EMERGENCY TRANSPORTATION INFRASTRUCTURE RECOVERY WATER BASIN ASSESSMENT AND FLOOD HAZARD MITIGATION ALTERNATIVES

MALTANNER CREEK
HERKIMER COUNTY, NEW YORK

April 2014

MMI #5231-01

Photo Source: Milone & MacBroom, Inc. (2013)

This document was prepared for the New York State Department of Transportation, in cooperation with the New York State Department of Environmental Conservation.

Prepared by:

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ABBREVIATIONS/ACRONYMS

BIN	Bridge Identification Number
CFS	Cubic Feet per Second
CME	Creighton Manning Engineering
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
FT	Feet
FTP	File Transfer Protocol
GIS	Geographic Information System
HEC-RAS	Hydrologic Engineering Center – River Analysis System
LiDAR	Light Detection and Ranging
MMI	Milone & MacBroom, Inc.
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
Sq. Mi.	Square Mile
STA	River Station
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
YR	Year

1.0 INTRODUCTION

1.1 Project Background

A severe precipitation system in June 2013 caused excessive flow rates and flooding in a number of communities in the greater Utica region. As a result, the New York State Department of Transportation (NYSDOT) in consultation with the New York State Department of Environmental Conservation (NYSDEC) retained Milone & MacBroom, Inc. (MMI) through a subconsultant agreement with Creighton Manning Engineering (CME) to undertake a comprehensive water basin assessment of 13 watersheds in Herkimer, Oneida, and Montgomery Counties, including Maltanner Creek. Prudent Engineering was also contracted through CME to provide support services, including field survey of stream cross sections.

Work conducted for this study included field assessment of the watersheds, streams, and rivers; analysis of flood mitigation needs in the affected areas; hydrologic assessment; hydraulic modeling; and identification of long-term recommendations for mitigation of future flood hazards.

Maltanner Creek is located in the town of Fairfield and the village of Middleville, in Herkimer County. The creek is 4.1 miles long with a contributing watershed of 6.6 square miles. Figure 1 depicts the drainage basin of the creek. The basin is 36 percent forested, with a mix of rural residential and agriculture uses throughout. Residential and commercial land uses are concentrated in the lower part of the basin in the village of Middleville, where Maltanner Creek flows into West Canada Creek. The watercourse has an average slope of 4.0 percent.

