET Photo #____ OUTLET Photo #____ ______ Photo #____ ______

Photo #____ UPSTREAM Photo #____ DOWNSTREAM Photo #____ ______ Photo #____ ______

Photo #____ ROADWAY Photo #____ ______ Photo #____ ______ Photo #____ ______

Flow Condition ☐ NO FLOW ☐ TYPICAL-LOW ☐ MODERATE ☐ HIGH

Road-Killed Wildlife ______ or None

Visible Utilities ☐ OVERHEAD WIRES ☐ WATER/SEWER PIPES ☐ GAS LINE ☐ NONE ☐ OTHER ______

pp. 9-12

Alignment ☐ SHARP BEND ☐ MILD BEND ☐ NATURALLY STRAIGHT ☐ CHANNELIZED STRAIGHT

Road Fill Height ______ Road Crest Height ______

Bankfull Width ______ Confidence ☐ HIGH ☐ LOW/ESTIMATED

Constriction ☐ SEVERE ☐ MODERATE ☐ SPANS ONLY BANKFULL/ACTIVE CHANNEL ☐ SPANS FULL CHANNEL & BANKS

Tailwater Scour Pool ☐ NONE ☐ SMALL ☐ LARGE

HY-8

pp. 8, 13-15

Using HY-8? ☐ YES ☐ NO

Estimated Overtopping Length ______ Crest Width ______

Road Surface Type ☐ PAVED ☐ GRAVEL ☐ GRASS

Channel Slope ______

Side Slope ☐ 5:1 ☐ 4:1 ☐ 3:1 ☐ 2:1 ☐ 1:1 ☐ 0.5:1 ☐ steeper than 0.5:1

Stream Substrate ☐ MUCK/SILT ☐ SAND ☐ GRAVEL ☐ COBBLE ☐ BOULDER ☐ BEDROCK ☐ UNKNOWN

GEO.

pp. 13

Bank Erosion ☐ HIGH ☐ LOW ☐ ESTIMATED ☐ NONE

Significant Break in Valley Slope ☐ YES ☐ NO ☐ UNKNOWN

Sediment Deposition ☐ UPSTREAM ☐ DOWNSTREAM ☐ WITHIN STRUCTURE ☐ NONE

Elevation of Sediment Deposits >= 1/2 Bankfull Height ☐ YES ☐ NO

TIDAL

pp. 16-18

Tidal? ☐ YES ☐ NO ☐ UNKNOWN

Tide Chart Location ______

Tide Prediction ____:____ AM / PM

Tide Stage ☐ LOW SLACK TIDE ☐ LOW EBB TIDE ☐ LOW FLOOD TIDE ☐ UNKNOWN ☐ OTHER ______

Vegetation Above/Below ☐ COMPARABLE ☐ SLIGHTLY DIFFERENT ☐ MODERATELY DIFFERENT ☐ VERY DIFFERENT ☐ UNKNOWN

Tide Gate Type ☐ NONE ☐ STOP LOGS ☐ FLAP GATE ☐ SLUICE GATE ☐ SELF-REGULATING ☐ OTHER ______

Tide Gate Severity ☐ NONE ☐ MINOR ☐ MODERATE ☐ SEVERE ☐ NO AQUATIC PASSAGE

CROSSING COMMENTS

pp. 5

______

FORM PUBLISHED: OCTOBER 18, 2018

FORM ADAPTED BY FUSS & O'NEILL, INC. (WITH PERMISSION) FROM THE NAACC AQUATIC CONNECTIVITY STREAM CROSSING SURVEY DATA FORM

STRUCTURE 1

OUTLET

pp. 19-35

Structure Material ☐ SMOOTH PLASTIC ☐ CORRUGATED PLASTIC ☐ SMOOTH METAL ☐ CORRUGATED METAL ☐ CONCRETE ☐ WOOD ☐ ROCK/STONE ☐ FIBERGLASS ☐ COMBINATION

Outlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Outlet Armoring ☐ NONE ☐ NOT EXTENSIVE ☐ EXTENSIVE

Outlet Grade (Pick one) ☐ AT STREAM GRADE ☐ FREE FALL ☐ CASCADE ☐ FREE FALL ONTO CASCADE ☐ UNKNOWN

Outlet Dimensions A. Width__________.____ B. Height__________.____ C. Substrate/Water Width__________.____ D. Water Depth__________.____

Outlet Drop to Water Surface__________.____ Outlet Drop to Stream Bottom__________.____ E. Abutment Height (Type 7 bridges only)______________.____

L. Structure Length (Overall length from inlet to outlet)______________.____

INLET

pp. 35-43

Inlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Inlet Type ☐ PROJECTING ☐ HEADWALL WITH SQUARE EDGE ☐ HEADWALL WITH GROOVED EDGE ☐ HEADWALL WITH SQUARE EDGE AND WINGWALLS ☐ HEADWALL WITH GROOVED/BEVELED EDGE AND WINGWALLS ☐ MITERED TO SLOPE ☐ OTHER ☐ NONE

Inlet Grade (Pick one) ☐ AT STREAM GRADE ☐ INLET DROP ☐ PERCHED ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN

Inlet Dimensions A. Width__________.____ B. Height__________.____ C. Substrate/Water Width__________.____ D. Water Depth__________.____

ADDITIONAL CONDITIONS

pp. 43-56

Slope % ______________ Slope Confidence ☐ HIGH ☐ LOW

Internal Structures ☐ NONE ☐ BAFFLES/WEIRS ☐ SUPPORTS ☐ OTHER__________

Structure Substrate Matches Stream ☐ NONE ☐ COMPARABLE ☐ CONTRASTING ☐ NOT APPROPRIATE ☐ UNKNOWN

Structure Substrate Type (Pick one) ☐ NONE ☐ SILT ☐ SAND ☐ GRAVEL ☐ COBBLE ☐ BOULDER ☐ BEDROCK ☐ UNKNOWN

Structure Substrate Coverage ☐ NONE ☐ 25% ☐ 50% ☐ 75% ☐ 100% ☐ UNKNOWN

Physical Barriers (Pick all that apply) ☐ NONE ☐ DEBRIS/SEDIMENT/ROCK ☐ DEFORMATION ☐ FREE FALL ☐ FENCING ☐ DRY ☐ OTHER

Severity (Choose carefully based on barrier type(s) above) ☐ NONE ☐ MINOR ☐ MODERATE ☐ SEVERE

Water Depth Matches Stream ☐ YES ☐ NO-SHALLOWER ☐ NO-DEEPER ☐ UNKNOWN ☐ DRY

Water Velocity Matches Stream ☐ YES ☐ NO-FASTER ☐ NO-SLOWER ☐ UNKNOWN ☐ DRY

Dry Passage through Structure? ☐ YES ☐ NO ☐ UNKNOWN

Height above Dry Passage______________

STRUCTURAL CONDITION ASSESSMENT

pp. 57-70

	INLET					OUTLET				
	Adequate	Poor	Critical	Unknown	N/A	Adequate	Poor	Critical	Unknown	N/A
Longitudinal Alignment										
Level of Blockage										
Flared End Section										
Invert Deterioration										
Buoyancy or Crushing										
Cross-Section Deformation										
Structural Integrity of Barrel										
Joints and Seams										
Footings										
Headwall/Wingwalls										
Armoring										
Apron/Scour Protection										
Embankment Piping										

STRUCTURE COMMENTS

pp. 44

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FORM PUBLISHED: OCTOBER 18, 2018

STRUCTURE 2

Structure Material ☐ SMOOTH PLASTIC ☐ CORRUGATED PLASTIC ☐ SMOOTH METAL ☐ CORRUGATED METAL ☐ CONCRETE ☐ WOOD ☐ ROCK/STONE ☐ FIBERGLASS ☐ COMBINATION

pp. 19-35

OUTLET

Outlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Outlet Armoring ☐ NONE ☐ NOT EXTENSIVE ☐ EXTENSIVE

Outlet Grade (Pick one) ☐ AT STREAM GRADE ☐ FREE FALL ☐ CASCADE ☐ FREE FALL ONTO CASCADE ☐ UNKNOWN

Outlet Dimensions A. Width_________.____ B. Height_________.____ C. Substrate/Water Width_________.____ D. Water Depth_________.____

Outlet Drop to Water Surface_________.____ Outlet Drop to Stream Bottom_________.____ E. Abutment Height (Type 7 bridges only)_________.____

L. Structure Length (Overall length from inlet to outlet)_________.____

INLET

pp. 35-43

Inlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Inlet Type ☐ PROJECTING ☐ HEADWALL WITH SQUARE EDGE ☐ HEADWALL WITH GROOVED EDGE ☐ HEADWALL WITH SQUARE EDGE AND WINGWALLS ☐ HEADWALL WITH GROOVED/BEVELED EDGE AND WINGWALLS ☐ MITERED TO SLOPE ☐ OTHER ☐ NONE

Inlet Grade (Pick one) ☐ AT STREAM GRADE ☐ INLET DROP ☐ PERCHED ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN

Inlet Dimensions A. Width_________.____ B. Height_________.____ C. Substrate/Water Width_________.____ D. Water Depth_________.____

ADDITIONAL CONDITIONS

pp. 43-56

Slope % ___________ Slope Confidence ☐ HIGH ☐ LOW

Internal Structures ☐ NONE ☐ BAFFLES/WEIRS ☐ SUPPORTS ☐ OTHER___________

Structure Substrate Matches Stream ☐ NONE ☐ COMPARABLE ☐ CONTRASTING ☐ NOT APPROPRIATE ☐ UNKNOWN

Structure Substrate Type (Pick one) ☐ NONE ☐ SILT ☐ SAND ☐ GRAVEL ☐ COBBLE ☐ BOULDER ☐ BEDROCK ☐ UNKNOWN

Structure Substrate Coverage ☐ NONE ☐ 25% ☐ 50% ☐ 75% ☐ 100% ☐ UNKNOWN

Physical Barriers (Pick all that apply) ☐ NONE ☐ DEBRIS/SEDIMENT/ROCK ☐ DEFORMATION ☐ FREE FALL ☐ FENCING ☐ DRY ☐ OTHER

Severity (Choose carefully based on barrier type(s) above) ☐ NONE ☐ MINOR ☐ MODERATE ☐ SEVERE

Water Depth Matches Stream ☐ YES ☐ NO-SHALLOWER ☐ NO-DEEPER ☐ UNKNOWN ☐ DRY

Water Velocity Matches Stream ☐ YES ☐ NO-FASTER ☐ NO-SLOWER ☐ UNKNOWN ☐ DRY

Dry Passage through Structure? ☐ YES ☐ NO ☐ UNKNOWN

Height above Dry Passage___________

STRUCTURAL CONDITION ASSESSMENT

pp. 57-70

	INLET					OUTLET				
	Adequate	Poor	Critical	Unknown	N/A	Adequate	Poor	Critical	Unknown	N/A
Longitudinal Alignment										
Level of Blockage										
Flared End Section										
Invert Deterioration										
Buoyancy or Crushing										
Cross-Section Deformation										
Structural Integrity of Barrel										
Joints and Seams										
Footings										
Headwall/Wingwalls										
Armoring										
Apron/Scour Protection										
Embankment Piping										

STRUCTURE COMMENTS

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STRUCTURE 3

OUTLET

pp. 19-35

Structure Material ☐ SMOOTH PLASTIC ☐ CORRUGATED PLASTIC ☐ SMOOTH METAL ☐ CORRUGATED METAL ☐ CONCRETE ☐ WOOD ☐ ROCK/STONE ☐ FIBERGLASS ☐ COMBINATION

Outlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Outlet Armoring ☐ NONE ☐ NOT EXTENSIVE ☐ EXTENSIVE

Outlet Grade (Pick one) ☐ AT STREAM GRADE ☐ FREE FALL ☐ CASCADE ☐ FREE FALL ONTO CASCADE ☐ UNKNOWN

Outlet Dimensions A. Width________.____ B. Height________.____ C. Substrate/Water Width________.____ D. Water Depth________.____

Outlet Drop to Water Surface________.____ Outlet Drop to Stream Bottom________.____ E. Abutment Height (Type 7 bridges only)________.____

L. Structure Length (Overall length from inlet to outlet)________.____

INLET

pp. 35-43

Inlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Inlet Type ☐ PROJECTING ☐ HEADWALL WITH SQUARE EDGE ☐ HEADWALL WITH GROOVED EDGE ☐ HEADWALL WITH SQUARE EDGE AND WINGWALLS ☐ HEADWALL WITH GROOVED/BEVELED EDGE AND WINGWALLS ☐ MITERED TO SLOPE ☐ OTHER ☐ NONE

Inlet Grade (Pick one) ☐ AT STREAM GRADE ☐ INLET DROP ☐ PERCHED ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN

Inlet Dimensions A. Width________.____ B. Height________.____ C. Substrate/Water Width________.____ D. Water Depth________.____

ADDITIONAL CONDITIONS

pp. 43-56

Slope % ____________ Slope Confidence ☐ HIGH ☐ LOW

Internal Structures ☐ NONE ☐ BAFFLES/WEIRS ☐ SUPPORTS ☐ OTHER________

Structure Substrate Matches Stream ☐ NONE ☐ COMPARABLE ☐ CONTRASTING ☐ NOT APPROPRIATE ☐ UNKNOWN

Structure Substrate Type (Pick one) ☐ NONE ☐ SILT ☐ SAND ☐ GRAVEL ☐ COBBLE ☐ BOULDER ☐ BEDROCK ☐ UNKNOWN

Structure Substrate Coverage ☐ NONE ☐ 25% ☐ 50% ☐ 75% ☐ 100% ☐ UNKNOWN

Physical Barriers (Pick all that apply) ☐ NONE ☐ DEBRIS/SEDIMENT/ROCK ☐ DEFORMATION ☐ FREE FALL ☐ FENCING ☐ DRY ☐ OTHER

Severity (Choose carefully based on barrier type(s) above) ☐ NONE ☐ MINOR ☐ MODERATE ☐ SEVERE

Water Depth Matches Stream ☐ YES ☐ NO-SHALLOWER ☐ NO-DEEPER ☐ UNKNOWN ☐ DRY

Water Velocity Matches Stream ☐ YES ☐ NO-FASTER ☐ NO-SLOWER ☐ UNKNOWN ☐ DRY

Dry Passage through Structure? ☐ YES ☐ NO ☐ UNKNOWN

Height above Dry Passage____________

STRUCTURAL CONDITION ASSESSMENT

pp. 57-70

	INLET					OUTLET				
	Adequate	Poor	Critical	Unknown	N/A	Adequate	Poor	Critical	Unknown	N/A
Longitudinal Alignment										
Level of Blockage										
Flared End Section										
Invert Deterioration										
Buoyancy or Crushing										
Cross-Section Deformation										
Structural Integrity of Barrel										
Joints and Seams										
Footings										
Headwall/Wingwalls										
Armoring										
Apron/Scour Protection										
Embankment Piping										

STRUCTURE COMMENTS

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STRUCTURE 4

OUTLET

Structure Material ☐ SMOOTH PLASTIC ☐ CORRUGATED PLASTIC ☐ SMOOTH METAL ☐ CORRUGATED METAL ☐ CONCRETE ☐ WOOD ☐ ROCK/STONE ☐ FIBERGLASS ☐ COMBINATION

pp. 19-35

Outlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED   Outlet Armoring ☐ NONE ☐ NOT EXTENSIVE ☐ EXTENSIVE

Outlet Grade (Pick one) ☐ AT STREAM GRADE ☐ FREE FALL ☐ CASCADE ☐ FREE FALL ONTO CASCADE ☐ UNKNOWN

Outlet Dimensions A. Width_________.____ B. Height_________.____ C. Substrate/Water Width_________.____ D. Water Depth_________.____

Outlet Drop to Water Surface_________.____ Outlet Drop to Stream Bottom_________.____ E. Abutment Height (Type 7 bridges only)_________.____

L. Structure Length (Overall length from inlet to outlet)_________.____

INLET

pp. 35-43

Inlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Inlet Type ☐ PROJECTING ☐ HEADWALL WITH SQUARE EDGE ☐ HEADWALL WITH GROOVED EDGE ☐ HEADWALL WITH SQUARE EDGE AND WINGWALLS ☐ HEADWALL WITH GROOVED/BEVELED EDGE AND WINGWALLS ☐ MITERED TO SLOPE ☐ OTHER ☐ NONE

Inlet Grade (Pick one) ☐ AT STREAM GRADE ☐ INLET DROP ☐ PERCHED ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN

Inlet Dimensions A. Width_________.____ B. Height_________.____ C. Substrate/Water Width_________.____ D. Water Depth_________.____

ADDITIONAL CONDITIONS

pp. 43-56

Slope % __________ Slope Confidence ☐ HIGH ☐ LOW   Internal Structures ☐ NONE ☐ BAFFLES/WEIRS ☐ SUPPORTS ☐ OTHER__________

Structure Substrate Matches Stream ☐ NONE ☐ COMPARABLE ☐ CONTRASTING ☐ NOT APPROPRIATE ☐ UNKNOWN

Structure Substrate Type (Pick one) ☐ NONE ☐ SILT ☐ SAND ☐ GRAVEL ☐ COBBLE ☐ BOULDER ☐ BEDROCK ☐ UNKNOWN

Structure Substrate Coverage ☐ NONE ☐ 25% ☐ 50% ☐ 75% ☐ 100% ☐ UNKNOWN

Physical Barriers (Pick all that apply) ☐ NONE ☐ DEBRIS/SEDIMENT/ROCK ☐ DEFORMATION ☐ FREE FALL ☐ FENCING ☐ DRY ☐ OTHER

Severity (Choose carefully based on barrier type(s) above) ☐ NONE ☐ MINOR ☐ MODERATE ☐ SEVERE

Water Depth Matches Stream ☐ YES ☐ NO-SHALLOWER ☐ NO-DEEPER ☐ UNKNOWN ☐ DRY

Water Velocity Matches Stream ☐ YES ☐ NO-FASTER ☐ NO-SLOWER ☐ UNKNOWN ☐ DRY

Dry Passage through Structure? ☐ YES ☐ NO ☐ UNKNOWN   Height above Dry Passage__________

STRUCTURAL CONDITION ASSESSMENT

pp. 57-70

	INLET					OUTLET				
	Adequate	Poor	Critical	Unknown	N/A	Adequate	Poor	Critical	Unknown	N/A
Longitudinal Alignment										
Level of Blockage										
Flared End Section										
Invert Deterioration										
Buoyancy or Crushing										
Cross-Section Deformation										
Structural Integrity of Barrel										
Joints and Seams										
Footings										
Headwall/Wingwalls										
Armoring										
Apron/Scour Protection										
Embankment Piping										

STRUCTURE COMMENTS

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STRUCTURE 5

OUTLET

pp. 19-35

Structure Material ☐ SMOOTH PLASTIC ☐ CORRUGATED PLASTIC ☐ SMOOTH METAL ☐ CORRUGATED METAL ☐ CONCRETE ☐ WOOD ☐ ROCK/STONE ☐ FIBERGLASS ☐ COMBINATION

Outlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Outlet Armoring ☐ NONE ☐ NOT EXTENSIVE ☐ EXTENSIVE

Outlet Grade (Pick one) ☐ AT STREAM GRADE ☐ FREE FALL ☐ CASCADE ☐ FREE FALL ONTO CASCADE ☐ UNKNOWN

Outlet Dimensions A. Width______.___ B. Height______.___ C. Substrate/Water Width______.___ D. Water Depth______.___

Outlet Drop to Water Surface______.___ Outlet Drop to Stream Bottom______.___ E. Abutment Height (Type 7 bridges only)______.___

L. Structure Length (Overall length from inlet to outlet)______.___

INLET

pp. 35-43

Inlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Inlet Type ☐ PROJECTING ☐ HEADWALL WITH SQUARE EDGE ☐ HEADWALL WITH GROOVED EDGE ☐ HEADWALL WITH SQUARE EDGE AND WINGWALLS ☐ HEADWALL WITH GROOVED/BEVELED EDGE AND WINGWALLS ☐ MITERED TO SLOPE ☐ OTHER ☐ NONE