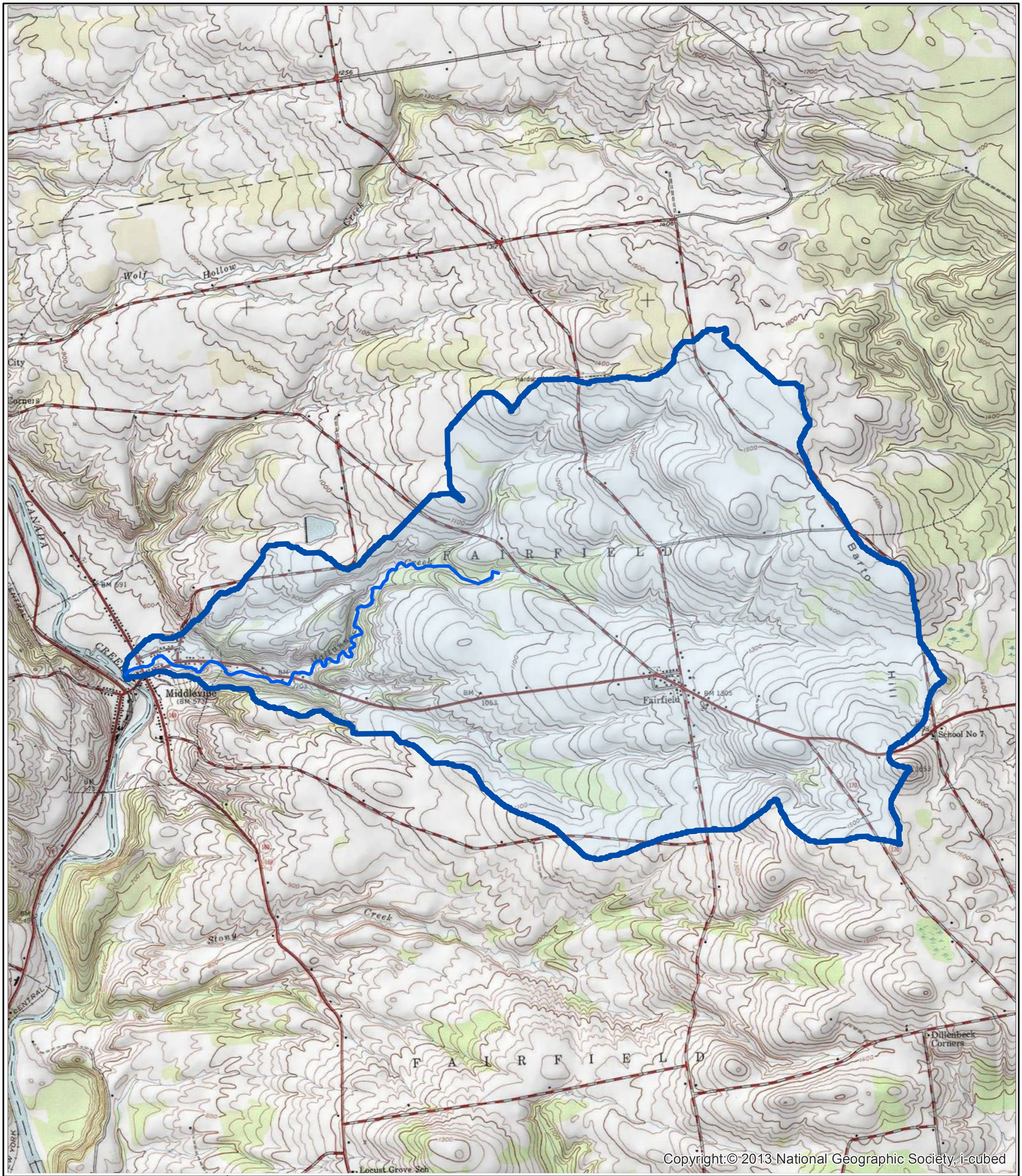
Maltanner Creek is a steep watercourse that generates a substantial amount of stream power during high flows. The bridges that span the creek are undersized, which restricts flows and causes flooding in the village of Middleville. The Maltanner Creek channel is lined by steep hillslopes that are eroding and contributing a coarse-grained sediment load to the creek, further restricting the channel and bridge capacity.

Compounding the poor stream hydraulics, commercial and residential development occurs very close to the edge of the stream in the village of Middleville. When the channel exceeds its low hydraulic capacity, or becomes clogged with sediment debris, it causes flooding and erosion that damages property, structures, and infrastructure.

The goals of the subject water basin assessment were to:

1. Collect and analyze information relative to the June 28, 2013 flood and other historic flooding events.

2. Identify critical areas subject to flood risk.



SOURCE(S):	**Figure 1: Maltanner Creek Drainage Basin Location**	**LOCATION:** **Herkimer County, New York**

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3. Develop and evaluate flood hazard mitigation alternatives for each high risk area within the stream corridor.

1.2 Nomenclature

In this report and associated mapping, stream stationing is used as an address to identify specific points along the watercourse. Stationing is measured in feet and begins at the mouth of Maltanner Creek at station (STA) 0+00 and continues upstream to STA 160+00. As an example, STA 73+00 indicates a point in the channel located 7,300 linear feet upstream of the mouth. Figure 2 depicts the stream stationing along Maltanner Creek.

All references to right bank and left bank in this report refer to "river right" and "river left," meaning the orientation assumes that the reader is standing in the river looking downstream.

2.0 DATA COLLECTION

2.1 Initial Data Collection

Public information pertaining to Maltanner Creek was collected from previously published documents, reports, and studies, as well as through meetings with municipal, county, and state officials. Data collected includes reports, flood photographs, newspaper articles, Federal Emergency Management Agency (FEMA) Flood Insurance Studies (FIS), aerial photographs, and geographic information system (GIS) mapping. Appendix A is a summary listing of data and reports collected.

2.2 Public Outreach

An initial project kickoff meeting was held in early October 2013 with representatives from NYSDOT and NYSDEC, followed by public outreach meetings held in the affected communities, including a meeting with community officials in the village of Middleville. These meetings provided more detailed, firsthand accounts of past flooding events; identified specific areas that flooded in each community and the extent and severity of flood damage; and provided information on post-flood efforts such as bridge reconstruction, road repair, channel modification, and dredging. This outreach effort assisted in the identification of target areas for field investigations and future analysis.

2.3 Field Assessment

Following initial data gathering and outreach meetings, field staff from Prudent Engineering and MMI undertook field data collection efforts, with special attention given to areas identified in the outreach meetings. Initial field assessment of all 13 watersheds was conducted in October and November 2013. Selected locations identified in the initial phase were assessed more closely by multiple field teams in late November 2013. Information collected during field investigations included the following:

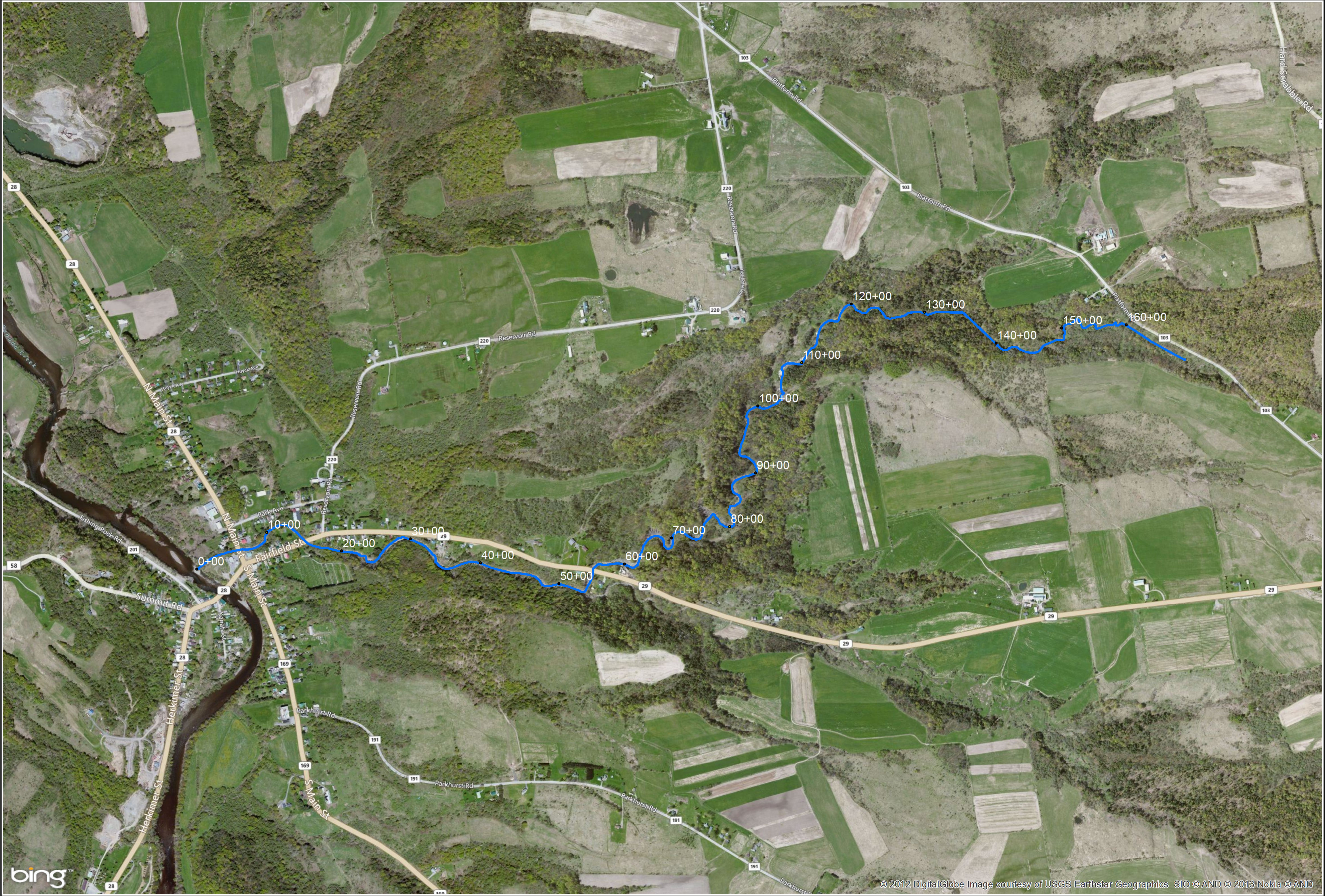

Figure 2: Maltanner Creek Watercourse Stationing

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Herkimer County, New York

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Figure 2

- Rapid "windshield" river corridor inspection
- Photo documentation of inspected areas
- Measurement and rapid hydraulic assessment of bridges, culverts, and dams
- Geomorphic classification and assessment, including measurement of bankfull channel widths and depths at key cross sections
- Field identification of potential flood storage areas
- Wolman pebble counts
- Cohesive soil shear strength measurements
- Characterization of key bank failures, headcuts, bed erosion, aggradation areas, and other unstable channel features
- Preliminary identification of potential flood hazard mitigation alternatives, including those requiring further analysis

Included in Appendix B is a copy of the River Assessment Reach Data Form, River Condition Assessment Form, Bridge Waterway Inspection Form, and Wolman Pebble Count Form. Appendix C is a photo log of select locations within the river corridor. Field Data Collection Index Summary mapping has been developed to graphically depict the type and location of field data collected. Completed data sheets, field notes, photo documentation, and mapping developed for this project have been uploaded onto the NYSDOT ProjectWise system and the project-specific file transfer protocol (FTP) site at MMI. The data and mapping were also provided electronically to NYSDEC.