Inlet Grade (Pick one) ☐ AT STREAM GRADE ☐ INLET DROP ☐ PERCHED ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN

Inlet Dimensions A. Width______.___ B. Height______.___ C. Substrate/Water Width______.___ D. Water Depth______.___

ADDITIONAL CONDITIONS

pp. 43-56

Slope % ______ Slope Confidence ☐ HIGH ☐ LOW

Internal Structures ☐ NONE ☐ BAFFLES/WEIRS ☐ SUPPORTS ☐ OTHER______

Structure Substrate Matches Stream ☐ NONE ☐ COMPARABLE ☐ CONTRASTING ☐ NOT APPROPRIATE ☐ UNKNOWN

Structure Substrate Type (Pick one) ☐ NONE ☐ SILT ☐ SAND ☐ GRAVEL ☐ COBBLE ☐ BOULDER ☐ BEDROCK ☐ UNKNOWN

Structure Substrate Coverage ☐ NONE ☐ 25% ☐ 50% ☐ 75% ☐ 100% ☐ UNKNOWN

Physical Barriers (Pick all that apply) ☐ NONE ☐ DEBRIS/SEDIMENT/ROCK ☐ DEFORMATION ☐ FREE FALL ☐ FENCING ☐ DRY ☐ OTHER

Severity (Choose carefully based on barrier type(s) above) ☐ NONE ☐ MINOR ☐ MODERATE ☐ SEVERE

Water Depth Matches Stream ☐ YES ☐ NO-SHALLOWER ☐ NO-DEEPER ☐ UNKNOWN ☐ DRY

Water Velocity Matches Stream ☐ YES ☐ NO-FASTER ☐ NO-SLOWER ☐ UNKNOWN ☐ DRY

Dry Passage through Structure? ☐ YES ☐ NO ☐ UNKNOWN

Height above Dry Passage______

STRUCTURAL CONDITION ASSESSMENT

pp. 57-70

	INLET					OUTLET				
	Adequate	Poor	Critical	Unknown	N/A	Adequate	Poor	Critical	Unknown	N/A
Longitudinal Alignment										
Level of Blockage										
Flared End Section										
Invert Deterioration										
Buoyancy or Crushing										
Cross-Section Deformation										
Structural Integrity of Barrel										
Joints and Seams										
Footings										
Headwall/Wingwalls										
Armoring										
Apron/Scour Protection										
Embankment Piping										

STRUCTURE COMMENTS

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STRUCTURE 6

OUTLET

pp. 19-35

Structure Material ☐ SMOOTH PLASTIC ☐ CORRUGATED PLASTIC ☐ SMOOTH METAL ☐ CORRUGATED METAL ☐ CONCRETE ☐ WOOD ☐ ROCK/STONE ☐ FIBERGLASS ☐ COMBINATION

Outlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Outlet Armoring ☐ NONE ☐ NOT EXTENSIVE ☐ EXTENSIVE

Outlet Grade (Pick one) ☐ AT STREAM GRADE ☐ FREE FALL ☐ CASCADE ☐ FREE FALL ONTO CASCADE ☐ UNKNOWN

Outlet Dimensions A. Width__________.____ B. Height__________.____ C. Substrate/Water Width__________.____ D. Water Depth__________.____

Outlet Drop to Water Surface__________.____ Outlet Drop to Stream Bottom__________.____ E. Abutment Height (Type 7 bridges only)__________.____

L. Structure Length (Overall length from inlet to outlet)__________.____

INLET

pp. 35-43

Inlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Inlet Type ☐ PROJECTING ☐ HEADWALL WITH SQUARE EDGE ☐ HEADWALL WITH GROOVED EDGE ☐ HEADWALL WITH SQUARE EDGE AND WINGWALLS ☐ HEADWALL WITH GROOVED/BEVELED EDGE AND WINGWALLS ☐ MITERED TO SLOPE ☐ OTHER ☐ NONE

Inlet Grade (Pick one) ☐ AT STREAM GRADE ☐ INLET DROP ☐ PERCHED ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN

Inlet Dimensions A. Width__________.____ B. Height__________.____ C. Substrate/Water Width__________.____ D. Water Depth__________.____

ADDITIONAL CONDITIONS

pp. 43-56

Slope % __________ Slope Confidence ☐ HIGH ☐ LOW

Internal Structures ☐ NONE ☐ BAFFLES/WEIRS ☐ SUPPORTS ☐ OTHER__________

Structure Substrate Matches Stream ☐ NONE ☐ COMPARABLE ☐ CONTRASTING ☐ NOT APPROPRIATE ☐ UNKNOWN

Structure Substrate Type (Pick one) ☐ NONE ☐ SILT ☐ SAND ☐ GRAVEL ☐ COBBLE ☐ BOULDER ☐ BEDROCK ☐ UNKNOWN

Structure Substrate Coverage ☐ NONE ☐ 25% ☐ 50% ☐ 75% ☐ 100% ☐ UNKNOWN

Physical Barriers (Pick all that apply) ☐ NONE ☐ DEBRIS/SEDIMENT/ROCK ☐ DEFORMATION ☐ FREE FALL ☐ FENCING ☐ DRY ☐ OTHER

Severity (Choose carefully based on barrier type(s) above) ☐ NONE ☐ MINOR ☐ MODERATE ☐ SEVERE

Water Depth Matches Stream ☐ YES ☐ NO-SHALLOWER ☐ NO-DEEPER ☐ UNKNOWN ☐ DRY

Water Velocity Matches Stream ☐ YES ☐ NO-FASTER ☐ NO-SLOWER ☐ UNKNOWN ☐ DRY

Dry Passage through Structure? ☐ YES ☐ NO ☐ UNKNOWN

Height above Dry Passage__________

STRUCTURAL CONDITION ASSESSMENT

pp. 57-70

	INLET					OUTLET				
	Adequate	Poor	Critical	Unknown	N/A	Adequate	Poor	Critical	Unknown	N/A
Longitudinal Alignment										
Level of Blockage										
Flared End Section										
Invert Deterioration										
Buoyancy or Crushing										
Cross-Section Deformation										
Structural Integrity of Barrel										
Joints and Seams										
Footings										
Headwall/Wingwalls										
Armoring										
Apron/Scour Protection										
Embankment Piping										

STRUCTURE COMMENTS

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STRUCTURE 7

OUTLET

pp. 19-35

Structure Material ☐ SMOOTH PLASTIC ☐ CORRUGATED PLASTIC ☐ SMOOTH METAL ☐ CORRUGATED METAL ☐ CONCRETE ☐ WOOD ☐ ROCK/STONE ☐ FIBERGLASS ☐ COMBINATION

Outlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED   Outlet Armoring ☐ NONE ☐ NOT EXTENSIVE ☐ EXTENSIVE

Outlet Grade (Pick one) ☐ AT STREAM GRADE ☐ FREE FALL ☐ CASCADE ☐ FREE FALL ONTO CASCADE ☐ UNKNOWN

Outlet Dimensions A. Width_________._____ B. Height_________._____ C. Substrate/Water Width_________._____ D. Water Depth_________._____

Outlet Drop to Water Surface_________._____ Outlet Drop to Stream Bottom_________._____ E. Abutment Height (Type 7 bridges only)_________._____

L. Structure Length (Overall length from inlet to outlet)_________._____

INLET

pp. 35-43

Inlet Shape ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ FORD ☐ UNKNOWN ☐ REMOVED

Inlet Type ☐ PROJECTING ☐ HEADWALL WITH SQUARE EDGE ☐ HEADWALL WITH GROOVED EDGE ☐ HEADWALL WITH SQUARE EDGE AND WINGWALLS ☐ HEADWALL WITH GROOVED/BEVELED EDGE AND WINGWALLS ☐ MITERED TO SLOPE ☐ OTHER ☐ NONE

Inlet Grade (Pick one) ☐ AT STREAM GRADE ☐ INLET DROP ☐ PERCHED ☐ CLOGGED/COLLAPSED/SUBMERGED ☐ UNKNOWN

Inlet Dimensions A. Width_________._____ B. Height_________._____ C. Substrate/Water Width_________._____ D. Water Depth_________._____

ADDITIONAL CONDITIONS

pp. 43-56

Slope % ____________ Slope Confidence ☐ HIGH ☐ LOW   Internal Structures ☐ NONE ☐ BAFFLES/WEIRS ☐ SUPPORTS ☐ OTHER__________

Structure Substrate Matches Stream ☐ NONE ☐ COMPARABLE ☐ CONTRASTING ☐ NOT APPROPRIATE ☐ UNKNOWN

Structure Substrate Type (Pick one) ☐ NONE ☐ SILT ☐ SAND ☐ GRAVEL ☐ COBBLE ☐ BOULDER ☐ BEDROCK ☐ UNKNOWN

Structure Substrate Coverage ☐ NONE ☐ 25% ☐ 50% ☐ 75% ☐ 100% ☐ UNKNOWN

Physical Barriers (Pick all that apply) ☐ NONE ☐ DEBRIS/SEDIMENT/ROCK ☐ DEFORMATION ☐ FREE FALL ☐ FENCING ☐ DRY ☐ OTHER

Severity (Choose carefully based on barrier type(s) above) ☐ NONE ☐ MINOR ☐ MODERATE ☐ SEVERE

Water Depth Matches Stream ☐ YES ☐ NO-SHALLOWER ☐ NO-DEEPER ☐ UNKNOWN ☐ DRY

Water Velocity Matches Stream ☐ YES ☐ NO-FASTER ☐ NO-SLOWER ☐ UNKNOWN ☐ DRY

Dry Passage through Structure? ☐ YES ☐ NO ☐ UNKNOWN   Height above Dry Passage____________

STRUCTURAL CONDITION ASSESSMENT

pp. 57-70

	INLET					OUTLET				
	Adequate	Poor	Critical	Unknown	N/A	Adequate	Poor	Critical	Unknown	N/A
Longitudinal Alignment										
Level of Blockage										
Flared End Section										
Invert Deterioration										
Buoyancy or Crushing										
Cross-Section Deformation										
Structural Integrity of Barrel										
Joints and Seams										
Footings										
Headwall/Wingwalls										
Armoring										
Apron/Scour Protection										
Embankment Piping										

STRUCTURE COMMENTS

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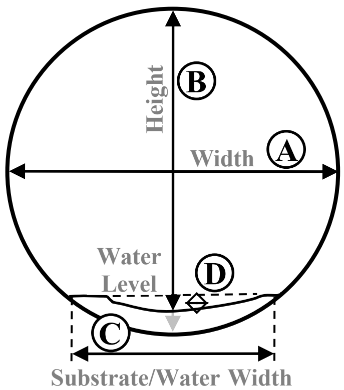
Structure Shape & Dimensions

1) Select the Structure Shape number from the diagrams below and record it on the form for Inlet and Outlet Shape.
2) Record on the form in the appropriate blanks dimensions **A, B, C** and **D** as shown in the diagrams;
   C captures the width of water or substrate, whichever is wider; for dry culverts without substrate, C = 0.
   D is the depth of water -- be sure to measure inside the structure; for dry culverts, D = 0.
3) Record Structure Length (**L**) . (Record abutment height (**E**) only for Type 7 Structures.)
4) For multiple culverts, also record the Inlet and Outlet shape and dimensions for each additional culvert.

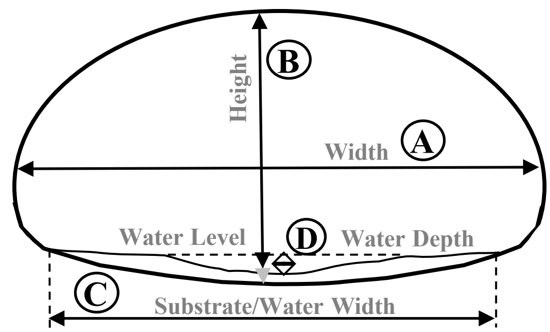
NOTE: Culverts 1, 2 & 4 may or may not have substrate in them, so height measurements (B) are taken from the level of the "stream bed", whether that bed is composed of substrate or just the inside bottom surface of a culvert (grey arrows below show measuring to bottom, black arrows show measuring to substrate).

1



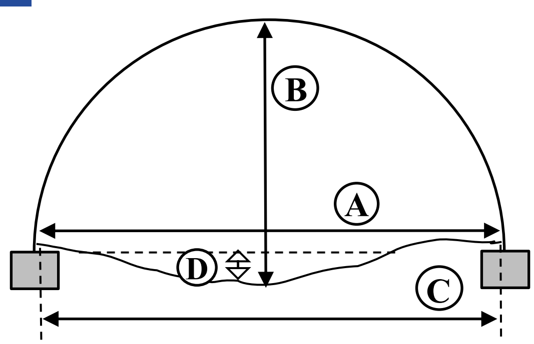
Round Culvert

2



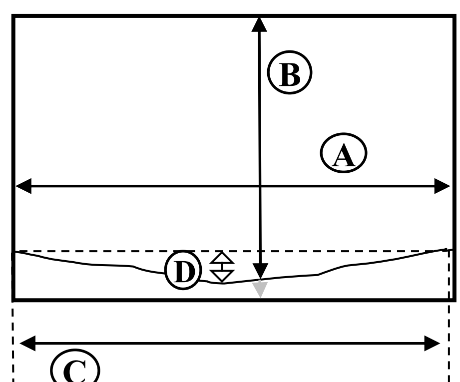
Pipe Arch/Elliptical Culvert

3



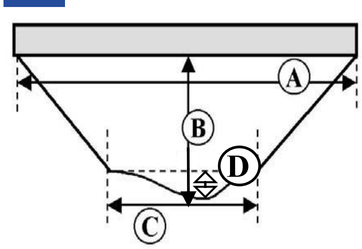
Open Bottom Arch Bridge/Culvert

4



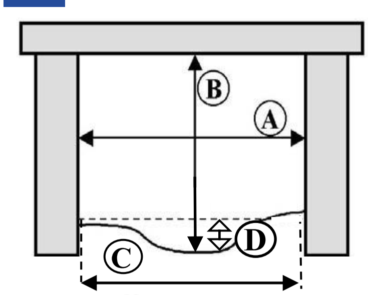
Box Culvert

5



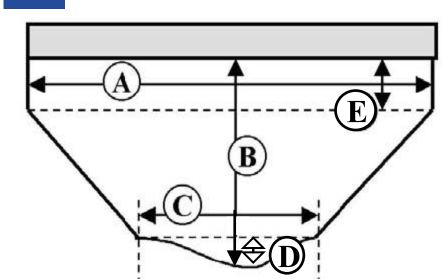
Bridge with Side Slopes

6



Box/Bridge with Abutments

7



Bridge with Abutments and Side Slopes

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FUSS & O'NEILL

Attachment B

Road-Stream Crossing Scoring and Prioritization Results

Hydraulic Capacity Worksheet
Road-Stream Crossing Assessment
Tioga County Watersheds

April 2019

Stream Name	Road Name	Crossing Hydraulic Capacity @ Failure				Existing Streamflow Conditions								Future Streamflow Conditions (20% Increase in Flows - Projected Climate Change)								Scoring	
		Capacity Structure 1 (cfs)	Capacity Structure 2 (cfs)	Total Culvert Capacity (cfs)	Drainage Area (mi2)	10-Year Peak Flow (cfs)	25-Year Peak Flow (cfs)	50-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)	10-Year Capacity Ratio	25-Year Capacity Ratio	50-Year Capacity Ratio	100-Year Capacity Ratio	10-Year Peak Flow (cfs)	25-Year Peak Flow (cfs)	50-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)	10-Year Capacity Ratio	25-Year Capacity Ratio	50-Year Capacity Ratio	100-Year Capacity Ratio	Existing Hydraulic Capacity Score (1-5)	Future Hydraulic Capacity Score (1-5)
Wappasening Creek Watershed																							
Unnamed Trib to Unnamed Trib at Briggs Hollow	Moore Hill Road	99		99	0.37	99	137	171	206	1.00	0.72	0.58	0.48	118	164	205	247	0.83	0.60	0.48	0.40	5	5
Unnamed Tributary at Briggs Hollow	State Line Road	382		382	2.47	501	691	858	1030	0.76	0.55	0.45	0.37	601	829	1030	1236	0.64	0.46	0.37	0.31	5	5
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	637		637	1.82	415	576	719	867	1.54	1.11	0.89	0.73	498	691	863	1040	1.28	0.92	0.74	0.61	3	4
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	664		664	1.13	304	426	535	648	2.18	1.56	1.24	1.02	365	511	642	778	1.82	1.30	1.03	0.85	1	2
Unnamed Tributary at Briggs Hollow	Briggs Hollow Road	235		235	0.55	169	237	298	363	1.39	0.99	0.79	0.65	203	284	358	436	1.16	0.83	0.66	0.54	4	4
Unnamed Tributary at Briggs Hollow	Upper Briggs Hollow Road	328		328	0.52	166	234	295	360	1.98	1.40	1.11	0.91	199	281	354	432	1.65	1.17	0.93	0.76	2	3
Huntington Creek Watershed																							
Huntington Creek	Sheldon Guile Boulevard	244	271	515	1.92	473	663	832	1010	1.09	0.78	0.62	0.51	568	796	998	1212	0.91	0.65	0.52	0.43	4	5
Huntington Creek	Owego & Hartford Railroad	59		59	1.92	473	663	832	1010	0.12	0.09	0.07	0.06	568	796	998	1212	0.10	0.07	0.06	0.05	5	5
Huntington Creek	North Avenue (NY 96)	6179		6179	1.91	477	669	840	1020	12.95	9.24	7.36	6.06	572	803	1008	1224	10.80	7.70	6.13	5.05	1	1
Huntington Creek	Driveway off Dean Street	2601		2601	1.51	383	536	673	816	6.79	4.85	3.86	3.19	460	643	808	979	5.66	4.04	3.22	2.66	1	1
Huntington Creek	Driveway off Dean Street	236		236	1.49	379	531	667	810	0.62	0.44	0.35	0.29	455	637	800	972	0.52	0.37	0.29	0.24	5	5
Huntington Creek	Winery Driveway off Allen Glen Rd	224		224	1.37	353	495	622	755	0.63	0.45	0.36	0.30	424	594	746	906	0.53	0.38	0.30	0.25	5	5
Huntington Creek	Allen Glen Road	492		492	0.79	206	288	361	437	2.39	1.71	1.36	1.12	247	346	433	524	1.99	1.42	1.13	0.94	1	2
Tributary to Huntington Creek	Winery Trail off Allen Glen Rd	3810		3810	0.58	199	284	360	441	19.14	13.41	10.58	8.64	239	341	432	529	15.95	11.18	8.82	7.20	1	1
Tributary to Huntington Creek	Carmichael Road	75		75	0.14	54	76	97	118	1.40	0.98	0.78	0.64	64	92	116	142	1.17	0.82	0.65	0.53	4	4
Tributary to Huntington Creek	Driveway off Carmichael Rd	220		220	0.09	35	49	62	76	6.37	4.49	3.55	2.90	41	59	74	91	5.31	3.74	2.96	2.42	1	1
Apalachin Creek Watershed																							
Unnamed Tributary to Deerlick Creek	Summit Road	18		18	0.03	10	14	17	20	1.76	1.28	1.04	0.87	12	16	20	24	1.47	1.07	0.87	0.73	2	3
Unnamed Tributary to Deerlick Creek	Beach Road	241		241	0.30	82	113	141	169	2.95	2.13	1.71	1.43	98	136	169	203	2.45	1.78	1.42	1.19	1	1
Unnamed Tributary to Apalachin Creek	Barton Road	18		18	0.05	19	26	33	39	0.95	0.68	0.54	0.45	22	31	39	47	0.79	0.56	0.45	0.37	5	5
Deerlick Creek	Pennsylvania Avenue	3696		3696	4.01	636	858	1050	1250	5.81	4.31	3.52	2.96	763	1030	1260	1500	4.84	3.59	2.93	2.46	1	1
Long Creek	Pennsylvania Avenue	4625		4625	2.85	586	804	996	1190	7.89	5.75	4.64	3.89	703	965	1195	1428	6.58	4.79	3.87	3.24	1	1
Long Creek	Long Creek Road	3075		3075	2.70	570	784	972	1170	5.40	3.92	3.16	2.63	684	941	1166	1404	4.50	3.27	2.64	2.19	1	1
Unnamed Tributary to Long Creek	Long Creek Road	25		25	0.26	65	89	110	131	0.39	0.28	0.23	0.19	78	107	132	157	0.32	0.24	0.19	0.16	5	5
Deerlick Creek	Chestnut Ridge Road	39		39	0.05	12	16	20	23	3.27	2.41	1.98	1.67	14	19	23	28	2.72	2.01	1.65	1.39	1	1
Unnamed Tributary to Deerlick Creek	Montrose Turnpike	18		18	0.07	22	30	38	45	0.81	0.58	0.47	0.39	26	36	45	54	0.67	0.49	0.39	0.32	5	5
Unnamed Tributary to Apalachin Creek	Gaylord Road	607		607	2.22	480	657	812	972	1.26	0.92	0.75	0.62	576	788	974	1166	1.05	0.77	0.62	0.52	4	4
Unnamed Tributary to Apalachin Creek	Gaylord Road	536		536	1.73	396	543	672	806	1.35	0.99	0.80	0.67	475	652	806	967	1.13	0.82	0.67	0.55	4	4
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	58		58	0.50	156	217	272	329	0.37	0.27	0.21	0.18	187	260	326	395	0.31	0.22	0.18	0.15	5	5
Unnamed Tributary to Apalachin Creek	Card Road	327		327	0.48	152	211	265	320	2.15	1.55	1.23	1.02	182	253	318	384	1.79	1.29	1.03	0.85	1	2
Apalachin Creek	Harnick Road	3792	356	4148	23.80	3000	3990	4850	5720	1.38	1.04	0.86	0.73	3600	4788	5820	6864	1.15	0.87	0.71	0.60	3	4
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	661		661	1.35	326	449	557	669	2.03	1.47	1.19	0.99	391	539	668	803	1.69	1.23	0.99	0.82	2	3
Unnamed Tributary to Apalachin Creek	Fox Road	295		295	1.34	327	451	560	673	0.90	0.65	0.53	0.44	392	541	672	808	0.75	0.55	0.44	0.37	5	5