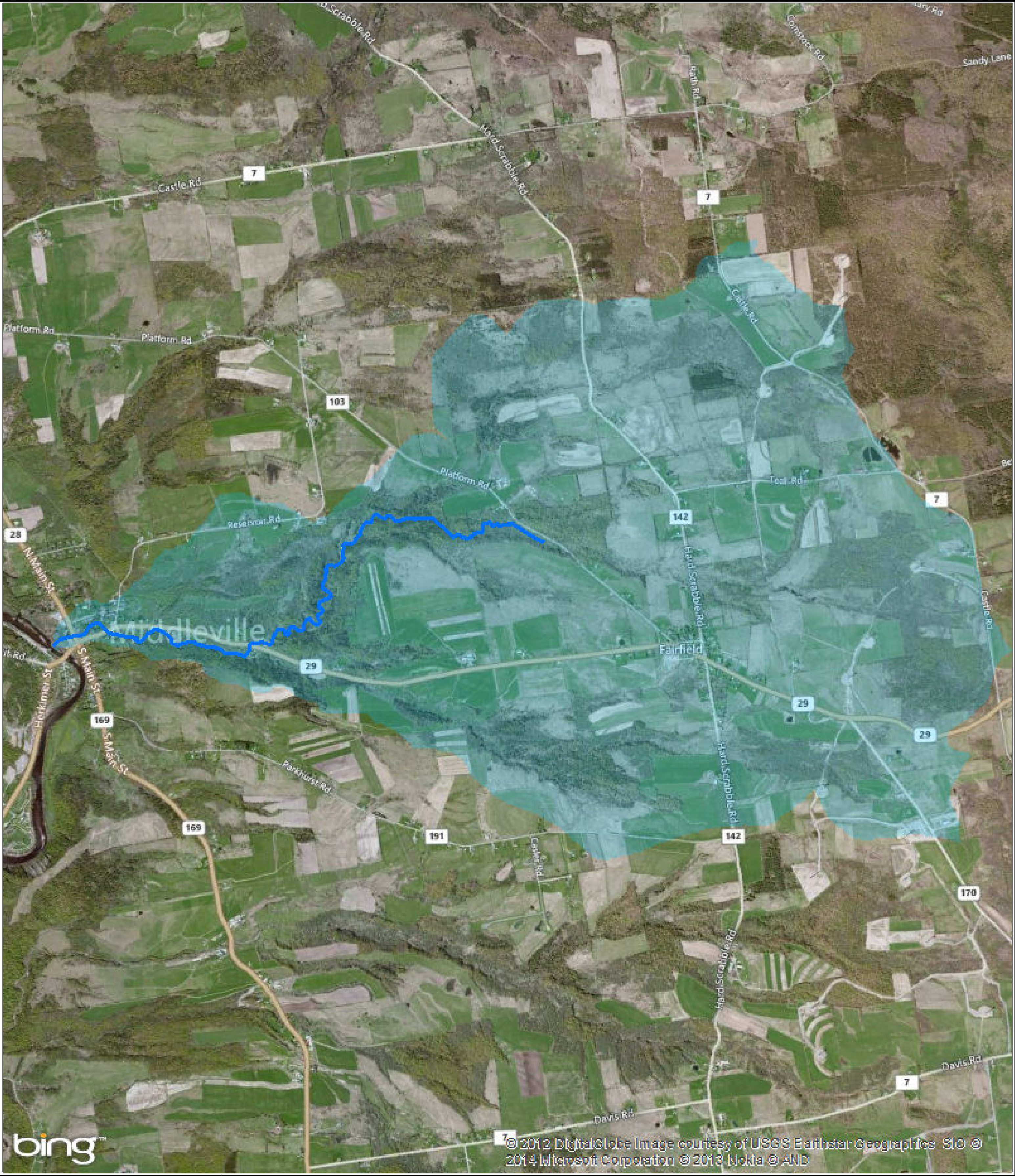
2.4 Watershed Land Use

Figure 3 is a watershed map of Maltanner Creek. The creek flows through the town of Fairfield and the village of Middleville. The contributing drainage basin contains 36 percent forest land with a mix of rural residential and agriculture uses. Residential and commercial land uses are concentrated in the lower part of the basin, in the village of Middleville.

Maltanner Creek originates at its headwaters east of the intersection of Route 142 and Route 29 in the town of Fairfield. The creek flows west and south, passing under Route 29 twice before flowing through the village of Middleville to its outlet at West Canada Creek.

2.5 Geomorphology

Maltanner Creek is a steep watercourse, with evidence of high sediment load. The creek has an average slope of 4 percent, falling 878 vertical feet over its length of 4.1 miles to its outlet at West Canada Creek. Sediment sources include bedload from higher in the watershed, and eroding banks combined with specific point sources, including a number of bank slides and severe high bank failures. At various points along its length, especially in its lower reaches in the village of Middleville, Maltanner Creek has been lined by stacked rock and concrete block walls.



SOURCE(S):	Figure 3: Maltanner Creek Drainage Basin	LOCATION: Herkimer County, NY

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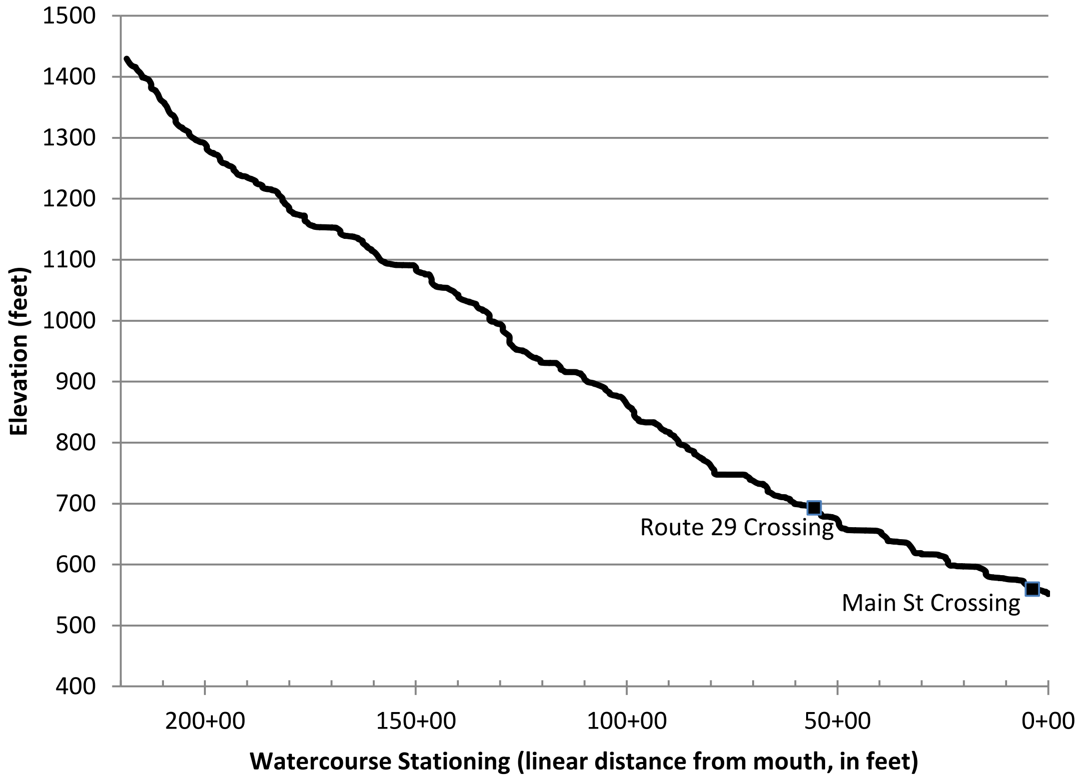
Figure 4 is a profile of Maltanner Creek, showing the watercourse elevation versus the linear distance from the mouth of the watercourse. The creek drops nearly 900 feet from its headwaters to its mouth.

FIGURE 4
Maltanner Creek Profile



Steep stream reaches such as seen on Maltanner Creek have a great deal of stream power, with high velocities that can carry a great deal of sediment. These mobilized sediments are then deposited in lower gradient reaches lower in the watershed, where they fill the channel, reduce hydraulic capacity, and exacerbate flooding.

The stream channel has been recently dredged within some reaches to remove accumulated sediment. Field investigations in October and November 2013 revealed evidence of post-flood dredging, with exposed clay visible in some areas, indicating over-excavation is likely to have occurred. In some areas, dredged materials have been placed directly on the adjacent stream banks or in the floodplain, leaving them at risk to remobilize during future high flows.

The largest bank failures on Maltanner Creek are located upstream of the Route 29 crossing at STA 55+50, with two of the largest failures occurring in the vicinity of STA 76+50 and STA 65+00. These failures are actively contributing fine and coarse-grained sediments that reduce water conveyance in the channel downstream. A number of smaller bank slides of varying severities occur along the creek and a tributary that discharges into Maltanner Creek at STA 53+00, just downstream of the Route 29 crossing.

A large sediment load is also being washed out of Maltanner Creek into West Canada Creek, resulting in the formation of a substantial sediment bar in West Canada Creek under the east span of the Route 28 (Bridge Street) bridge.