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Hydraulic Capacity Worksheet
Road-Stream Crossing Assessment
Tioga County Watersheds

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Headwater Depth at $Q_{failure}$

Road-Stream Crossing Structure Type and Material	Allowable Headwater Depth[1]
Stone Masonry or Wood Culvert	HW = 1.0 x D
Smooth or Corrugated Metal or Plastic Culvert[2]	HW = 1.2 x D
Concrete Culvert	HW = 1 foot below lowest point in roadway surface
Bridge	HW = 1 foot below lowest point of bottom of bridge deck

[1] In some cases a lower elevation in the approach to a road-stream crossing may be utilized instead to estimate the allowable headwater depth. It is the responsibility of the Assessment Coordinator to determine when this is appropriate.
[2] Includes fiberglass culverts.

Hydraulic Capacity Score

Hydraulic Capacity Rating (Capacity Ratio > 1.0 for listed Return Interval)	Hydraulic Capacity Score
100-Year	1
50 Year	2
25-Year	3
10 Year	4
< 10-Year	5

Tailwater Depth used in Calculating Hydraulic Capacity ($Q_{failure}$)

Crossing Type	Crossing Structure Slope	Tailwater Depth
Non-Tidal Crossings	> 2%	TW = 0.75 x D
	< 2%	TW = 0.75 x D when HW/D < 1.3 TW = 1.0 x D when HW/D ≥ 1.3
Tidal Crossings	Not Applicable	TW = 1.0 x D
Crossings discharging directly into a lake, pond, or wetland[1]	Not Applicable	Based on elevation of receiving water body or wetland
Crossings with cascade or free fall at the outlet with a significant drop to the normal elevation of the downstream channel	Not Applicable	Based on elevation drop at outlet

[1] Situations where the tailwater depth is dictated by the water elevation in the downstream receiving water body or wetland and does not vary with flow, where available.

Geomorphic Vulnerability Worksheet
Road-Stream Crossing Assessment
Tioga County Watersheds

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Stream Name	Road Name	Potential for Geomorphic Impacts				Observed Geomorphic Impacts			Scoring			
		Alignment Impact Potential Rating	Bankfull Width Impact Potential Rating	Slope Impact Potential Rating	Substrate Size Impact Potential Rating	Sediment Continuity Impact Rating	Bank Erosion and Outlet Amoring Impact Rating	Inlet/ Outlet Grade Impact Rating	Combined Potential Impact Rating	Combined Observed Impact Rating	Geomorphic Vulnerability Score (sum)	Geomorphic Vulnerability Score (1-5)
Wappasening Creek Watershed												
Unnamed Trib to Unnamed Trib at Briggs Hollow	Moore Hill Road	1	5	3	4	5	5	4	13	14	27	4
Unnamed Tributary at Briggs Hollow	State Line Road	2	5	1	3	4	5	2	11	11	22	4
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	2	5	1	3	4	5	1	11	10	21	3
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	2	4	1	3	3	5	5	10	13	23	4
Unnamed Tributary at Briggs Hollow	Briggs Hollow Road	1	5	4	4	4	5	3	14	12	26	4
Unnamed Tributary at Briggs Hollow	Upper Briggs Hollow Road	4	5	1	3	3	5	1	13	9	22	4
Huntington Creek Watershed												
Huntington Creek	Sheldon Guile Boulevard	4	3	3	3	3	5	1	13	9	22	4
Huntington Creek	Owego & Hartford Railroad	4	3	3	3	2	5	1	13	8	21	3
Huntington Creek	North Avenue (NY 96)	4	1	3	2	2	5	1	10	8	18	3
Huntington Creek	Driveway off Dean Street	1	5	1	3	3	5	1	10	9	19	3
Huntington Creek	Driveway off Dean Street	2	5	5	3	5	5	2	15	12	27	4
Huntington Creek	Winery Driveway off Allen Glen Rd	2	5	3	3	3	5	5	13	13	26	4
Huntington Creek	Allen Glen Road	2	5	3	4	3	5	1	14	9	23	4
Tributary to Huntington Creek	Winery Trail off Allen Glen Rd	2	1	3	3	3	5	1	9	9	18	3
Tributary to Huntington Creek	Carmichael Road	2	5	4	4	2	5	5	15	12	27	4
Tributary to Huntington Creek	Driveway off Carmichael Rd	5	5	4	3	4	5	4	17	13	30	5
Apalachin Creek Watershed												
Unnamed Tributary to Deerlick Creek	Summit Road	5	5	1	4	4	3	4	15	11	26	4
Unnamed Tributary to Deerlick Creek	Beach Road	5	5	3	3	3	5	5	16	13	29	5
Unnamed Tributary to Apalachin Creek	Barton Road	5	5	4	5	1	5	4	19	10	29	5
Deerlick Creek	Pennsylvania Avenue	1	1	1	3	2	5	1	6	8	14	2
Long Creek	Pennsylvania Avenue	2	2	1	4	1	5	1	9	7	16	3
Long Creek	Long Creek Road	2	2	1	4	3	5	1	9	9	18	3
Unnamed Tributary to Long Creek	Long Creek Road	4	5	3	3	4	5	2	15	11	26	4
Deerlick Creek	Chestnut Ridge Road	5	5	4	5	2	5	4	19	11	30	5
Unnamed Tributary to Deerlick Creek	Montrose Turnpike	5	4	5	5	2	3	4	19	9	28	4
Unnamed Tributary to Apalachin Creek	Gaylord Road	2	5	3	3	4	5	5	13	14	27	4
Unnamed Tributary to Apalachin Creek	Gaylord Road	2	5	3	2	3	5	3	12	11	23	4
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	2	3	1	3	3	5	1	9	9	18	3
Unnamed Tributary to Apalachin Creek	Card Road	2	5	5	3	5	5	3	15	13	28	4
Apalachin Creek	Harnick Road	2	3	1	3	3	5	1	9	9	18	3
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	2	4	1	3	4	5	4	10	13	23	4
Unnamed Tributary to Apalachin Creek	Fox Road	2	5	5	3	5	5	1	15	11	26	4

Geomorphic Vulnerability Worksheet
Road-Stream Crossing Assessment
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Crossing alignment impact potential ratings

Impact Rating	Alignment
1	Naturally straight
2	Mild bend
3	--
4	Channelized straight
5	Sharp bend

Bankfull width impact potential ratings when confident width measurements are available

Impact Rating	Inlet Width/Bankfull Width Ratio (ft/ft)
1	≥1.0
2	1.0-0.85
3	0.85-0.7
4	0.7-0.5
5	≤0.5

Bankfull width impact potential ratings when no confident width measurements are available

Impact Rating	Constriction
1	None – Spans full channel and banks
2	Slight – Spans only bankfull/active channel
3	-
4	Moderate
5	Severe

Substrate size impact potential ratings

Impact Rating	Stream Substrate
1	Bedrock
2	Boulder
3	Cobble
4	Gravel
5	Sand or muck/silt

Channel and crossing structure slope impact potential ratings

Impact Rating	Slope Conditions at Crossing
1	No natural break in slope AND crossing structure slope and channel slope the same
2	No natural break in slope but crossing structure slope greater than channel slope
3	Natural break in slope present but crossing structure and channel slope the same
4	No natural break in slope but crossing structure slope less than channel slope
5	Natural slope break present AND crossing structure slope different from channel slope (less than or greater than)

Sediment continuity impact ratings

Impact Rating	Sediment Deposition, Elevation of Sediment Deposits, and Tailwater Scour Pool
1	No deposition upstream AND no tailwater scour pool downstream
2	Deposition upstream <½ bankfull height OR small tailwater pool downstream
3	No deposition upstream AND large tailwater scour pool downstream
3	Deposition upstream <½ bankfull height AND small tailwater pool downstream
3	Deposition upstream ≥½ bankfull height AND no tailwater scour pool downstream
4	Both deposition & pool present w/ either large pool or deposition ≥½ bankfull height
5	Deposition upstream ≥½ bankfull height AND large tailwater pool downstream

Bank erosion and outlet armoring impact ratings

Impact Rating	Bank Erosion and Outlet Armoring
1	No bank erosion or outlet armoring
2	--
3	Low levels of bank erosion and/or not extensive outlet armoring
4	--
5	High levels of bank erosion and/or extensive outlet armoring

Inlet and outlet grade impact ratings

Impact Rating	Character of Inlet and Outlet Grade
1	Both inlet and outlet at stream grade
2	Inlet drop OR cascade at outlet
3	Inlet drop AND cascade at outlet
4	Perched inlet OR free fall or free fall onto cascade at outlet
5	Inlet drop AND free fall or free fall onto cascade at outlet

Combined geomorphic potential impact ratings

Combined Potential Impact Rating	Likelihood for Geomorphic Impacts
4	Very unlikely
5-8	Unlikely
9-12	Possible
13-16	Likely
17-20	Very likely

Combined observed geomorphic impact ratings

Combined Impact Rating	Degree of Observed Geomorphic Impacts
3	None
4-6	Minor
7-9	Moderate
10-12	Significant
13-15	Severe

Structural Condition Worksheet
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Stream Name	Road Name	Inlet, Outlet or Barrel Condition A = Adequate P = Poor C = Critical U-NA = Unknown or Not Applicable												Scoring					
		Level of Blockage	Flared End Section	Invert Deterioration	Buoyancy or Crushing	Cross-Section Deformation	Structural Integrity of Barrel	Joints & Seams	Footings	Headwalls & Wingwalls	Armoring	Apron/ Scour Protection	Embankment Piping	Level 1 Variables V1 (0.0-1.0)	Level 2 Variables V2 Part I (0.0-1.0)	Level 2 Variables V2 Part II (0.0-1.0)	Level 3 Variables V3 (0.0-1.0)	Structural Condition Score (0.0-1.0)	Structural Condition Score (1-5)
Wappasening Creek Watershed																			
Unnamed Trib to Unnamed Trib at Briggs Hollow	Moore Hill Road	A	U-NA	P	A	A	A	A	U-NA	P	U-NA	U-NA	P	1.0	1.0	1.0	0.7	0.7	2
Unnamed Tributary at Briggs Hollow	State Line Road	A	A	A	A	A	A		A	A	A	P	A	1.0	1.0	1.0	0.9	0.9	1
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	A	U-NA	A	A	A	A	A	U-NA	C	P	P	C	1.0	0.1	1.0	0.8	0.1	5
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	A	U-NA	A	A	A	A	A	U-NA	A	P	U-NA	P	1.0	1.0	1.0	0.8	0.8	2
Unnamed Tributary at Briggs Hollow	Briggs Hollow Road	A	U-NA	A	A	A	A	A	U-NA	P	U-NA	P	P	1.0	1.0	1.0	0.7	0.7	2
Unnamed Tributary at Briggs Hollow	Upper Briggs Hollow Road	A	U-NA	A	A	A	A	A	U-NA	P	U-NA	U-NA	A	1.0	1.0	1.0	0.9	0.9	1
Huntington Creek Watershed																			
Huntington Creek	Sheldon Guile Boulevard	P	U-NA	A	A	U-NA	A	A	U-NA	A	P	U-NA	A	1.0	1.0	0.2	0.9	0.2	5
Huntington Creek	Owego & Hartford Railroad	A	U-NA	A	A	A	A	A	A	U-NA	A	U-NA	A	1.0	1.0	1.0	1.0	1.0	1
Huntington Creek	North Avenue (NY 96)	A	U-NA	A	A	U-NA	A	U-NA	A	A	P	P	A	1.0	1.0	1.0	0.8	0.8	2
Huntington Creek	Driveway off Dean Street	A	U-NA	A	A	A	C	A	U-NA	P	U-NA	U-NA	P	0.0	1.0	1.0	0.8	0.0	5
Huntington Creek	Driveway off Dean Street	A	U-NA	A	A	A	A	U-NA	U-NA	U-NA	C	U-NA	C	1.0	0.1	1.0	1.0	0.1	5
Huntington Creek	Winery Driveway off Allen Glen Rd	A	U-NA	A	A	A	A	A	U-NA	C	C	U-NA	C	1.0	0.0	1.0	1.0	0.0	5
Huntington Creek	Allen Glen Road	A	U-NA	A	A	A	A	C	A	C	C	P	C	1.0	0.0	1.0	0.9	0.0	5
Tributary to Huntington Creek	Winery Trail off Allen Glen Rd	A	U-NA	A	A	A	U-NA	A	A	U-NA	U-NA	U-NA	A	1.0	1.0	1.0	1.0	1.0	1
Tributary to Huntington Creek	Carmichael Road	P	U-NA	C	C	C	C	A	U-NA	U-NA	C	U-NA	C	0.0	0.0	0.2	1.0	0.0	5
Tributary to Huntington Creek	Driveway off Carmichael Rd	A	U-NA	P	A	A	C	A	U-NA	U-NA	U-NA	U-NA	C	0.0	0.2	1.0	0.9	0.0	5
Apalachin Creek Watershed																			
Unnamed Tributary to Deerlick Creek	Summit Road	A	U-NA	A	A	A	A	A	A	U-NA	P	U-NA	P	1.0	1.0	1.0	0.8	0.8	2
Unnamed Tributary to Deerlick Creek	Beach Road	P	U-NA	A	A	A	A	A	U-NA	C	U-NA	A	C	1.0	0.1	0.2	1.0	0.1	5
Unnamed Tributary to Apalachin Creek	Barton Road	A	A	A	A	A	A	A	U-NA	U-NA	C	U-NA	P	1.0	0.2	1.0	0.9	0.2	5
Deerlick Creek	Pennsylvania Avenue	A	U-NA	A	A	A	A	A	A	A	A	U-NA	A	1.0	1.0	1.0	1.0	1.0	1
Long Creek	Pennsylvania Avenue	A	U-NA	A	U-NA	A	A	A	A	A	C	U-NA	A	1.0	0.2	1.0	1.0	0.2	5
Long Creek	Long Creek Road	A	U-NA	P	A	A	P	A	C	P	C	U-NA	C	0.0	0.1	0.2	0.8	0.0	5
Unnamed Tributary to Long Creek	Long Creek Road	A	U-NA	P	A	A	A	P	U-NA	U-NA	C	U-NA	P	1.0	0.2	1.0	0.7	0.2	5
Deerlick Creek	Chestnut Ridge Road	C	U-NA	A	C	C	C	A	U-NA	U-NA	C	P	C	0.0	0.0	1.0	0.9	0.0	5
Unnamed Tributary to Deerlick Creek	Montrose Turnpike	A	U-NA	P	A	A	A	U-NA	U-NA	U-NA	U-NA	U-NA	A	1.0	1.0	1.0	0.9	0.9	1
Unnamed Tributary to Apalachin Creek	Gaylord Road	A	U-NA	P	A	A	A	A	U-NA	C	P	P	P	1.0	0.2	1.0	0.6	0.2	5
Unnamed Tributary to Apalachin Creek	Gaylord Road	A	U-NA	P	A	A	A	P	P	P	P	P	P	1.0	1.0	0.2	0.4	0.2	5
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	C	U-NA	A	A	A	A	P	A	P	U-NA	U-NA	A	0.0	1.0	1.0	0.8	0.0	5
Unnamed Tributary to Apalachin Creek	Card Road	A	U-NA	P	A	A	P	A	U-NA	C	P	U-NA	P	1.0	0.2	0.2	0.7	0.2	5
Apalachin Creek	Harnick Road	A	U-NA	A	A	U-NA	A	A	A	U-NA	A	U-NA	A	1.0	1.0	1.0	1.0	1.0	1
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	A	U-NA	A	A	A	A	A	U-NA	P	P	U-NA	A	1.0	1.0	1.0	0.8	0.8	2
Unnamed Tributary to Apalachin Creek	Fox Road	A	U-NA	A	A	A	A	A	U-NA	C	P	U-NA	P	1.0	0.2	1.0	0.8	0.2	5

Structural Condition Worksheet
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Table 1: Level 1 Variables

Number of Variables Marked "Critical" (Inlet, Outlet, or Both)	Score
Any one of the following variables: • Cross Section Deformation • Barrel Condition/Structural Integrity • Footing Condition • Level of Blockage	0.0
None of the above variables are marked "Critical"	1.0

Table 2A: Level 2 Variables – Part I

Number of Variables Marked Critical	Score
Any three of the following variables (inlet, outlet, or both): • Buoyancy or Crushing • Invert Deterioration • Joints and Seams Condition • Headwall/Wingwall Condition • Flared End Section Condition • Apron/Scour Protection Condition (outlet only) • Armoring Condition • Embankment Piping	0.0
Any two of the following variables (inlet, outlet, or both): • Buoyancy or Crushing • Invert Deterioration • Joints and Seams Condition • Headwall/Wingwall Condition • Flared End Section Condition • Apron/Scour Protection Condition (outlet only) • Armoring Condition • Embankment Piping	0.1
Any one of the following variables (inlet/outlet/both): • Buoyancy or Crushing • Invert Deterioration • Joints and Seams Condition • Headwall/Wingwall Condition • Flared End Section Condition • Apron/Scour Protection Condition (outlet only) • Armoring Condition • Embankment Piping	0.2
None of the above variables are marked "Critical"	1.0

Table 2B: Level 2 Variables – Part II

Number of Variables Marked "Poor"	Score
Any three of the following variables (inlet, outlet, or both): • Cross Section Deformation • Barrel Condition/Structural Integrity • Footing Condition • Level of Blockage	0.0
Any two of the following variables (inlet, outlet, or both): • Cross Section Deformation • Barrel Condition/Structural Integrity • Footing Condition • Level of Blockage	0.1
Any one of the following variables (inlet, outlet, or both): • Cross Section Deformation • Barrel Condition/Structural Integrity • Footing Condition • Level of Blockage	0.2
None of the above variables are marked "Poor"	1.0