2.6 Hydrology

Alluvial river channels adjust their width and depth around a long-term dynamic equilibrium condition that corresponds to "bankfull" conditions. Extensive data sets indicate the channel-forming or bankfull discharge in specific regions is primarily a function of watershed area. The bankfull width and depth of alluvial channels represent long-term equilibrium conditions and are important design criteria. Table 1 below lists estimated bankfull discharge, width, and depth at two points along Maltanner Creek, as derived from the United States Geological Survey (USGS) *StreamStats* program.

TABLE 1
Estimated Bankfull Discharge, Width, and Depth
(Source: USGS *StreamStats*)

Location	Station	Watershed Area (sq. mi.)	Discharge (cfs)	Bankfull Width (ft)	Bankfull Depth (ft)
High Bank Failure	76+50	4.11	165	35.9	1.69
West Canada Creek	0+00	6.58	246	42.5	1.97

There are no USGS stream gauging stations on Maltanner Creek. Hydrologic data on peak flood flow rates for many New York streams are available from FEMA. A preliminary draft FIS for all of Herkimer County was issued on September 30, 2011 but does not include flow information or flood mapping for Maltanner Creek. Estimated peak discharges for various frequency events were calculated using *StreamStats*. Table 2 lists estimated peak flows at Maltanner Creek's confluence with West Canada Creek, which is located at MMI STA 0+00.

TABLE 2
Maltanner Creek Peak Discharges at Confluence with West Canada Creek
(Station 0+00)

Frequency	Peak Discharge (cfs)
10-Yr	1,030
50-Yr	1,530
100-Yr	1,780
500-Yr	2,370

Table 3 lists estimated peak flows in the vicinity of the high bank failures upstream of the Route 29 crossing, at STA 76+50.

TABLE 3
Maltanner Creek Peak Discharges Upstream of Route 29 at Bank Failures (STA 76+50)

Frequency	Peak Discharge (cfs)
10-Yr	675
50-Yr	1,000
100-Yr	1,160
500-Yr	1,560

2.7 Infrastructure

Bridge spans and heights were measured as part of the 2013 MMI field investigations. Table 4 summarizes the bridge measurements collected during field inspection. For purposes of comparison, estimated bankfull widths at each structure are also included.

TABLE 4
Summary of Stream Crossing Data

Roadway Crossing	BIN	Station	Width (ft)	Height (ft)	Bankfull Width (ft)
Route 29 Bridge (Fairfield)	---	56+00	18.0	6.5	35.9
Route 29 Bridge (Middleville)	000000001020520	15+50	67.0	5.0-12.3	41.7
Main Street Bridge	---	5+50	34.0	5.0-7.5	42.5

Table 4 indicates that the Route 29 crossing at STA 56+00 and the Main Street bridge are not wide enough to span the bankfull width of Maltanner Creek. According to reports from municipal officials, the Main Street bridge overtops during flood events. The bridge appears to be in poor condition and is clearly undersized, particularly when it becomes partially clogged with sediment.

3.0 FLOODING HAZARDS AND MITIGATION ALTERNATIVES

3.1 Flooding History Along Maltanner Creek

The most severe flood-related damages on Maltanner Creek have occurred to homes along Route 29 (Fairfield Street), as well as homes, businesses, and bridges in the village of Middleville. Other areas of concern include high bank failures that are contributing to sediment loads and channel instability. Large amounts of coarse sediment moved downstream and have been deposited in the lower reaches, clogging the channel and the bridges.

In mid to late June and early July 2013, a severe precipitation system caused excessive flow rates and flooding in a number of communities in the greater Utica region, including in the Maltanner Creek Basin. Because rainfall across the region was highly varied, it is not possible to determine exact rainfall amounts within the Maltanner Creek Basin.

Historic records on the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service (NWS) Advanced Hydrologic Prediction Service website indicate that the Herkimer County area received between 10 and 15 inches of rainfall in the month of June and an additional 5 to 8 inches in July 2013. Much of this rainfall occurred over several storm events that dropped between 3.5 and 4.5 inches of rain between June 11 and June 14; 5.5 to 8.5 inches between June 24 and June 28; and 1.5 to 2.0 inches on July 2. In between these more severe rain events were a number of smaller rain showers that dropped trace amounts of precipitation, preventing soils from drying out between the larger rain events.