Table 3: Level 3 Variables

Variables marked as "Poor" (inlet, outlet, or both)
Buoyancy or Crushing
Invert Deterioration
Joints and Seams Condition
Headwall/Wingwall Condition
Flared End Section Condition
Apron/Scour Protection Condition (outlet only)
Armoring Condition
Embankment Piping

Equation 1: Level 3 Score

$$Score = 1.0 - (0.1 \times N)$$

N = number of variables from Table 3 marked "Poor"

Table 4: Structural Condition Binned Score

Lowest Score Resulting from Level 1, Level 2, and Level 3 Variable Assessment	Condition Binned Score
0.81 - 1.00	1
0.61 - 0.80	2
0.41 - 0.60	3
0.21 - 0.40	4
0.0 - 0.20	5

Aquatic Organism Passage Worksheet
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Stream Name	Road Name	Aquatic Organism Passage Component Scores														Final Score		
		Constriction	Inlet Grade	Internal Structures	Outlet Armoring	Physical Barriers	Scour Pool	Substrate Coverage	Substrate Matches Stream	Water Depth	Water Velocity	Openness Measurement	Openness Score (So)	Height Score (Sh)	Outlet Drop Score (Sod)	Weighted Composite Passability Score	Aquatic Passability Score	Aquatic Passability Score (1-5)
Wappasening Creek Watershed																		
Unnamed Trib to Unnamed Trib at Briggs Hollow	Moore Hill Road	0.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	0.34	0.66	0.97	0.07	0.461	0.067	5
Unnamed Tributary at Briggs Hollow	State Line Road	0.0	1.0	1.0	0.0	1.0	0.8	0.5	1.0	0.0	0.0	1.27	1.00	0.96	0.08	0.518	0.079	5
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	0.0	1.0	1.0	0.0	0.0	0.8	0.5	1.0	0.0	1.0	1.65	1.00	1.00	1.00	0.613	0.613	2
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	0.5	0.0	1.0	1.0	1.0	0.0	0.5	1.0	0.0	0.0	1.32	1.00	1.00	0.96	0.599	0.599	3
Unnamed Tributary at Briggs Hollow	Briggs Hollow Road	0.0	0.0	1.0	0.5	1.0	0.0	0.0	0.0	0.0	0.0	0.56	0.89	0.97	-0.02	0.272	-0.022	5
Unnamed Tributary at Briggs Hollow	Upper Briggs Hollow Road	0.0	1.0	1.0	1.0	1.0	0.8	0.5	1.0	0.0	1.0	0.70	0.95	0.95	1.00	0.780	0.780	2
Huntington Creek Watershed																		
Huntington Creek	Sheldon Guile Boulevard	1.0	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0	1.0	1.29	1.00	0.93	1.00	0.929	0.929	1
Huntington Creek	Owego & Hartford Railroad	0.9	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	2.91	1.00	0.35	1.00	0.925	0.925	1
Huntington Creek	North Avenue (NY 96)	0.9	1.0	1.0	0.5	0.5	1.0	1.0	1.0	1.0	1.0	6.27	1.00	1.00	1.00	0.905	0.905	1
Huntington Creek	Driveway off Dean Street	0.0	1.0	1.0	1.0	0.8	1.0	1.0	1.0	1.0	1.0	14.33	1.00	1.00	1.00	0.883	0.883	1
Huntington Creek	Driveway off Dean Street	0.0	0.0	1.0	1.0	0.8	0.0	0.7	1.0	1.0	1.0	1.36	1.00	0.99	1.00	0.706	0.706	2
Huntington Creek	Winery Driveway off Allen Glen Rd	0.0	0.0	1.0	1.0	0.8	0.8	0.0	0.0	0.0	0.0	0.88	0.98	1.00	0.74	0.449	0.449	3
Huntington Creek	Allen Glen Road	0.0	1.0	1.0	0.0	0.5	0.8	0.0	0.0	0.0	0.5	1.36	1.00	0.99	1.00	0.542	0.542	3
Tributary to Huntington Creek	Winery Trail off Allen Glen Rd	0.5	1.0	1.0	1.0	1.0	0.8	1.0	1.0	1.0	1.0	11.66	1.00	0.97	1.00	0.940	0.940	1
Tributary to Huntington Creek	Carmichael Road	0.0	0.0	1.0	1.0	0.0	1.0	0.5	1.0	0.0	0.5	0.16	0.27	0.84	1.00	0.491	0.491	3
Tributary to Huntington Creek	Driveway off Carmichael Rd	0.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.5	1.25	1.00	0.90	-0.01	0.422	-0.013	5
Apalachin Creek Watershed																		
Unnamed Tributary to Deerlick Creek	Summit Road	0.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	0.5	0.07	0.06	0.50	0.04	0.364	0.041	5
Unnamed Tributary to Deerlick Creek	Beach Road	0.0	0.0	1.0	1.0	0.5	1.0	0.0	0.0	0.0	0.0	0.62	0.93	0.97	-0.02	0.297	-0.017	5
Unnamed Tributary to Apalachin Creek	Barton Road	0.0	0.0	1.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.04	0.02	0.50	0.50	0.244	0.244	4
Deerlick Creek	Pennsylvania Avenue	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	4.63	1.00	1.00	1.00	0.955	0.955	1
Long Creek	Pennsylvania Avenue	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.30	1.00	1.00	1.00	0.955	0.955	1
Long Creek	Long Creek Road	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.98	1.00	0.72	0.50	0.862	0.500	3
Unnamed Tributary to Long Creek	Long Creek Road	0.0	1.0	1.0	1.0	1.0	0.8	0.0	0.0	0.0	1.0	0.07	0.06	0.72	0.50	0.545	0.500	3
Deerlick Creek	Chestnut Ridge Road	0.0	1.0	1.0	0.5	0.0	1.0	1.0	1.0	0.5	0.5	0.13	0.18	0.72	1.00	0.620	0.620	2
Unnamed Tributary to Deerlick Creek	Montrose Turnpike	0.5	1.0	1.0	1.0	1.0	0.8	0.0	0.0	1.0	0.0	0.08	0.06	0.50	0.02	0.504	0.016	5
Unnamed Tributary to Apalachin Creek	Gaylord Road	0.0	0.0	1.0	1.0	1.0	0.8	0.0	0.0	0.0	0.0	1.88	1.00	1.00	0.08	0.371	0.079	5
Unnamed Tributary to Apalachin Creek	Gaylord Road	0.0	0.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0	1.13	1.00	1.00	0.01	0.416	0.007	5
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.26	1.00	0.68	1.00	0.941	0.941	1
Unnamed Tributary to Apalachin Creek	Card Road	0.0	0.0	1.0	0.0	1.0	0.0	0.5	1.0	1.0	0.5	0.88	0.98	0.60	0.33	0.519	0.332	4
Apalachin Creek	Harnick Road	0.9	1.0	1.0	1.0	0.8	1.0	1.0	1.0	1.0	1.0	8.39	1.00	1.00	1.00	0.964	0.964	1
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	0.5	1.0	1.0	1.0	1.0	0.8	0.0	0.0	0.0	0.5	3.89	1.00	1.00	0.61	0.629	0.612	2
Unnamed Tributary to Apalachin Creek	Fox Road	0.0	1.0	1.0	1.0	0.8	0.0	0.5	1.0	0.0	0.0	1.10	1.00	1.00	1.00	0.621	0.621	2

Aquatic Organism Passage Worksheet
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Equation 1: Openness Measurement (feet)

$$\text{Openness Measurement} = \frac{\text{Structure Cross Sectional Area}}{\text{Structure Length}}$$

Equation 2: Openness Score (S_o), for openness measurement (x) in feet

$$S_o = (1 - e^{-5.7x})^{2.6316}$$

Equation 3: Height Score (S_h) for height measurement (x) in feet

$$S_h = min\left(\left(\frac{1.1x^2}{4.84 + x^2}\right), 1\right)$$

Equation 4: Outlet Drop Score (S_{od}) for outlet drop measurement (x) in feet

$$S_{od} = 1 - \frac{1.029412x^2}{0.26470588 + x^2}$$

Equation 5: Aquatic Passability Score

Aquatic Passability Score = Min [Composite Score, Outlet Drop score]

Component Scores for AOP field variables

Field Variable	Level	Component Score
Constriction	Severe	0
	Moderate	0.5
	Spans Only Bankfull/Active Channel	0.9
	Spans Full Channel and Banks	1
Inlet Grade	Inlet Drop	0
	Perched	0
	Clogged/Collapsed/Submerged	1
	Unknown	1
	At Stream Grade	1
Internal Structures	Baffles/Weirs	0
	Supports	0.8
	Other	1
	None	1
Outlet Apron	Extensive	0
	Not Extensive	0.5
	None	1
Physical Barriers	Severe	0
	Moderate	0.5
	Minor	0.8
	None	1
Scour Pool	Large	0
	Small	0.8
	None	1
Substrate Coverage	None	0
	25%	0.5
	50%	0.5
	75%	0.7
	100%	1
Substrate Matches Stream	None	0
	Not Appropriate	0.25
	Contrasting	0.75
	Comparable	1
Water Depth	No (Significantly Deeper)	0.5
	No (Significantly Shallower)	0
	Yes (Comparable)	1
	Dry (Stream Also Dry)	1
Water Velocity	No (Significantly Faster)	0
	No (Significantly Slower)	0.5
	Yes (Comparable)	1
	Dry (Stream Also Dry)	1

Weights associated with each variable in the component scoring algorithm

Parameter	Weight
Outlet Drop	0.161
Physical Barriers	0.135
Constriction	0.090
Inlet Grade	0.088
Water Depth	0.082
Water Velocity	0.080
Scour Pool	0.071
Substrate Matches Stream	0.070
Substrate Coverage	0.057
Openness	0.052
Height	0.045
Outlet Armoring	0.037
Internal structures	0.032

Aquatic Passability Binned Score

Aquatic Passability Score	Descriptor	Aquatic Passability Binned Score
1.00	No Barrier	1
0.80 - 0.99	Insignificant Barrier	1
0.60 - 0.79	Minor Barrier	2
0.40 - 0.59	Moderate Barrier	3
0.20 - 0.39	Significant Barrier	4
0.0 - 0.19	Severe Barrier	5

Transportation Services Disruption Worksheet
Road-Stream Crossing Assessment
Tioga County Watersheds

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Stream Name	Road Name	NYS Road Functional Classification	Transportation Disruption Score (1-5)
Wappasening Creek Watershed			
Unnamed Trib to Unnamed Trib at Briggs Hollow	Moore Hill Road	9	1
Unnamed Tributary at Briggs Hollow	State Line Road	9	1
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	9	1
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	9	1
Unnamed Tributary at Briggs Hollow	Briggs Hollow Road	9	1
Unnamed Tributary at Briggs Hollow	Upper Briggs Hollow Road	9	1
Huntington Creek Watershed			
Huntington Creek	Sheldon Guile Boulevard	7	2
Huntington Creek	Owego & Hartford Railroad	14	4
Huntington Creek	North Avenue (NY 96)	14	4
Huntington Creek	Driveway off Dean Street	9	1
Huntington Creek	Driveway off Dean Street	9	1
Huntington Creek	Winery Driveway off Allen Glen Rd	9	1
Huntington Creek	Allen Glen Road	9	1
Tributary to Huntington Creek	Winery Trail off Allen Glen Rd	9	1
Tributary to Huntington Creek	Carmichael Road	9	1
Tributary to Huntington Creek	Driveway off Carmichael Rd	9	1
Apalachin Creek Watershed			
Unnamed Tributary to Deerlick Creek	Summit Road	9	1
Unnamed Tributary to Deerlick Creek	Beach Road	9	1
Unnamed Tributary to Apalachin Creek	Barton Road	9	1
Deerlick Creek	Pennsylvania Avenue	16	3
Long Creek	Pennsylvania Avenue	16	3
Long Creek	Long Creek Road	9	1
Unnamed Tributary to Long Creek	Long Creek Road	9	1
Deerlick Creek	Chestnut Ridge Road	9	1
Unnamed Tributary to Deerlick Creek	Montrose Turnpike	8	2
Unnamed Tributary to Apalachin Creek	Gaylord Road	9	1
Unnamed Tributary to Apalachin Creek	Gaylord Road	9	1
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	16	3
Unnamed Tributary to Apalachin Creek	Card Road	9	1
Apalachin Creek	Harnick Road	9	1
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	16	3
Unnamed Tributary to Apalachin Creek	Fox Road	9	1

FUNCTIONAL CLASSIFICATION CODES	NYS Codes Urban	NYS Codes Rural	FHWA Codes
Principal Arterial - Interstate	11	01	1
Principal Arterial - Other Freeway/Expressway	12	02	2
Principal Arterial - Other	14	04	3
Minor Arterial	16	06	4
Major Collector	17	07	5
Minor Collector	18	08	6
Local	19	09	7

https://www.dot.ny.gov/gisapps/functional-class-maps

Transportation Disruption Score	Road Classification (Highway Functional Classification)
1	Local Roads, Trails, Driveways
2	Major and Minor Collectors
3	Minor Arterials
4	Other Principal Arterials
5	Interstates, Freeways, and Expressways

Sheldon Guile Boulevard crossing assigned as "Major Collector" (score=2) given school access drive.

Potential Flooding Impacts Worksheet
Road-Stream Crossing Assessment
Tioga County Watersheds

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Stream Name	Road Name	Potential Flood Impacts			Scoring				
		Percent Developed Area within Flood Impact Area	Number of Stream Crossings within Flood Impact Area	Number of Utilities (Gas, Water, Sewer) conveyed by Crossing	Developed Area Score	Crossings Score	Utilities Score	Flood Impact Potential Score (sum)	Flood Impact Potential Score (1-5)
Wappasening Creek Watershed									
Unnamed Trib to Unnamed Trib at Briggs Hollow	Moore Hill Road	1.2%	0	0	1	1	1	3	1
Unnamed Tributary at Briggs Hollow	State Line Road	2.4%	1	0	1	3	1	5	2
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	0.9%	0	0	1	1	1	3	1
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	6.0%	2	0	2	5	1	8	3
Unnamed Tributary at Briggs Hollow	Briggs Hollow Road	3.7%	2	0	1	5	1	7	3
Unnamed Tributary at Briggs Hollow	Upper Briggs Hollow Road	4.3%	2	0	1	5	1	7	3
Huntington Creek Watershed									
Huntington Creek	Sheldon Guile Boulevard	5.7%	2	0	2	5	1	8	3
Huntington Creek	Owego & Hartford Railroad	6.1%	3	0	2	5	1	8	3
Huntington Creek	North Avenue (NY 96)	5.1%	3	1	2	5	3	10	4
Huntington Creek	Driveway off Dean Street	6.6%	6	0	2	5	1	8	3
Huntington Creek	Driveway off Dean Street	5.0%	5	0	2	5	1	8	3
Huntington Creek	Winery Driveway off Allen Glen Rd	0.8%	3	0	1	5	1	7	3
Huntington Creek	Allen Glen Road	1.0%	3	0	1	5	1	7	3
Tributary to Huntington Creek	Winery Trail off Allen Glen Rd	0.2%	2	0	1	5	1	7	3
Tributary to Huntington Creek	Carmichael Road	5.3%	1	0	2	3	1	6	2
Tributary to Huntington Creek	Driveway off Carmichael Rd	1.2%	1	0	1	3	1	5	2
Apalachin Creek Watershed									
Unnamed Tributary to Deerlick Creek	Summit Road	0.9%	0	0	1	1	1	3	1
Unnamed Tributary to Deerlick Creek	Beach Road	0.6%	0	0	1	1	1	3	1
Unnamed Tributary to Apalachin Creek	Barton Road	1.1%	0	0	1	1	1	3	1
Deerlick Creek	Pennsylvania Avenue	22.4%	0	0	3	1	1	5	2
Long Creek	Pennsylvania Avenue	12.5%	0	0	3	1	1	5	2
Long Creek	Long Creek Road	15.8%	0	0	3	1	1	5	2
Unnamed Tributary to Long Creek	Long Creek Road	3.6%	0	0	1	1	1	3	1
Deerlick Creek	Chestnut Ridge Road	0.0%	0	0	1	1	1	3	1
Unnamed Tributary to Deerlick Creek	Montrose Turnpike	1.0%	0	0	1	1	1	3	1
Unnamed Tributary to Apalachin Creek	Gaylord Road	8.6%	0	0	2	1	1	4	2
Unnamed Tributary to Apalachin Creek	Gaylord Road	4.3%	0	0	1	1	1	3	1
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	4.0%	1	0	1	3	1	5	2
Unnamed Tributary to Apalachin Creek	Card Road	4.9%	1	0	1	3	1	5	2
Apalachin Creek	Harnick Road	5.0%	2	0	1	5	1	7	3
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	3.3%	2	0	1	5	1	7	3
Unnamed Tributary to Apalachin Creek	Fox Road	3.3%	2	0	1	5	1	7	3

Flooding impact potential ratings

Impact Rating	Percent Developed Area within Flood Impact Area	Number of Stream Crossings within Flood Impact Area
1	<5% developed area	0
2	<10% developed area	--
3	<25% developed area	1
4	<50% developed area	--
5	>50% developed area	>1

Utility impact potential ratings

Impact Rating	Utilities Present at the Crossing
1	None
2	--
3	Single Utility (Gas, Water, or Sewer) attached to or buried within crossing
4	--
5	Two or more utilities attached to or buried within crossing

Binned Flood Impact Potential Scores

Impact Rating	Sum of Component Scores
1	1 - 3
2	4 - 6
3	7 - 9
4	10 - 12
5	13 - 15

Prioritization Worksheet
Road-Stream Crossing Assessment
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Stream Name	Road Name	Probability of Failure			Magnitude of Failure Impact		Aquatic Passability Score (1-5)	Risk Score				Priority		
		Hydraulic Capacity Score (1-5)	Geomorphic Vulnerability Score (1-5)	Structural Condition Score (1-5)	Transportation Disruption Score (1-5)	Flood Impact Potential Score (1-5)		Hydraulic Risk Score (2-50)	Geomorphic Risk Score (2-50)	Structural Risk Score (2-50)	Crossing Risk Score (2-50)	Crossing Priority Score (3-55)	Normalized Crossing Priority Score (0.00 - 1.00)	Relative Priority Rating
Wappasening Creek Watershed														
Unnamed Trib to Unnamed Trib at Briggs Hollow	Moore Hill Road	5	4	2	1	1	5	10	8	4	10	15	0.23	Medium
Unnamed Tributary at Briggs Hollow	State Line Road	5	4	1	1	2	5	15	12	3	15	20	0.33	Medium
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	3	3	5	1	1	2	6	6	10	10	12	0.17	Low
Unnamed Tributary at Briggs Hollow	Lower Briggs Hollow Road	1	4	2	1	3	3	4	16	8	16	19	0.31	Medium
Unnamed Tributary at Briggs Hollow	Briggs Hollow Road	4	4	2	1	3	5	16	16	8	16	21	0.35	Medium
Unnamed Tributary at Briggs Hollow	Upper Briggs Hollow Road	2	4	1	1	3	2	8	16	4	16	18	0.29	Medium
Huntington Creek Watershed														
Huntington Creek	Sheldon Guile Boulevard	4	4	5	2	3	1	20	20	25	25	26	0.44	High
Huntington Creek	Owego & Hartford Railroad	5	3	1	4	3	1	35	21	7	35	36	0.63	High
Huntington Creek	North Avenue (NY 96)	1	3	2	4	4	1	8	24	16	24	25	0.42	High
Huntington Creek	Driveway off Dean Street	1	3	5	1	3	1	4	12	20	20	21	0.35	Medium
Huntington Creek	Driveway off Dean Street	5	4	5	1	3	2	20	16	20	20	22	0.37	Medium
Huntington Creek	Winery Driveway off Allen Glen Rd	5	4	5	1	3	3	20	16	20	20	23	0.38	Medium
Huntington Creek	Allen Glen Road	1	4	5	1	3	3	4	16	20	20	23	0.38	Medium
Tributary to Huntington Creek	Winery Trail off Allen Glen Rd	1	3	1	1	3	1	4	12	4	12	13	0.19	Low
Tributary to Huntington Creek	Carmichael Road	4	4	5	1	2	3	12	12	15	15	18	0.29	Medium
Tributary to Huntington Creek	Driveway off Carmichael Rd	1	5	5	1	2	5	3	15	15	15	20	0.33	Medium
Apalachin Creek Watershed														
Unnamed Tributary to Deerlick Creek	Summit Road	2	4	2	1	1	5	4	8	4	8	13	0.19	Low
Unnamed Tributary to Deerlick Creek	Beach Road	1	5	5	1	1	5	2	10	10	10	15	0.23	Medium
Unnamed Tributary to Apalachin Creek	Barton Road	5	5	5	1	1	4	10	10	10	10	14	0.21	Medium
Deerlick Creek	Pennsylvania Avenue	1	2	1	3	2	1	5	10	5	10	11	0.15	Low
Long Creek	Pennsylvania Avenue	1	3	5	3	2	1	5	15	25	25	26	0.44	High
Long Creek	Long Creek Road	1	3	5	1	2	3	3	9	15	15	18	0.29	Medium
Unnamed Tributary to Long Creek	Long Creek Road	5	4	5	1	1	3	10	8	10	10	13	0.19	Low
Deerlick Creek	Chestnut Ridge Road	1	5	5	1	1	2	2	10	10	10	12	0.17	Low
Unnamed Tributary to Deerlick Creek	Montrose Turnpike	5	4	1	2	1	5	15	12	3	15	20	0.33	Medium
Unnamed Tributary to Apalachin Creek	Gaylord Road	4	4	5	1	2	5	12	12	15	15	20	0.33	Medium
Unnamed Tributary to Apalachin Creek	Gaylord Road	4	4	5	1	1	5	8	8	10	10	15	0.23	Medium
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	5	3	5	3	2	1	25	15	25	25	26	0.44	High
Unnamed Tributary to Apalachin Creek	Card Road	1	4	5	1	2	4	3	12	15	15	19	0.31	Medium
Apalachin Creek	Harnick Road	3	3	1	1	3	1	12	12	4	12	13	0.19	Low
Unnamed Tributary to Apalachin Creek	Pennsylvania Avenue	2	4	2	3	3	2	12	24	12	24	26	0.44	High
Unnamed Tributary to Apalachin Creek	Fox Road	5	4	5	1	3	2	20	16	20	20	22	0.37	Medium

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Equation 1: Risk Equation

$$Risk\ of\ Failure = Probability\ of\ Failure \times Magnitude\ of\ the\ Impact\ of\ Failure$$

Equation 2: Impact Score

$$Impact\ Score = Transportation\ Disruption\ Score + Flood\ Impact\ Potential\ Score$$

Equation 3: Hydraulic Risk Score

$$Hydraulic\ Risk\ Score = Hydraulic\ Capacity\ Score \times Impact\ Score$$

Equation 4: Geomorphic Risk Score

$$Geomorphic\ Risk\ Score = Geomorphic\ Vulnerability\ Score \times Impact\ Score$$

Equation 5: Structural Risk Score

$$Structural\ Risk\ Score = Structural\ Condition\ Score \times Impact\ Score$$

Equation 6: Crossing Risk Score

$$Crossing\ Risk\ Score = Maximum(Hydraulic\ Risk\ Score, Geomorphic\ Risk\ Score, Structural\ Risk\ Score)$$

Equation 7: Crossing Priority Score

$$Crossing\ Priority\ Score = Crossing\ Risk\ Score + Aquatic\ Passability\ Score$$

Normalized Crossing Priority Score	Relative Priority Rating
0.40 – 1.00	High
0.20 - 0.40	Medium
0.00 - 0.20	Low

Appendix C - Summary Prioritization Matrix

Summary Prioritization Matrix

Location				Ranking Criteria									Summary	
				Criteria weight										
				2	2	2	2	1	1	1				
Watershed	**Watercourse**	**Project number**	**Project type**	**Flood risk - Attenuation**	**Flood risk - Damage reduction**	**Stream corridor infrastructure risk**	**Erosion/ channel stability**	**In-stream ecological benefit**	**Riparian ecological benefit**	**Public education value**	**Estimated implementation cost**	**Notes**	**Total Score** *(Out of 100)*	**Rank**
Huntington Creek	Huntington Creek mainstem	Ht-9600	Floodplain Reconnection	5	1	5	9	5	5	1	$25-75k	Would increase functionality of natural floodplain and wetlands and slow flow out of headwaters. Would protect pipeline. Relatively remote site. Complete Ht-9300 first to establish downstream grade control.	**52**	**6**
		Ht-9300	Grade Control	5	1	1	9	5	5	1	$25-75k	Would slow flows and trap coarse sediment. Large wood would provide habitat value.	**44**	**11**
		Ht-8500	Floodplain Reconnection	5	1	1	9	5	5	1	$500k - $1M	Would increase functionality of natural floodplain and wetlands and slow flow out of headwaters. Relatively remote site.	**44**	**11**
		Ht-7500	Bank Stabilization	1	1	1	9	5	5	1	$75-150k	Would reduce sediment input and improve riparian corridor.	**36**	**18**
		Ht-7000	Riparian Management	5	1	1	5	5	1	1	$25-75k	Would slow flows and improve water quality.	**32**	**20**
		Ht-6200	Crossing Improvement - Allen Glen Road	1	5	9	1	5	1	5	$250-500k	Would reduce flood risk to road and neighboring properties and resolve a public safety issue. Educational opportunity working with municipal staff.	**44**	**11**
		Ht-6100	Structure Removal - Private crossing at winery	1	5	9	1	5	1	9	$250-500k	Would reduce flood risk to road and resolve a public safety issue. Would improve in-stream and riparian habitat. Highly visible location with opportunity for educating public including visitors.	**48**	**8**
		Ht-4600	Crossing Improvement - Private crossing	1	5	9	1	5	1	1	$75-150k	Would reduce risk of blockage and flood risk to neighboring properties and Allen Glen Road. Implement in conjunction with Ht-4100.	**40**	**16**
		Ht-4100	Structure Removal - Private crossing	5	1	9	9	5	5	1	$150-250k	Would restore channel and floodplain function and enhance storage of coarse sediment. Restoration of roughness and functional floodplain would slow flows. Implement in conjunction with Ht-4600.	**60**	**3**

Summary Prioritization Matrix

Location				Ranking Criteria									Summary	
				Criteria weight										
				2	2	2	2	1	1	1				
Watershed	Watercourse	Project number	Project type	Flood risk - Attenuation	Flood risk - Damage reduction	Stream corridor infrastructure risk	Erosion/ channel stability	In-stream ecological benefit	Riparian ecological benefit	Public education value	Estimated implementation cost	Notes	Total Score *(Out of 100)*	Rank
Huntington Creek	Huntington Creek mainstem	Ht-3700	Floodplain Reconnection	5	1	1	9	5	5	1	$150-250k	Would enhance floodplain connectivity and storage and slow flows. Would help trap coarse sediment. Large wood provides habitat value.	**44**	**11**
		Ht-3300	Floodplain Reconnection	5	1	1	9	5	5	5	$150-250k	One large wood structure spanning valley to maximize flood retention. Complete Ht-3000 first to establish downstream grade control.	**48**	**8**
		Ht-3000	Barrier Removal	1	1	1	1	9	5	9	$250-500k	Would improve in-stream and riparian habitat and aquatic organism passage. Public land. Determines grade control for upstream projects.	**32**	**20**
		Ht-1850	Riparian Management	1	9	5	9	9	5	9	$250-500k	Would increase flood conveyance capacity and restore channel functionality. High in-stream habitat benefits. Highly visible project with high potential for public education and involvement.	**72**	**1**
		Ht-1800	Crossing Improvement - Railroad	1	9	9	1	5	1	9	> $1M	Would reduce risk to infrastructure and improve flood conveyance capacity at crossing. High value for public education when combined with adjacent projects.	**56**	**4**
		Ht-1700	Crossing Improvement - Sheldon Guile Blvd	1	9	9	1	5	1	9	$500k - $1M	Would reduce risk to infrastructure and flood risk to surrounding areas, including the school. Cost includes relocation of Sheldon Guile Boulevard between bus station and culvert to make room for widening of floodplain and crossing.	**56**	**4**
		Ht-1200	Floodplain Reconnection	5	9	1	9	9	5	9	$500 - $1M	Would help attenuate flows and would reduce flood damages by relocating and protecting assets. Would restore channel-floodplain functionality, improve habitat, and provide excellent public education opportunities. Relocation of some athletic fields may be necessary to maximize project benefits.	**72**	**1**

Summary Prioritization Matrix

Watershed	Watercourse	Project number	Project type	Flood risk - Attenuation	Flood risk - Damage reduction	Stream corridor infrastructure risk	Erosion/ channel stability	In-stream ecological benefit	Riparian ecological benefit	Public education value	Estimated implementation cost	Notes	Total Score (Out of 100)	Rank
Location				Ranking Criteria (Criteria weight)									Summary	
				2	2	2	2	1	1	1				
Huntington Creek	First branch	Ht1-2200	Upland Land Management - East Beecher Hill Rd drainage	5	5	1	1	5	1	5	$150-250k	Would slow runoff and reduce damages to road. Minor water quality improvement. Educational opportunity with municipal staff.	**36**	**18**
Huntington Creek	First branch	Ht1-1800	Upland Land Management	5	1	1	1	5	1	5	< $25k	Would slow runoff and provide minor water quality improvement. Educational opportunity working with landowner.	**28**	**22**
Huntington Creek	Second branch	Ht2-700	Riparian Management	5	1	1	1	5	1	1	< $25k	Would slow runoff and provide minor water quality improvement. Limited educational opportunity.	**24**	**23**
Huntington Creek	Third branch	Ht3-2700	Structure Removal - Private crossing	1	5	5	9	5	1	1	$75-150k	Would reduce risk of damage to downstream areas and to infrastructure and public safety in the event of failure. Potential public safety risk at Carmichael Road. Installed project would trap coarse sediment. Habitat benefits of large wood. Implement after Ht3-1900.	**48**	**8**
Huntington Creek	Third branch	Ht3-2200	Upland Land Management - Carmichael Rd drainage	5	5	1	5	5	1	5	$250-500k	Would slow runoff, reduce risk of damage to road, and reduce erosion along small drainages leading from road. Minor water quality improvements. Educational opportunity with municipal staff.	**44**	**11**
Huntington Creek	Third branch	Ht3-1900	Crossing Improvement - Carmichael Road	1	5	9	5	5	1	5	$250-500k	Would resolve an immediate public safety risk. Improved conveyance and bed stabilization would reduce flood risk and erosion. Educational opportunity with municipal staff. Implement after Ht3-100.	**52**	**6**
Huntington Creek	Third branch	Ht3-100	Grade Control	5	1	1	9	5	1	1	$500k - $1M	Would slow flows, stabilize the channel, and trap sediment. Cost covers entire 1,800-foot length of channel and could be reduced by reducing treatment length.	**40**	**16**

DRAFT

Tioga County Industrial Development Agency

June 5, 2019 • 4:30 p.m. • Ronald E. Dougherty County Office Building
56 Main Street, Owego, NY 13827

Regular Meeting Minutes

I. **Call to Order and Introductions –** Chairman R. Kelsey called the meeting to order at 4:31 p.m.

II. **Attendance**
IDA Board Members:
A. Roll Call: R. Kelsey, A. Gowan, J. Ceccherelli, K. Gillette, T. Monell *(arrived @ 4:39 p.m.)*
B. Absent:
C. Excused: M. Sauerbrey
Guests: C. Curtis, L. Tinney, J. Meagher, M. Freeze (*departed @ 5:25 p.m.),*
C. Haskell *(arrived @ 5:00 p.m.)*

III. **Privilege of the Floor –** None

IV. **Approval of Minutes**
A. May 1, 2019 Regular Meeting Minutes
Motion to approve May 1, 2019 regular meeting minutes, as written.
(J. Ceccherelli, A. Gowan)

Aye – 4	**Abstain – 0**
No – 0	**Carried**

V. **Financials –**
A. Balance Sheet
B. Profit & Loss
C. Transaction Detail; Cash Accounts Only
Motion to acknowledge financials, as presented. (J. Ceccherelli, A. Gowan,)

Aye – 5	**Abstain – 0**
No – 0	**Carried**

VI. **New Business: C. Curtis**
A. NYS Senate Investigations and Government Operations Committee Information and Document Request - C. Curtis reported the information requested has already been reported to PARIS and should be readily available. L. Tinney stated other Southern Tier County IDA's also received the information request including Chemung, Steuben, Chenango, and Delaware. K. Gillette raised the question of why the NYS Senate

Investigations and Government Operation Committee with not gather the information directly from PARIS. J. Ceccherelli requested C. Curtis inform the full Board if any issues arise while completing the request.

B. Sexual Harassment Prevention Training – The IDA Board agreed all TCIDA Board members and employees should have sexual harassment prevention training. If anyone has already obtained a training certificate for the year 2019, additional training will not be required. L. Tinney and C. Curtis will investigate training options.

C. Resolution Recognizing Kevin Dougherty – Recognition resolution presented to the IDA Board recognizing Kevin Dougherty's 9 years of service on the Tioga County IDA Board. **Motion to approve recognition resolution for Kevin Dougherty's 9 years of dedicated service to the Tioga County IDA. (T. Monell, J. Ceccherelli).**

Aye – 5 Abstain – 0
No - 0 Carried

D. Name Vice-Chair – J. Ceccherelli reported Kevin Dougherty's resignation left a vacancy in the position of Vice-Chairman. Board nominated Kevin Gillette to fill this position. **Motion to approve Kevin Gillette to fill the vacant Vice-Chairman position on the Tioga County IDA effective 6/5/19. (R. Kelsey, J. Ceccherelli).**

Aye – 5 Abstain – 0
No - 0 Carried

E. IDA Board Member; Considering Candidates – The Governance Committee conducted interviews of two qualified candidates to fill the one board member vacancy. The Governance Committee recommended E. Knolles be invited to serve on the Tioga County IDA Board. The IDA Board agreed to move forward the recommendation to the Tioga County Legislature.

F. Water Issues on Southside Drive – C. Curtis prepared a summary of information related to the water issues on Southside Drive noting the Owego Gardens construction did not cause the water issues. The water issues resulted from record high rainfall over the last year resulting in soil saturation, as well as the natural pre-existing spring uphill on land that is not associated with Tioga County IDA.

G. Z. Baker Resignation; Agriculture Development Specialist – L. Tinney reported Zack Baker submitted his resignation effective 6/14/19 as the ED&P Agriculture Development Specialist to pursue his Master's Degree.

H. Easement Request – C. Curtis reported Loadstar Energy, LLC is requesting a 20-25 year easement on the property located off Berry Road in the Town of Nichols. C. Curtis reported this is a preliminary request from the company to determine if the Tioga County IDA would be open and agreeable to such a request.
   1. Proposed Location – C. Curtis provided a map identifying the proposed location off Berry Road, Town of Nichols.
   2. Overhead Pole Example – C. Curtis provided a photo from the company as an example of an overhead pole and solar panels in relation to how this would look on the proposed location.

The IDA Board requested additional information prior to making a determination on Loadstar Energy, LLC request.
ACTION: C. Curtis will contact Loadstar Energy, LLC to obtain additional information and inquire about solar and wetland location.

VII. Old Business: C. Curtis

A. Public Authority Accountability Act (PAAA)

1. Audit Committee Report: R. Kelsey, A. Gowan
   a. Bonadio & Co., LLP Response to Depreciation Schedule Omission – C. Curtis reported she requested feedback from Bonadio & Co., LLP on the depreciation schedule omission on the recent audit and received the response that they were aware the amount was recorded on the schedule and that it would be entered into QuickBooks, therefore, was comfortable with proceeding as such.
   b. Audit RFP – C. Curtis prepared and distributed a draft RFP for IDA Board consideration. The IDA Board did not express any issues with the draft document and suggested submission of this RFP to Bonadio & Co., LLP, Insero & Co., EFPR Group, and Piaker & Lyons. C. Curtis reported EFPR Group, located in Rochester, NY, is currently the firm conducting the Tioga County LDC audits.
   c. NYS Comptroller Audit – C. Curtis reported the NYS Comptroller audit is still in progress and seems to be going well. The auditors anticipate a minimum of another 2-3 weeks on-site; however, noting this timeframe does not guarantee completion.

B. 96 Smith Creek Road Demolition Update – C. Curtis reported NYSEG disconnected the utilities on Monday, June 3rd. Upstate Machinery has removed the garage. Upstate Machinery anticipated the demolition of the house to begin on Wednesday, June 5th, with an anticipated 30-day completion.

C. SUNY Broome QuickBooks Continuing Education Course – C. Curtis reported she and C. Haskell completed the 12-hour QuickBooks continuing education course last month.

D. V&S New York Galvanizing, LLC Capital Assistance Application – C. Curtis reported V&S received the Capital Assistance Application for the project's $300,000 water and sewer extension. As previously noted, C. Curtis reported the Division of Budget approved this funding via letter to the Tioga County ED&P to assist with offsetting these project costs and this is the formal application process. L. Tinney reported V&S broke ground and construction is underway.

VIII. ED&P Update – L. Tinney reported the following:

- ✓ Southern Tier 4th Wave Coalition – This coalition consists of the region's eight counties and is in the process of preparing a proposal for a specific technology in this region.
- ✓ STEAM 21 Steering Committee – As a member of the steering committee, L. Tinney reported this effort is moving forward and the O-A Central School District recently held a press conference.

- ✓ Met with MWBE Executive Director, as a result of the letter sent to the Governor, regarding DRI related projects.
- ✓ Conducted business visits with Raymond Hadley and Ensco.
- ✓ Consolidated Funding Application (CFA) process is officially open. Assisting the Village of Owego with a fire/police station application and Applied Technology Manufacturing Corporation.
- ✓ Preparing a NYMS Grant Application for the Village of Owego.
- ✓ Preparing Opportunity Zone Application for Tioga Downs.
- ✓ Preparing a Rural Economic Development Grant Application for REAP, LDC.
- ✓ Preparing a Code Enforcement Feasibility Grant Application.
- ✓ Assisting O–A Central School District with Workforce Development Application.
- ✓ Assisting Village of Owego with a Tioga Downs Foundation Application.
- ✓ Preparing a marketing grant application for the Candor Farmers Market.
- ✓ Ag Development Specialist, Zack Baker, resigned effective 6/14/19.
- ✓ Hired Community Development Specialist, Abbey Hendrickson, effective 6/24/19.
- ✓ Working on a regional approach for childcare issues in rural communities.
- ✓ Completion of Workforce Development Pipeline Strategy Study Phase I.
- ✓ Organizing DRI projects in anticipation of July/August announcement.
- ✓ Phase II Housing Study is underway.
- ✓ Restore NY Owego and Waverly is underway.
- ✓ Land Bank pre-demolition meeting held with three projects in the Village of Owego slated for demolition on 6/17/19 and six projects in the Village of Waverly slated for demolition on 6/27/19 with a 30-day anticipated completion for all sites. Bid awarded to Upstate Machinery.
- ✓ Land Bank Board Vacancies – Currently, there are two board vacancies.
- ✓ Attended Broome County IDA Annual Breakfast Meeting – L. Tinney reported this was a well-attended event by businesses and elected officials. L. Tinney suggested Tioga County IDA consider doing a similar type of event to inform the community of the IDA's mission and projects. The IDA Board was agreeable for L. Tinney to draft a plan for further discussion.

  ACTION: L. Tinney will draft a plan for an annual meeting of businesses and elected officials for Tioga County IDA Board consideration.

IX. PILOT Updates: C. Curtis:

A. Sanmina –

1. Corrected PILOT Disbursed – C. Curtis reported the corrected 2017 & 2018 PILOTs for $886.93 is completed.
2. PILOT Closed – C. Curtis reported the PILOT closed and notification received from Tioga County Real Property that the parcels are back on the tax rolls.

X. Other:

1. Letter Regarding Live Stream Meeting Legislation – A. Gowan inquired about the status of the letter from the IDA Board regarding recently passed legislation for live streaming IDA meetings, posting on website, and maintaining video library

for five years effective January 1, 2020.
ACTION: L. Tinney will prepare a letter for IDA Board review/approval by the July meeting.

XI. Motion to move into Executive Session pursuant to Public Officers Law Section 105 at 5:26 p.m. to discuss financial and individual personnel matters. (J. Ceccherelli, T. Monell)

Aye – 5	**Abstain – 0**
No – 0	**Carried**

T. Monell motioned to adjourn Executive Session adjourned at 5:35 p.m.

Motion to recommend resolution to the Tioga County Legislature appointing Eric Knolles to fill the IDA Board vacancy effective June 12, 2019 due to Kevin Dougherty's resignation.

XII. **Next Meeting** – Wednesday, July 3, 2019, at 4:30 p.m. in the Legislative Conference Room.

XIII. **Adjournment** –T. Monell motioned to adjourn the meeting at 5:37 p.m.

Respectfully submitted,

Cathy Haskell

IDA Executive Assistant

Tioga County Industrial Development Agency
Balance Sheet
As of June 30, 2019

	Jun 30, 19	Jun 30, 18	$ Change
ASSETS			
Current Assets			
Checking/Savings			
Restricted Cash Accounts			
Community- Facade Improvement	85,030.05	42,190.49	42,839.56
CCTC- Industrial Park	11,995.37	11,995.37	0.00
USDA Funds			
CCTC- Loan Loss Reserve	40,433.16	40,414.54	18.62
TSB- IRP 2016 (Formerly IRP 4)	122,000.16	198,573.75	-76,573.59
TSB- RBEG	125,584.62	205,527.43	-79,942.81
TSB- marketing	1,477.63	1,477.22	0.41
Total USDA Funds	289,495.57	445,992.94	-156,497.37
Total Restricted Cash Accounts	386,520.99	500,178.80	-113,657.81
CCTC- CDs			
Land Acquisition (879)	534,542.01	528,439.10	6,102.91
Capital Improvement (284)	315,216.99	310,716.91	4,500.08
Total CCTC- CDs	849,759.00	839,156.01	10,602.99
Temporarily Restricted Cash Acc			
TSB-Owego Gardens	22,661.35	22,168.35	493.00
TSB-Crown Cork and Seal	300,105.67	300,134.21	-28.54
Community- BestBuy PILOT Acct.	570,215.45	570,124.84	90.61
Total Temporarily Restricted Cash Acc	892,982.47	892,427.40	555.07
Unrestricted Cash Accounts			
TSB ICS	2,139,881.68	1,600,482.22	539,399.46
TSB- checking	353,355.78	387,116.88	-33,761.10
TSB- general fund	125,560.48	221,463.43	-95,902.95
Total Unrestricted Cash Accounts	2,618,797.94	2,209,062.53	409,735.41
Total Checking/Savings	4,748,060.40	4,440,824.74	307,235.66
Other Current Assets			
Accounts Receivable 1300.01	730,888.89	329,158.69	401,730.20
Allowance for Doubtful Accounts	-35,000.00	-35,000.00	0.00
Commercial Facade Loan Program			
Loan Rec - 2017-01-C	38,125.00	45,000.00	-6,875.00
Loan Rec - 2018-03-C	18,437.50	21,875.00	-3,437.50
Loan Rec - 2018-02-C	1,895.25	3,718.50	-1,823.25
Loan Rec - 2018-01-C	7,170.02	9,450.00	-2,279.98
Loan Rec - 2017-03-C	8,570.00	11,320.00	-2,750.00
Loan Rec - 2017-02-C	27,577.45	31,288.99	-3,711.54
Loan Rec - 2016-03-C	10,665.36	13,947.12	-3,281.76
Loan Rec - 2016-02-C	25,000.16	33,333.44	-8,333.28
Loan Rec - 2016-01-C	5,044.52	7,031.80	-1,987.28
Loan Rec - 2015-06-C	11,341.60	15,366.06	-4,024.46
Loan Rec - 2014-01-C	2,373.36	4,407.84	-2,034.48
Loan Rec - 2015-02-C	0.00	593.96	-593.96
Loan Rec - 2015-05-C	8,685.15	12,576.18	-3,891.03
Total Commercial Facade Loan Program	164,885.37	209,908.89	-45,023.52
RBEG			
Loan Rec - RBEG 2019 -06	80,000.00	0.00	80,000.00
Total RBEG	80,000.00	0.00	80,000.00
IRP 4			
Loan Rec - 2019 - 06A	100,000.00	0.00	100,000.00
Loan Rec 2018-02-A	8,778.41	0.00	8,778.41
Loan Rec 2018-01-A	67,350.91	70,772.04	-3,421.13
Loan Rec 2017-05-A	13,877.52	18,625.27	-4,747.75
Loan Rec 2017-04-A	35,984.32	37,987.86	-2,003.54
Loan Rec 2017-03-A	16,240.67	18,072.22	-1,831.55
Loan Rec 2017-02-A	66,991.22	83,063.16	-16,071.94
Loan Rec 2017-01-A	19,996.60	22,151.34	-2,154.74
Loan Rec 2016-01-A	17,263.19	25,240.54	-7,977.35
Loan Rec 2015-03-A	4,404.24	6,853.44	-2,449.20
Loan Rec 2013-02-A	-14.16	1,624.06	-1,638.22
Loan Rec 2009-02-A	51,251.58	52,251.58	-1,000.00
Total IRP 4	402,124.50	336,641.51	65,482.99
IRP 3			
Loan Rec 2013-01-A	0.00	1,857.21	-1,857.21

Tioga County Industrial Development Agency
Balance Sheet
As of June 30, 2019

	Jun 30, 19	Jun 30, 18	$ Change
Loan Rec 2007-08-A	24,469.33	31,447.25	-6,977.92
Total IRP 3	24,469.33	33,304.46	-8,835.13
IRP 2			
Loan Rec 2011-03-A	30,647.30	41,875.10	-11,227.80
Total IRP 2	30,647.30	41,875.10	-11,227.80
Total Other Current Assets	1,398,015.39	915,888.65	482,126.74
Total Current Assets	6,146,075.79	5,356,713.39	789,362.40
Fixed Assets			
Land- Mitchell	58,453.51	58,453.51	0.00
Equipment			
2012 computer upgrade	1,436.88	1,436.88	0.00
Equipment - Other	264.00	264.00	0.00
Total Equipment	1,700.88	1,700.88	0.00
Land- Cavataio	2,500.00	2,500.00	0.00
Land-general	601,257.05	441,566.59	159,690.46
Land-Louns			
Lopke	8,993.03	8,993.03	0.00
Town of Nichols	20,000.00	20,000.00	0.00
Hess	259,561.43	259,561.43	0.00
Land-Louns - Other	139,612.53	139,612.53	0.00
Total Land-Louns	428,166.99	428,166.99	0.00
Land 434	376,800.36	376,800.36	0.00
Railroad Improvements	1,979,330.50	1,979,330.50	0.00
Z Accumulated Depreciation	-1,175,790.43	-1,154,503.43	-21,287.00
Total Fixed Assets	2,272,418.86	2,134,015.40	138,403.46
TOTAL ASSETS	**8,418,494.65**	**7,490,728.79**	**927,765.86**
LIABILITIES & EQUITY			
Liabilities			
Current Liabilities			
Other Current Liabilities			
Accrued Expenses	462,389.00	0.00	462,389.00
2100 · Payroll Liabilities	0.00	1,646.82	-1,646.82
PILOT Payments			
Gateway Owego, LLC	1,500.00	0.00	1,500.00
Crown Cork and Seal	299,971.46	300,000.00	-28.54
+ · 231 Main Town/County	-0.01	-0.01	0.00
Owego Gardens	22,627.00	22,134.00	493.00
School - 231 Main Street	0.01	0.00	0.01
CNYOG	274,971.49	30,113.46	244,858.03
Best Buy PP	570,000.00	570,000.00	0.00
Rynone	44.08	44.08	0.00
Total PILOT Payments	1,169,114.03	922,291.53	246,822.50
Total Other Current Liabilities	1,631,503.03	923,938.35	707,564.68
Total Current Liabilities	1,631,503.03	923,938.35	707,564.68
Long Term Liabilities			
Loan Pay- IRP 4	232,632.80	242,546.34	-9,913.54
Loan Pay- IRP 3	192,027.10	202,342.67	-10,315.57
Loan Pay- IRP 2	123,432.31	134,427.04	-10,994.73
Loan Pay- IRP 1	61,543.98	69,112.00	-7,568.02
Total Long Term Liabilities	609,636.19	648,428.05	-38,791.86
Total Liabilities	2,241,139.22	1,572,366.40	668,772.82
Equity			
Board Designated Funds	1,406,302.63	1,406,302.63	0.00
1110 · Retained Earnings	4,770,357.55	5,771,758.35	-1,001,400.80
Net Income	695.25	-1,259,698.59	1,260,393.84
Total Equity	6,177,355.43	5,918,362.39	258,993.04

Tioga County Industrial Development Agency
Balance Sheet
As of June 30, 2019

	Jun 30, 19	Jun 30, 18	$ Change
TOTAL LIABILITIES & EQUITY	8,418,494.65	7,490,728.79	927,765.86

Tioga County Industrial Development Agency
Profit & Loss Prev Yr. Comparison
January through June 2019

	Jan - Jun 19	Jan - Jun 18	$ Change
Ordinary Income/Expense			
Income			
Loan Interest Income			
IRP 2			
2011-03-A	849.36	1,126.00	-276.64
Total IRP 2	849.36	1,126.00	-276.64
IRP 3			
2013-01-A	0.00	80.24	-80.24
2007-08-A	829.53	1,043.69	-214.16
Total IRP 3	829.53	1,123.93	-294.40
IRP 4			
2018-02-A	184.13	0.00	184.13
2018-01-A	812.40	1,131.51	-319.11
2017-04-A	684.24	721.39	-37.15
2017-03-A	175.27	232.46	-57.19
2017-05-A	191.99	256.57	-64.58
2017-01-A	258.57	342.33	-83.76
2017-02-A	748.44	1,095.89	-347.45
2016-01-A	490.68	687.24	-196.56
2015-03-A	83.76	192.14	-108.38
2013-02-A	0.00	60.43	-60.43
2010-02-A	148.01	0.00	148.01
Total IRP 4	3,777.49	4,719.96	-942.47
Loan Interest Income - Other	572.27	0.00	572.27
Total Loan Interest Income	6,028.65	6,969.89	-941.24
Loan Program Fee			
IRP 4	1,800.00	0.00	1,800.00
Loan Program Fee - Other	0.00	200.00	-200.00
Total Loan Program Fee	1,800.00	200.00	1,600.00
Loan Late Fee			
2018-01-C	5.00	0.00	5.00
2015-03 · 2015-03-A	30.00	30.00	0.00
Loan Late Fee - Other	0.00	7.08	-7.08
Total Loan Late Fee	35.00	37.08	-2.08
4110 · Grants			
Waverly Trade Center DOT Grant	10,880.00	21,195.00	-10,315.00
4110 · Grants - Other	465,000.00	1,696,136.00	-1,231,136.00
Total 4110 · Grants	475,880.00	1,717,331.00	-1,241,451.00
Interest Income-			
Interest Income- TSB ICS	8,833.95	482.22	8,351.73
Community- Facade Improvement	14.80	25.90	-11.10
CCTC Loan Loss Reserve Account	8.37	10.09	-1.72
Community- Lounsberry	52.21	57.18	-4.97
TSB- checking	205.13	269.67	-64.54
TSB-general fund	41.55	130.07	-88.52
TSB- IRP 4	28.28	39.43	-11.15
TSB- RBEG	25.68	31.00	-5.32
TSB- marketing	0.19	0.22	-0.03
Total Interest Income-	9,210.16	1,045.78	8,164.38
Leases/Licenses	10,304.97	11,548.08	-1,243.11
OHRy			
freight	48,809.70	78,249.00	-29,439.30

Tioga County Industrial Development Agency
Profit & Loss Prev Yr. Comparison
January through June 2019

	Jan - Jun 19	Jan - Jun 18	$ Change
Total OHRy	48,809.70	78,249.00	-29,439.30
4170 · PILOT Program Fees			
V&S NY Galvanizing LLC	84,131.50	0.00	84,131.50
Gateway	16,416.39	0.00	16,416.39
Owego Garden - Home Leasing	2,500.00	0.00	2,500.00
Best Buy	2,500.00	0.00	2,500.00
Total 4170 · PILOT Program Fees	105,547.89	0.00	105,547.89
Total Income	657,616.37	1,815,380.83	-1,157,764.46
Expense			
IDA Paint Program			
2018	0.00	1,000.00	-1,000.00
Total IDA Paint Program	0.00	1,000.00	-1,000.00
66900 · Reconciliation Discrepancies	0.00	-0.01	0.01
Grant Expense	465,000.00	17,595.10	447,404.90
WWTP Crown Cork and Seal	0.00	-18,633.74	18,633.74
Marketing	0.00	510.38	-510.38
Waverly Trade Center DOT Grant	10,880.00	21,195.00	-10,315.00
Tioga Industrial Park			
Corporate Drive	0.00	5.00	-5.00
Total Tioga Industrial Park	0.00	5.00	-5.00
Education			
Haskell	139.00	0.00	139.00
Curtis	139.00	0.00	139.00
Education - Other	0.00	3,501.80	-3,501.80
Total Education	278.00	3,501.80	-3,223.80
Loan Admin Fee			
IRP 4	0.00	0.00	0.00
Total Loan Admin Fee	0.00	0.00	0.00
Loan Program Expense	60.00	87.65	-27.65
6120 · Bank Service Charges	60.00	155.20	-95.20
Copies	394.15	288.15	106.00
6160 · Dues and Subscriptions	285.00	960.00	-675.00
E=mt3			
site preparation	0.00	200.00	-200.00
Total E=mt3	0.00	200.00	-200.00
Employee benefit			
IRA Company Match	735.60	969.33	-233.73
IRA	0.00	969.33	-969.33
Total Employee benefit	735.60	1,938.66	-1,203.06
6180 · Insurance			
Travel/Accident (Hartford)	750.00	750.00	0.00
D & O (Philadelphia Ins. Co)	3,292.00	3,287.00	5.00
6190 · Disability (First Rehab Life)	157.04	0.00	157.04
Employee Health (SSA)	2,188.55	0.00	2,188.55
6185 · Property & Liability (Dryden)	9,803.08	11,575.83	-1,772.75
RR Liability (Steadfast)	19,923.84	20,883.84	-960.00
WC (Amtrust)	0.00	-333.00	333.00
Total 6180 · Insurance	36,114.51	36,163.67	-49.16
6200 · Interest Expense			
6210 · Finance Charge	0.00	0.39	-0.39

Tioga County Industrial Development Agency
Profit & Loss Prev Yr. Comparison
January through June 2019

	Jan - Jun 19	Jan - Jun 18	$ Change
6220 · Loan Interest			
IRP 3	0.00	0.21	-0.21
Total 6220 · Loan Interest	0.00	0.21	-0.21
6200 · Interest Expense - Other	4,058.82	4,344.74	-285.92
Total 6200 · Interest Expense	4,058.82	4,345.34	-286.52
6240 · Miscellaneous	102.66	0.00	102.66
6550 · Office Supplies	558.86	325.42	233.44
6560 · Payroll Expenses			
M. Tinney	0.00	1,480.28	-1,480.28
6560 · Payroll Expenses - Other	20,958.20	30,562.73	-9,604.53
Total 6560 · Payroll Expenses	20,958.20	32,043.01	-11,084.81
PILOT Program Expenses			
Distributed Sun	0.00	305.00	-305.00
Total PILOT Program Expenses	0.00	305.00	-305.00
6250 · Postage and Delivery	36.37	72.40	-36.03
6270 · Professional Fees			
Ag Ec Dev Specialist Position	4,131.00	0.00	4,131.00
Administrative Services			
Tinney, M	1,700.00	0.00	1,700.00
Haskell	4,650.00	5,278.00	-628.00
Tinney	12,750.00	10,500.00	2,250.00
Total Administrative Services	19,100.00	15,778.00	3,322.00
6650 · Accounting			
Piaker & Lyons	0.00	9,500.00	-9,500.00
Jan Nolis	2,627.50	2,183.75	443.75
6650 · Accounting - Other	12,500.00	0.00	12,500.00
Total 6650 · Accounting	15,127.50	11,683.75	3,443.75
6655 · Consulting	0.00	19,500.00	-19,500.00
6280 · Legal Fees			
Loan Program Fees	0.00	388.00	-388.00
Special Project Fees	18,000.00	0.00	18,000.00
6280 · Legal Fees - Other	20,985.50	19,474.50	1,511.00
Total 6280 · Legal Fees	38,985.50	19,862.50	19,123.00
6270 · Professional Fees - Other	6,671.64	2,450.00	4,221.64
Total 6270 · Professional Fees	84,015.64	69,274.25	14,741.39
6670 · Program Expense			
Water Tower	30,547.25	0.00	30,547.25
Total 6670 · Program Expense	30,547.25	0.00	30,547.25
Property Taxes			
96 · Smith Creek Rd	181.63	2,197.55	-2,015.92
540 · Stanton Hill	21.03	81.74	-60.71
Spring St	0.25	0.22	0.03
Berry Road (47)	106.32	97.94	8.38
Carmichael Road	3.95	3.74	0.21
Smith Creek Road	17.66	16.27	1.39
Glenmary Drive	11.03	10.06	0.97
Metro Road	9.19	8.39	0.80
Total Property Taxes	351.06	2,415.91	-2,064.85
Real Estate Taxes	2,357.00	0.00	2,357.00

Tioga County Industrial Development Agency
Profit & Loss Prev Yr. Comparison
January through June 2019

	Jan - Jun 19	Jan - Jun 18	$ Change
Recording fees	0.00	235.00	-235.00
6770 · Supplies			
6790 · Office	0.00	518.49	-518.49
Total 6770 · Supplies	0.00	518.49	-518.49
6340 · Telephone	40.01	120.03	-80.02
6350 · Travel & Ent			
6370 · Meals	0.00	325.93	-325.93
6380 · Travel	87.99	508.49	-420.50
Total 6350 · Travel & Ent	87.99	834.42	-746.43
Total Expense	656,921.12	175,456.13	481,464.99
Net Ordinary Income	695.25	1,639,924.70	-1,639,229.45
Other Income/Expense			
Other Expense			
Transferred Assets	0.00	2,899,623.29	-2,899,623.29
Total Other Expense	0.00	2,899,623.29	-2,899,623.29
Net Other Income	0.00	-2,899,623.29	2,899,623.29
Net Income	**695.25**	**-1,259,698.59**	**1,260,393.84**

Tioga County Industrial Development Agency
Transaction Detail by Account
June 2019

	Type	Date	Num	Name	Memo	Amount
Restricted Cash Accounts						
Community- Facade Improvement						
	Deposit	06/03/2019			Loan Payments	844.11
	Deposit	06/03/2019			Loan Payment	625.00
	Deposit	06/06/2019			Loan Payments	690.73
	Deposit	06/11/2019			Loan Payment	169.54
	Deposit	06/24/2019			Loan Payment	273.48
	Deposit	06/28/2019			Loan Payment	299.31
	Deposit	06/28/2019			Loan Payment	152.86
Total Community- Facade Improvement						3,055.03
USDA Funds						
TSB- IRP 2016 (Formerly IRP 4)						
	Deposit	06/06/2019			Deposit	3,340.83
	Deposit	06/06/2019			Loan Payment	240.00
	Deposit	06/18/2019			Loan Payment	152.54
	Deposit	06/24/2019			Loan Payment	420.00
Total TSB- IRP 2016 (Formerly IRP 4)						4,153.37
Total USDA Funds						4,153.37
Total Restricted Cash Accounts						7,208.40
Unrestricted Cash Accounts						
TSB- checking						
	Deposit	06/03/2019			Lease Payment	51.86
	Check	06/05/2019	6274	Thomas, Colliso...	Services April 1, 20...	-3,577.50
	Check	06/05/2019	6275	LeeAnn Tinney	Prof Services: June ...	-2,125.00
	Deposit	06/06/2019			Agency Fee Payment	16,416.39
	Check	06/10/2019	6276	Christine E Curtis	Pay period: 5/26/20...	-1,240.77
	Deposit	06/13/2019			OHRY	16,092.20
	Deposit	06/14/2019			ESD Weitsman Dis...	465,000.00
	Check	06/14/2019	X	TSB	Wire Transfer Fee - ...	-15.00
	Check	06/17/2019	X	Upstate Shreddi...	ESD GDA Disburse...	-465,000.00
	Check	06/24/2019	6277	Franklin Temple...	Christine E Curtis; S...	-196.16
	Check	06/24/2019	6278	Excellus Health ...	2019 Health Insuran...	-437.71
	Check	06/24/2019	6279	Tioga County Tr...	IT Invoice # 2639; J...	-40.01
	Check	06/24/2019	6280	Economic Devel...	Morning Times TEA...	-212.50
	Check	06/25/2019	6282	Upstate Machin...	Final Payment 96 S...	-10,200.00
	Check	06/26/2019	6281	Christine E Curtis	Pay period: 6/9/201...	-1,240.77
	Check	06/26/2019	X	EFTPS	June 2019 Federal ...	-732.56
	Check	06/26/2019	X	NYS Division of ...	June 2019 State Ta...	-125.22
	Check	06/28/2019	6283	Cathy Haskell	Administrative Assis...	-775.00
	Check	06/28/2019	6284	LeeAnn Tinney	Prof Services: July ...	-2,125.00
Total TSB- checking						9,517.25
Total Unrestricted Cash Accounts						9,517.25
TOTAL						**16,725.65**

Tioga County Industrial Development Agency
2nd Quarter Operating Income vs. Operating Expense
April through June 2019

	Apr - Jun 19	Apr - Jun 18	$ Change
Ordinary Income/Expense			
Income			
Loan Program Fee	0.00	100.00	-100.00
4110 · Grants	465,000.00	1,696,136.00	-1,231,136.00
Interest Income-			
TSB- checking	32.11	67.22	-35.11
TSB-general fund	16.79	105.37	-88.58
Total Interest Income-	48.90	172.59	-123.69
Leases/Licenses	9,282.48	4,504.12	4,778.36
OHRy			
freight	34,587.80	51,131.90	-16,544.10
Total OHRy	34,587.80	51,131.90	-16,544.10
Total Income	508,919.18	1,752,044.61	-1,243,125.43
Expense			
Education	0.00	3,501.80	-3,501.80
Copies	354.14	64.75	289.39
6160 · Dues and Subscriptions	210.00	960.00	-750.00
Employee benefit			
IRA	0.00	387.75	-387.75
Total Employee benefit	0.00	387.75	-387.75
6180 · Insurance			
Travel/Accident (Hartford)	750.00	750.00	0.00
D & O (Philadelphia Ins. Co)	3,292.00	3,287.00	5.00
Employee Health (SSA)	1,313.13	0.00	1,313.13
6185 · Property & Liability (Dryden)	0.00	-960.00	960.00
RR Liability (Steadfast)	723.84	0.00	723.84
Total 6180 · Insurance	6,078.97	3,077.00	3,001.97
6550 · Office Supplies	212.50	325.42	-112.92
6560 · Payroll Expenses	10,384.05	13,891.66	-3,507.61
6250 · Postage and Delivery	0.00	63.62	-63.62
6270 · Professional Fees			
Administrative Services			
Haskell	2,325.00	3,100.00	-775.00
Tinney	8,500.00	6,000.00	2,500.00
Total Administrative Services	10,825.00	9,100.00	1,725.00
6650 · Accounting			
Piaker & Lyons	0.00	9,500.00	-9,500.00
Jan Nolis	488.75	858.75	-370.00
Total 6650 · Accounting	488.75	10,358.75	-9,870.00
6280 · Legal Fees			
Loan Program Fees	0.00	388.00	-388.00
6280 · Legal Fees - Other	8,797.50	9,587.50	-790.00
Total 6280 · Legal Fees	8,797.50	9,975.50	-1,178.00
6270 · Professional Fees - Other	6,671.64	2,350.00	4,321.64
Total 6270 · Professional Fees	26,782.89	31,784.25	-5,001.36
6340 · Telephone	0.00	80.02	-80.02
6350 · Travel & Ent			
6370 · Meals	0.00	325.93	-325.93

Tioga County Industrial Development Agency
2nd Quarter Operating Income vs. Operating Expense
April through June 2019

	Apr - Jun 19	Apr - Jun 18	$ Change
6380 · Travel	87.99	248.52	-160.53
Total 6350 · Travel & Ent	87.99	574.45	-486.46
Total Expense	44,110.54	54,710.72	-10,600.18
Net Ordinary Income	464,808.64	1,697,333.89	-1,232,525.25
Net Income	**464,808.64**	**1,697,333.89**	**-1,232,525.25**

MEMO

DATE: June 19, 2019

TO: IDA Board

FROM: LeeAnn

RE: Southern Tier 4th Wave- funding request

IDA Board- I am writing to ask for IDA support of a burgeoning economic development initiative.

The proposal is called "Southern Tier Fourth Wave" and is related to battery technology and energy storage. Broome, Tioga, Chemung, Steuben and Schuyler Counties are joining to explore the battery and energy storage possibilities as Southern Tier partners believe it will be the next major global industrial wave.

TEAM Tioga has identified several existing Tioga County businesses, such as Lockheed Martin, Best Buy, Crown Cork & Seal, Fed Ex and Midwestern Pet foods, as companies that are poised to drive demand particularly as it relates to military aircraft and devices and battery technology.

The partners strongly believe that the Southern Tier has the motivation, assets and resources, including financial incentives, R&D at world-renowned universities and global corporations, workforce, and basic infrastructure including commercial rail and interstate highway system to support an a Southern Tier Fourth Wave energy cluster.

At this time, we have engaged a consultant to assess the regional potential for business development and opportunities for application of the new technology (Phase 1- $60,000).

TEAM Tioga is excited and "energized" to be a part of this initiative. We have made a commitment to contribute $5,000 toward the initial data gathering stage of the assessment. My request of the IDA is to partner 50/50 toward the hire of the consultant. I will provide $2,500 from the ED&P budget if the IDA will consider matching this amount.

I have attached the Scope of Work from the consultant, Susan Payne, which outlines each phase of the study.

May 13, 2019

Southern Tier Fourth Wave

Scope of Work

To Develop an Economic Development Strategy in the Emerging Battery Technology Sector for New York's Southern Tier

Lead Consulting Team

Susan Payne, Strategic Planning Consultant
Buddy Steen, VP Technology at VAON LLC and Independent Technology Consultant

Proposed Next Steps

Phase 1: Assess the Regional Potential for Business Development and Opportunities for Application of New Technology

1.1 Conduct one-on-one and group meetings with an estimated 20 Southern Tier businesses to further assess opportunities to apply new technology, drive demand for battery applications, identify current and anticipated gaps and grow the supply chains. The businesses will be identified by the EDO's, which also will initiate contact on behalf of the consulting team.

1.2 Engage in one-on-one meetings with the Southern Tier R&D drivers such as Binghamton University, Cornell University and Corning Incorporated to gain an understanding of their current R&D activities related to battery technology and potential for application across business sectors, who are their customers currently involved in the technology application and what can we do to attract these companies. Also explore with each R&D entity their three highest value assets and three most underutilized value assets, together with related patents that are pending. Interviews also will be with technology and business development campuses such as the Huron Campus in Endicott and technology incubators such as the Ceramics Corridor Innovation Center, the Southern Tier High Technology Incubator, the Center for Advanced Microelectronics Manufacturing and more.

1.3 Work with Southern Tier EDO's to assess the potential for value added business development associated with new energy storage projects being built in the Southern Tier by companies such as NextEra, Invenergy and Calpine. Specifically, engage in one-on-one meetings/interviews to gain insight about current gaps and opportunity for supply chain development around topics such as battery packets, base components of energy storage stationary equipment, and systems integration. Also, gain an understanding of issues such as keeping the cells in energy storage units cool and more that could be addressed through R&D and application of new technology through collaborative relationships with BU, Cornell and Corning Incorporated.

Deliverable: Interim Report and brief PPT with graphic presentation of preliminary findings, opportunities and next steps for further in-depth investigate and analysis. This report will include, but not be limited to, an assessment of Southern Tier Region drivers of demand for battery technology and energy storage, opportunities for supply chain development, and opportunities for commercialization of new technology being generated by local R&D sources.

May 13, 2019

Phase 2: Detailed Situation Analysis and Assessment of Opportunity on the Regional, National and Global Levels

2.1 Research the current and anticipated New York State and national policies related to the application of battery technology.

2.2 Assess the financial viability of start-up businesses in the field of energy storage and battery technology such as Imperium3. If the initial analysis is positive, then actively pursue business development strategies and recommend the engagement of financial expert teams to conduct in-depth analyses and evaluate possible financing packages.

2.3 Internal Mapping: Prepare a detailed mapping of related assets in the region (i.e., technology infrastructure and business development sites such as the Huron Campus, concentration of R&D, test facilities at RIT and BU, URI funding, workforce/human capital, energy capacity, highway infrastructure, etc.), existing business and their respective capacity to drive demand, opportunities for growth and level of demand that will lay the foundation for an analysis of why new energy related business should locate in the Southern Tier, etc.

2.4 External Mapping: Undertake research and analysis of future drivers of demand for U.S. based battery ranging from global trade barriers to national security issues, environmental mandates, secondary market for batteries, and increasing focus on renewable energy. The outcome will be an analysis of demand for primary business and value chain opportunities, as well as, an assessment of qualified prospects. Any further needed research on high priority opportunities will be conducted, and special envoys (i.e., ex-military general and congressional representatives) to represent the region will be identified. For example:

a. Research where a similar initiative is being undertaken elsewhere in NYS or in other states.
b. Research pending patents and also global and/or U.S.-based start-up businesses to assess opportunities for new business development in the Southern Tier. Consider countries such as Sweden and Israel.
c. Identify and evaluate the demand for battery technology applications in the DOD, military and national security sectors.
d. Research opportunities and assess the level of demand for use of green energy generated by the Southern Tier energy storage in development of technology infrastructure for companies such as Google.
e. Assess the level of demand for materials such as synthetic graphite and recycling of essential materials.

Deliverables

1. A summary of the current and anticipate New York State and national policies related to the application of battery technology.
2. Mappings of related assets in the Southern Tier region and the external environment.
3. Preliminary assessment of the financial viability of start-up businesses.
4. An assessment of future drivers of demand for U.S. based battery production ranging from global trade barriers to national security issues, environmental mandates, secondary market for batteries and increased focus on renewable energy.

Phase 3: Economic Development Strategy

3.1. Develop a case statement and recruitment strategy that assigns a lead team to each major opportunity and addresses key questions to be posed by a prospective business; i.e., why the Southern Tier, what are the benefits and incentives, what is the opportunity to achieve long-term financial sustainability and grow, etc.

3.2 Assess the barriers and strategies for opportunities to overcome them; i.e., the cost of doing business in NYS that could be addressed via lower energy costs.

3.3 Identify ways to coordinate efforts with NYBEST, NYSERDA, Empire State Development, TEN, etc.

Deliverable

Economic development strategy and action plan including:

- Recommendation for targeted business development and recruitment efforts.
- Related recommendations such as site work and capital improvement projects, creation of joint ventures or other collaborative relationships, investment in local start-up businesses, and targeted talent recruitment and workforce development initiatives.
- Regional case statement and value proposition.
- Recruitment plan for global and domestic companies.
- Prospect lists, profiles, and business recruitment pitch for use by the EDO's.

Project Period and Budget

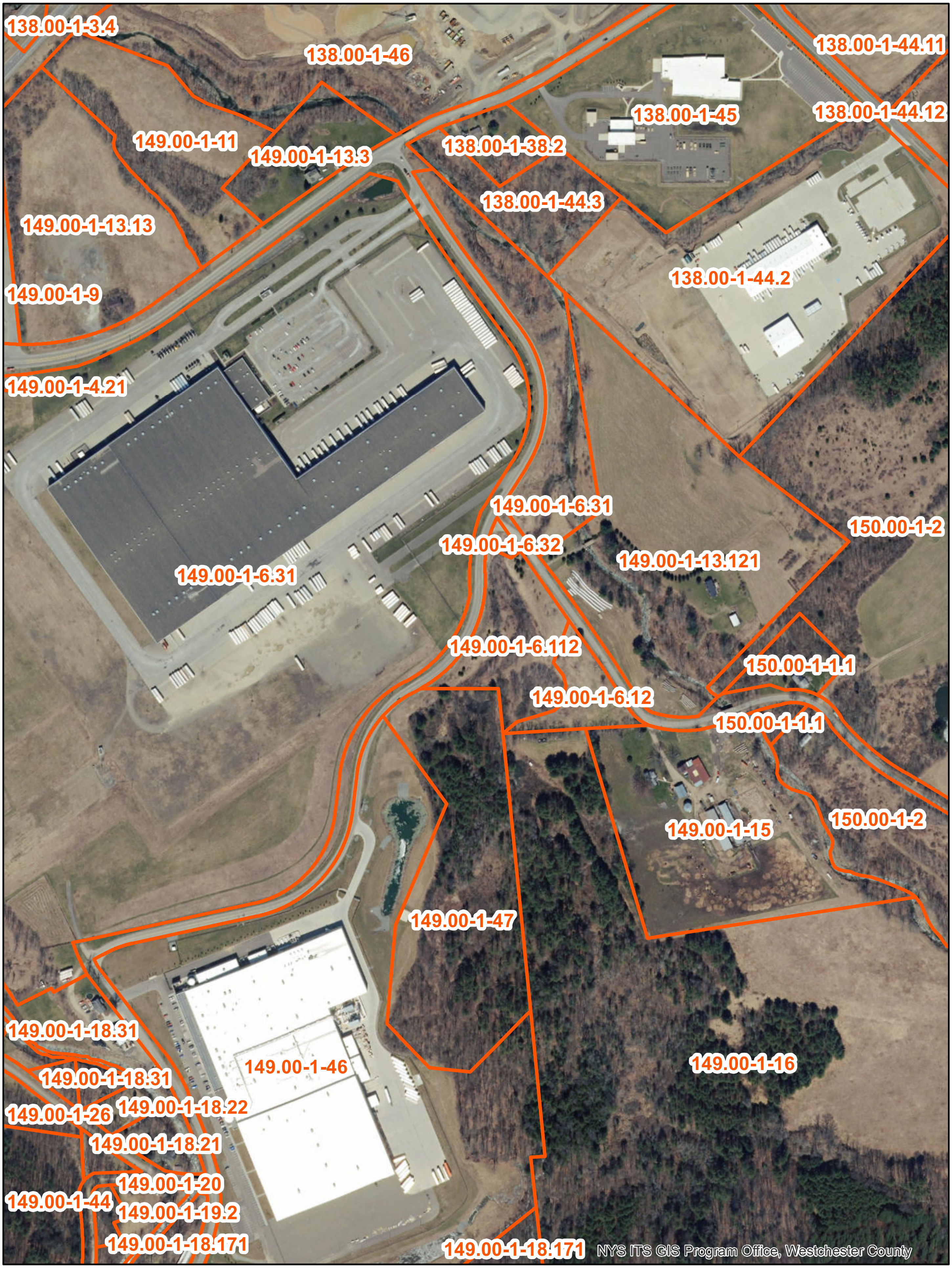
Time Commitment: It is expected the consultant time commitment to the project will be over a 6-month period, with the understanding that the project sponsors may determine the need for time between phases to review reports and evaluate any need for adjustments to the scope of work.

Total Budget

1. Lead Consulting Team	
a. Susan Payne Consulting	$ 70,000
b. Susan Payne Travel and Expenses	$ 5,000
c. Buddy Steen Consulting	$ 70,000
d. Buddy Steen Travel and Expenses	$ 15,000
2. Technical Consultants	$ 40,000 (Phase 2)
TOTAL	$ 200,000

Budget by Phases

Phase 1: Assess the Regional Potential for Business Development and Opportunities for Application of New Technology	$ 60,000
Phase 2: Detailed Situation Analysis and Assessment of Opportunity on the Regional, National and Global Levels	$104,000
Phase 3: Economic Development Strategy	$ 36,000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149.00-1-18.21
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NYS ITS GIS Program Office, Westchester County

MEMO

TO: ED&P Legislative Committee

FROM: LeeAnn Tinney, Director ED&P

DATE: 7/2/19

RE: Economic Development Specialist back fill request

ED&P Legislative Committee- I am writing to request the Committee consider backfilling the Economic Development Specialist (Ag emphasis) position recently vacated by Zack Baker's June resignation.

At this time, the authorized head count is 7 FT and 1 PT. If the vacant EcDev Specialist (EDS) position is not filled, the head count will be 5 FT and 1 PT. Up to now, we have operated with 6 FT and 0 PT. The request is to maintain the 6 FT positions along with the 1 PT (which is fully funded by way of the Land Bank).

I have attached a spread sheet outlining the salary budget numbers for 2019 and proposed for 2020. If the IDA agrees to provide a $20,000 annual stipend toward the EDS position in 2020, there would be zero impact as it compares to the original 2019 salary budget.

You may recall that the reasoning for the hire of the EDS (Ag) was to assist with the implementation of the Goals and Strategies set forth in the 2015 Tioga County Agricultural and Farmland Protection Plan. While it is true that CCE has in the last year taken on appropriate actions in the study, it is also true that it was never expected that one entity would have the responsibility of implementing the entirety of the plan. It was the County's goal to assist with implementation. I have attached a list of the Goals/Strategies and outlined those projects that were specifically addressed by ED&P as well as those duties handled by other entities.

Additionally, you may recall that earlier in the year I brought to your attention the need to use the EDS position for activities outside of only agricultural duties. Although Zack's primary responsibility was related to ag, he certainly covered much more in the operations of the department. I have attached a list of a few of the other duties assumed by Zack.

Also enclosed are statistics directly related to the work by the Economic Development and Planning Department over the past five (5) years including; significant drop in unemployment rate, significant increase in hotel/motel tax received, significant increase in real property tax received, increase in sales tax received, substantial amount of PILOT agency fees received, greatest increase in Gross Domestic Product across entire State of NY (and top 7% across the nation), substantial increase in amount of grant funds received across the County.

Teresa Saraceno is doing a great job with getting the Land Bank off the ground and running. However, due to her change and with Zack's resignation, there is a void that must be addressed.

Please consider allowing the back fill of the ESD position. With the IDA contribution there will be no impact to salary budget numbers. The manpower is greatly needed in order to continue with the positive growth that the TEAM Tioga has facilitated over the past 5 years.

Acknowledgement of Fiduciary Duties and Responsibilities

As a member of the Authority's board of directors, I understand that I have a fiduciary obligation to perform my duties and responsibilities to the best of my abilities, in good faith and with proper diligence and care, consistent with the enabling statute, mission, and by-laws of the Authority and the laws of New York State. The requirements set forth in this acknowledgement are based on the provisions of New York State law, including but not limited to the Public Authorities Reform Act of 2009, Public Officers Law, and General Municipal Law. As a member of the board of directors:

I. <u>Mission Statement</u>

I have read and understand the mission of the Authority; and the mission is designed to achieve a public purpose on behalf of the State of New York. I further understand that my fiduciary duty to this Authority is derived from and governed by its mission.

I agree that I have an obligation to become knowledgeable about the mission, purpose, functions, responsibilities, and statutory duties of the Authority and, when I believe it necessary, to make reasonable inquiry of management and others with knowledge and expertise so as to inform my decisions.

II. <u>Deliberation</u>

I understand that my obligation is to act in the best interests of the Authority and the People of the State of New York whom the Authority serves.

I agree that I will exercise independent judgment on all matters before the board.

I understand that any interested party may comment on any matter or proposed resolution that comes before the board of directors consistent with the laws governing procurement policy and practice, be it the general public, an affected party, a party potentially impacted by such matter or an elected or appointed public official. However, I understand that the ultimate decision is mine and will be consistent with the mission of the Authority and my fiduciary duties as a member of the Authority's board of directors.

I will participate in training sessions, attend board and committee meetings, and engage fully in the board's and committee's decision-making process.

III. <u>Confidentiality</u>

I agree that I will not divulge confidential discussions and confidential matters that come before the board for consideration or action.

IV. <u>Conflict of Interest</u>

I agree to disclose to the board any conflicts, or the appearance of a conflict, of a personal, financial, ethical, or professional nature that could inhibit me from performing my duties in good faith and with due diligence and care.

I do not have any interest, financial or otherwise, direct or indirect, or engage in any business or transaction or professional activity or incur any obligation of any nature, which is in substantial conflict with the proper discharge of my duties in the public interest.

Signature: Eric A. Knolles

Print Name: Eric A. Knolles

Authority Name: IDA

Date: 6-21-19

SALES TAX AGREEMENT

Pursuant to a resolution duly adopted on March 6, 2019, the Tioga County Industrial Development Agency (the "Agency") appointed Owego Gardens Associates II LLC (the "Company") the true and lawful agent of the Agency to acquire, construct and equip the property and building located off Belva Lockwood Lane in the Village of Owego, Tioga County New York (the "Project").

It is the intent of the Agency that this Agency appointment include, from the effective date of such appointment defined as March 6, 2019, authority to purchase, lease and otherwise use on behalf of the Agency all materials, equipment, goods, services and supplies to be incorporated into and made an integral part of the Project and also include the following activities as they relate to the acquisition, construction and equipping of any buildings or improvements, whether or not any materials, equipment or supplies described below are incorporated into or become an integral part of such buildings or improvements: (i) all purchases, leases, rentals and other uses of tools, machinery and equipment in connection with acquiring, constructing and equipping the Project, (ii) all purchases, leases, rentals, uses or consumption of supplies, materials and services of every kind and description used in connection with acquiring, constructing and equipping the Project, including all utility services, and (iii) all purchases, leases, rentals and uses of equipment, machinery and other tangible personal property (including installation costs), installed or placed in, upon or under the Project.

This Agency appointment includes the power to delegate such Agency appointment, in whole or in part, to agents, subagents, contractors, subcontractors, materialmen, suppliers and vendors of the Company and to such other parties as the Company chooses so long as they are engaged, directly or indirectly, in the activities hereinbefore described.

It has been estimated and confirmed by the Company as included within its Application that the purchase of goods and services relating to the Project and subject to New York State and local sales and use taxes are estimated to be in an amount up to $6,552,430.00 and, therefore, the value of the sales and use tax exemption benefits authorized and approved by the Agency cannot exceed **$524,194.40**. Sales and use tax exemption benefits in excess of the amounts authorized or outside the terms defined by the Agency as part of the project are subject to termination, modification or recapture by the Agency.

In exercising this Agency appointment, the Company, its agents, subagents, contractors and subcontractors, should give the supplier or vendor a copy of this letter to show that the Company, its agents, subagents, contractors and subcontractors are each acting as agent for the Agency. The supplier or vendor should identify the Project as the "Owego Gardens Associates II LLC Project" on each bill or invoice and indicate thereon that the Company, its agents, subagents, contractors and subcontractors acted as agent for the Tioga County Industrial Development Agency in making the purchase.

You and each of your agents, subagents, contractors and/or subcontractors claiming a sales tax exemption in connection with the Project must execute a copy of the Exempt

Purchase Certificate ST-123 attached hereto, and must complete a New York State Department of Taxation and Finance Form ST-60. Original copies of each completed Form ST-60 must be delivered to the Agency within thirty (30) days of the appointment of each of your agents, subagents, contractors or subcontractors. Any agent, subagent, contractor or subcontractor of the Company which delivers a completed Form ST-60 to the Agency will be deemed to be the agent, subagent, contractor or subcontractor of the Agency for purposes of acquiring, constructing and equipping the Project. Original copies of each ST-123 must be completed by the agent, subagent, contractor or subcontractor acting as purchaser and provided to the supplier or vendor. Failure to comply with these requirements may result in loss of sales tax exemptions for the Project.

You should be aware that the New York State General Municipal Law requires you to file an Annual Statement, Form ST-340, with the New York State Department of Taxation and Finance and the Agency regarding the value of sales tax exemptions you, your agents, subagents, contractors or subcontractors have claimed pursuant to the authority we have conferred on you with respect to this Project. The penalty for failure to file such statement is the removal of your authority to act as our agent.

The aforesaid appointment of the Company as agent of the Agency to acquire, construct and equip the Project shall expire at the earlier of (a) the completion of such activities and improvements, (b) March 6, 2020, provided, however, such appointment may be extended at the discretion of the Agency, upon the written request of the Company if such activities and improvements are not completed by such time, and further provided that the Agency shall not unreasonably withhold its consent to the extension of such appointment, or (c) upon the expiration or termination of the Lease Term.

The Company acknowledges receipt of a copy of Section 875 of the New York State General Municipal Law, a copy of which is attached hereto as Exhibit "A," and agrees to the terms thereof as a condition precedent to receiving or benefiting from a New York State sales and use tax exemption.

Very truly yours,

TIOGA COUNTY INDUSTRIAL DEVELOPMENT AGENCY

By: ______________________
Ralph E. Kelsey, Chairman

OWEGO GARDENS ASSOCIATES II LLC

By: ______________________

EXHIBIT A

SECTION 875 OF THE
NEW YORK STATE GENERAL MUNICIPAL LAW

(See Attached)

▷

Effective: March 28, 2013

McKinney's Consolidated Laws of New York Annotated Currentness
General Municipal Law (Refs & Annos)
Chapter 24. Of the Consolidated Laws
Article 18-A. Industrial Development
Title 1. Agencies, Organization and Powers (Refs & Annos)
→→ § 875. Special provisions applicable to state sales and compensating use taxes and certain types of facilities

1. For purposes of this section: "state sales and use taxes" means sales and compensating use taxes and fees imposed by article twenty-eight or twenty-eight-A of the tax law but excluding such taxes imposed in a city by section eleven hundred seven or eleven hundred eight of such article twenty-eight. "IDA" means an industrial development agency established by this article or an industrial development authority created by the public authorities law. "Commissioner" means the commissioner of taxation and finance.

2. An IDA shall keep records of the amount of state and local sales and use tax exemption benefits provided to each project and each agent or project operator and shall make such records available to the commissioner upon request. Such IDA shall also, within thirty days of providing financial assistance to a project that includes any amount of state sales and use tax exemption benefits, report to the commissioner the amount of such benefits for such project, the project to which they are being provided, together with such other information and such specificity and detail as the commissioner may prescribe. This report may be made in conjunction with the statement required by subdivision nine of section eight hundred seventy-four of this title or it may be made as a separate report, at the discretion of the commissioner. An IDA that fails to make such records available to the commissioner or to file such reports shall be prohibited from providing state sales and use tax exemption benefits for any project unless and until such IDA comes into compliance with all such requirements.

3. (a) An IDA shall include within its resolutions and project documents establishing any project or appointing an agent or project operator for any project the terms and conditions in this subdivision, and every agent, project operator or other person or entity that shall enjoy state sales and use tax exemption benefits provided by an IDA shall agree to such terms as a condition precedent to receiving or benefiting from such state sales and use exemptions benefits.

(b) The IDA shall recover, recapture, receive, or otherwise obtain from an agent, project operator or other person or entity state sales and use exemptions benefits taken or purported to be taken by any such person to which the person is not entitled or which are in excess of the amounts authorized or which are for property or services not authorized or taken in cases where such agent or project operator, or other person or entity failed to comply with a material term or condition to use property or services in the manner required by the person's agreement with the IDA. Such agent or project operator, or other person or entity shall cooperate with the IDA in its efforts to recover, recapture, receive, or otherwise obtain such state sales and use exemptions benefits and shall promptly pay over any such amounts to the IDA that it requests. The failure to pay over such amounts to the IDA shall be grounds for the commissioner to assess and determine state sales and use taxes due from the person under article twenty-eight of the tax law, together with any relevant penalties and interest due on such amounts.

(c) If an IDA recovers, recaptures, receives, or otherwise obtains, any amount of state sales and use tax exemption benefits from an agent, project operator or other person or entity, the IDA shall, within thirty days of coming into possession of such amount, remit it to the commissioner, together with such information and report that the commissioner deems necessary to administer payment over of such amount. An IDA shall join the commissioner as a party in any action or proceeding that the IDA commences to recover, recapture, obtain, or otherwise seek the return of, state sales and use tax exemption benefits from an agent, project operator or other person or entity.

(d) An IDA shall prepare an annual compliance report detailing its terms and conditions described in paragraph (a) of this subdivision and its activities and efforts to recover, recapture, receive, or otherwise obtain state sales and use exemptions benefits described in paragraph (b) of this subdivision, together with such other information as the commissioner and the commissioner of economic development may require. The report required by this subdivision shall be filed with the commissioner, the director of the division of the budget, the commissioner of economic development, the state comptroller, the governing body of the municipality for whose benefit the agency was created, and may be included with the annual financial statement required by paragraph (b) of subdivision one of section eight hundred fifty-nine of this title. Such report required by this subdivision shall be filed regardless of whether the IDA is required to file such financial statement described by such paragraph (b) of subdivision one of section eight hundred fifty-nine. The failure to file or substantially complete the report required by this subdivision shall be deemed to be the failure to file or substantially complete the statement required by such paragraph (b) of subdivision one of such section eight hundred fifty-nine, and the consequences shall be the same as provided in paragraph (e) of subdivision one of such section eight hundred fifty-nine.

(e) This subdivision shall apply to any amounts of state sales and use tax exemption benefits that an IDA recovers, recaptures, receives, or otherwise obtains, regardless of whether the IDA or the agent, project operator or other person or entity characterizes such benefits recovered, recaptured, received, or otherwise obtained, as a penalty or liquidated or contract damages or otherwise. The provisions of this subdivision shall also apply to any interest or penalty that the IDA imposes on any such amounts or that are imposed on such amounts by operation of law or by judicial order or otherwise. Any such amounts or payments that an IDA recovers, recaptures, receives, or otherwise obtains, together with any interest or penalties thereon, shall be deemed to be state sales and use taxes and the IDA shall receive any such amounts or payments, whether as a result of court action or otherwise, as trustee for and on account of the state.

4. The commissioner shall deposit and dispose of any amount of any payments or moneys received from or paid over by an IDA or from or by any person or entity, or received pursuant to an action or proceeding commenced by an IDA, together with any interest or penalties thereon, pursuant to subdivision three of this section, as state sales

and use taxes in accord with the provisions of article twenty-eight of the tax law. The amount of any such payments or moneys, together with any interest or penalties thereon, shall be attributed to the taxes imposed by sections eleven hundred five and eleven hundred ten, on the one hand, and section eleven hundred nine of the tax law, on the other hand, or to any like taxes or fees imposed by such article, based on the proportion that the rates of such taxes or fees bear to each other, unless there is evidence to show that only one or the other of such taxes or fees was imposed or received or paid over.

5. The statement that an IDA is required by subdivision nine of section eight hundred seventy-four of this article to file with the commissioner shall not be considered an exemption or other certificate or document under article twenty-eight or twenty-nine of the tax law. The IDA shall not represent to any agent, project operator, or other person or entity that a copy of such statement may serve as a sales or use tax exemption certificate or document. No agent or project operator may tender a copy of such statement to any person required to collect sales or use taxes as the basis to make any purchase exempt from tax. No such person required to collect sales or use taxes may accept such a statement in lieu of collecting any tax required to be collected. The civil and criminal penalties for misuse of a copy of such statement as an exemption certificate or document or for failure to pay or collect tax shall be as provided in the tax law. In addition, the use by an IDA or agent, project operator, or other person or entity of such statement, or the IDA's recommendation of the use or tendering of such statement, as such an exemption certificate or document shall be deemed to be, under articles twenty-eight and thirty-seven of the tax law, the issuance of a false or fraudulent exemption certificate or document with intent to evade tax.

6. The commissioner is hereby authorized to audit the records, actions, and proceedings of an IDA and of its agents and project operators to ensure that the IDA and its agents and project operators comply with all the requirements of this section. Any information the commissioner finds in the course of such audit may be used by the commissioner to assess and determine state and local taxes of the IDA's agent or project operator.

7. In addition to any other reporting or filing requirements an IDA has under this article or other law, an IDA shall also report and make available on the internet, without charge, copies of its resolutions and agreements appointing an agent or project operator or otherwise related to any project it establishes. It shall also provide, without charge, copies of all such reports and information to a person who asks for it in writing or in person. The IDA may, at the request of its agent or project operator delete from any such copies posted on the internet or provided to a person described in the prior sentence portions of its records that are specifically exempted from disclosure under article six of the public officers law.

8. In consultation with the commissioner of economic development, the commissioner of taxation and finance is hereby authorized to adopt rules and regulations and to issue publications and other guidance implementing the provisions of this section and of the other sections of this article relating to any state or local tax or fee, or exemption or exclusion therefrom, that the commissioner administers and that may be affected by any provision of this article, and any such rules and regulations of the commissioner shall have the same force and effect with respect to such taxes and fees, or amounts measured in respect of them, as if they had been adopted by the commissioner pursuant to the authority of the tax law.

9. To the extent that a provision of this section conflicts with a provision of any other section of this article, the pro-

visions of this section shall control.

CREDIT(S)

(Added L.2013, c. 59, pt. J, § 2, eff. March 28, 2013.)

Current through L.2014, chapters 1 to 552.

END OF DOCUMENT

TO: All Contractors, Subcontractors,
Suppliers and Vendors, etc. of
Owego Gardens Associates II LLC

Attached please find a "Contract in Lieu of Exemption Certificate" (the "Contract") which will serve as documentation for not charging Owego Gardens Associates II LLC (the "Company") for sales or use tax in connection with any purchase, lease, rental and other use of materials, equipment, goods, services or supplies at the Project to be leased by the Tioga County Industrial Development Agency (the "Agency") and described in Addendum A to the aforesaid Contract (the "Project").

The attached letter signed by the Agency appoints the Company as its agent for the purpose of acquiring, constructing and equipping the Project. This letter authorizes the Company to delegate its authority as agent of the Agency to its agents, subagents, contractors, subcontractors, materialmen, suppliers, vendors and such other parties as the Company authorizes.

In accordance with the authority granted to the Company by the Agency, you are hereby appointed as agent of the Agency for the purpose of making purchases or leases of materials, equipment, goods, services and supplies to the Project. **Your appointment as agent of the Agency is contingent upon your executing the attached Form ST-60 and returning it to us and the Form ST-60 then being filed by the Agency with the New York State Department of Taxation and Finance.**

The blanks in the Exempt Purchase Certificate ST-123 are provided so you can duplicate the Exempt Purchase Certificate ST-123 and Addendum A and forward same to your subcontractors and suppliers, as appropriate.

Very truly yours,

OWEGO GARDENS ASSOCIATES II LLC

By:______________________________

cc: Tioga County Industrial Development Agency

CONTRACT IN LIEU OF EXEMPTION CERTIFICATE

This Contract is entered into by and between Owego Gardens Associates II LLC (the "Company") as agent for and on behalf of the Tioga County Industrial Development Agency, a public benefit corporation and a governmental agency of the State of New York, hereinafter called the "Agency" or the "Owner" of the project described in Addendum A hereto (the "Project") and the contractor or the subcontractor more particularly described on page 2 hereof (hereinafter, the "Contractor").

Pursuant to the authority granted to the Company, as agent of the Agency, the Contractor is hereby appointed agent of said Agency for purposes of completing, executing or otherwise carrying out the obligations imposed under this Contract.

The Contractor acknowledges that the Agency will hold a leasehold interest in the Project and that said Agency is a public benefit corporation and governmental entity of the State of New York. By reason of such status, Owner and its agents acting on its behalf are exempt from payment of all New York State and local sales and use taxes on the purchase or lease of all materials, equipment, goods, services and supplies incorporated into and made an integral component part of any structure, building or real property which becomes the property of Owner, and all equipment, machinery and other tangible personal property (including installation costs with respect thereto) which becomes the property of Owner. In addition, Owner and its agents, acting on its behalf, are exempt from all sales and use taxes arising out of or connected with the following, as they relate to performance under this Contract: (i) purchases, leases, rentals and other uses of tools, machinery and equipment, and (ii) purchases, leases, rentals, uses or consumption of supplies, goods, materials and services of every kind and description; provided, however, that exemption from sales and use tax with respect to clauses (i) and (ii) above shall apply only if the Contractor is then acting as agent for Owner under the terms of this Contract.

Pursuant to these exemptions from sales and use taxes, the Contractor shall not include such taxes in its contract price, bid, or reimbursable costs, as the case may be. If the Contractor does not comply with the requirements for sales and use tax exemptions, as described above, then it shall be responsible for and pay any and all applicable New York State sales and use taxes, and no portion thereof shall be charged or billed to the Owner or to the Company directly or indirectly, the intent of this Contract being that neither the Owner nor the Company shall be liable for any of the sales or use taxes described above. This Contract may be accepted by the Contractor in lieu of an exemption certificate and the Contractor shall retain a copy thereof to substantiate the sales and use tax exemption.

The aforesaid appointment of the Company as agent of the Agency to acquire, construct and equip the Project shall expire at the earlier of (a) the completion of such activities and improvements, (b) March 5, 2020, provided, however, such appointment may be extended at the discretion of the Agency, upon the written request of the Company, if such activities and improvements are not completed by such time, and further provided that the Agency shall not unreasonably withhold its consent to the extension of such appointment, or (c) upon the expiration or termination of the Lease Term.

The Owner shall have the right to assign this Contract to the Company by written notice to the Contractor and without written consent of the Contractor, in which case Owner shall be relieved of all obligations hereunder. In the event of such assignment, all applicable sales and use taxes shall be added to the purchase price and paid to the Contractor pursuant to a change order. All of the above provisions with respect to exemptions for New York State sales and use taxes shall apply to all subcontractors and other parties in privity of contract with the Company, Owner or the Contractor pursuant to the terms of this Contract.

OWNER:

OWEGO GARDENS ASSOCIATES II LLC
as Agent for and on behalf of the
Tioga County Industrial Development Agency

By:______________________________

DATE: _______________, 2019

____
Insert name of Contractor or
Subcontractor

By:______________________________

Name:______________________________

Title:______________________________

DATE:______________________________

Address of Contractor or
Subcontractor

____

____

____

____

cc: Tioga County Industrial Development Agency

ADDENDUM A
DESCRIPTION OF THE PROJECT

The “Project” consists of the acquisition of 10.59+/- acres of land off Belva Lockwood Lane in the Village of Owego, Tioga County, New York, the construction thereon of 93 residential units comprised of a 62 unit apartment complex and 31 town homes and the acquisition and installation therein and thereon of certain machinery and equipment.

Curtis, Christine

From: Investigations Committee <investigations@nysenate.gov>
Sent: Thursday, June 27, 2019 10:03 PM
To: Curtis, Christine
Subject: [EXTERNAL] AUTO: Thank you for contacting the NYS Senate Investigations and Government Operations Committee

I am out of the office from Sun 05/12/2019 until Tue 05/03/2022.

The New York State Senate Standing Committee on Investigations and Government Operations will carefully review your email and will respond within seven (7) business days. Please note that contacting the Committee does not mean that the Committee has initiated or will initiate an investigation. Further, the Committee staff cannot provide legal advice or represent you in court. If you have any questions concerning legal rights or responsibilities, you should contact a private attorney. If you have an individual issue or concern, you should contact your New York State representatives or the appropriate law enforcement agency. Please disregard the out of office date range.

Note: This is an automated response to your message **"Tioga County Industrial Development Agency"** sent on **06/27/2019 17:21:44**.

This is the only notification you will receive while this person is away.