3.2 Post-Flood Community Response

Following the heavy flooding in June 2013 along Maltanner Creek, the village of Middleville implemented a number of temporary repairs. Private property owners throughout the village attempted repairs to individual sections of stream bank as well. Immediately after the June 2013 event, dredging was undertaken at various points along the creek. Bank repairs with stacked stone walls were still ongoing in December 2013 in the vicinity of STA 6+00 to STA 8+00 and STA 53+00 to STA 56+00.

3.3 Flood Mitigation Analysis

Hydraulic analysis of Maltanner Creek was conducted using the HEC-RAS program. The HEC-RAS computer program *(River Analysis System*) was written by the United States Army Corps of Engineers (USACE) Hydrologic Engineering Center (HEC) and is considered to be the industry standard for riverine flood analysis. The model is used to compute water surface profiles for one-dimensional, steady-state, or time-varied flow. The system can accommodate a full network of channels, a dendritic system, or a single river reach. HEC-RAS is capable of modeling water surface profiles under subcritical, supercritical, and mixed-flow conditions.

Water surface profiles are computed from one cross section to the next by solving the one-dimensional energy equation with an iterative procedure called the standard step method. Energy losses are evaluated by friction (Manning's Equation) and the contraction/expansion of flow through the channel. The momentum equation is used in situations where the water surface profile is rapidly varied, such as hydraulic jumps, mixed-flow regime calculations, hydraulics of dams and bridges, and evaluating profiles at a river confluence.

Hydraulic modeling of Maltanner Creek has not been completed by FEMA. As such, a new model was developed for the watercourse using surveyed data gathered as part of the subject study. The survey effort included the wetted area (within bankfull elevation) of 22 stream cross sections, plus three bridges. This data was combined with countywide light detection and ranging (LiDAR) data provided by the NYSDEC to develop sufficient geometry to be input into the model such that existing conditions flooding up to and including the 100-year recurrence interval can be modeled.

The model of existing conditions was then used to hydraulically model certain alternatives, described further in the report sections that follow. Model input and output files have been uploaded onto the NYSDOT ProjectWise site and have been delivered electronically to NYSDEC.

3.4 High-Risk Area #1 – Upper Watershed Bank Failures and Erosion (STA 56+00 to STA 78+00)

Figure 5 is a location plan of High Risk Area #1. At least three high bank failures were observed upstream of the Route 29 crossing at STA 61+00, STA 67+00, and STA76+50. These failures are actively contributing fine and coarse-grained sediments to Maltanner Creek. A number of smaller bank slides, bank erosion, and general channel instability were also observed along this reach.

Alternative 1-1: Individual Restoration of Bank Failures

A review of older aerial photography shows that the bank failures upstream of STA 56+00 are not new. Given the geology of this region and the stream power associated with Maltanner Creek, it is likely that the erosion is due to naturally occurring processes. The sandy/silty soils and clay observed in the valley are highly susceptible to erosion. Assessment of the surrounding topography indicates that the steep gorge through which Maltanner Creek flows was formed almost entirely through erosion from the higher plateau that surrounds the gorge. For thousands of years, flood flows have been eroding the banks and transporting sediment down to the West Canada River.

Hydraulic modeling indicates high velocities through this reach during severe flow events, fostered by the steep slope and narrow valley. Velocities at the three major bank failure locations range between 12 and 17 feet per second, which would mobilize all but the largest of boulders. Stabilization of the severe bank failures at STA 61+00, STA 67+00, and STA 76+50 would likely be cost prohibitive, as they are over 110 feet high and would likely require substantial structural elements to repair. A fourth bank failure appears to be forming near STA 99+00. Survey indicates that the channel in this region has an extremely steep slope, as high as 7 percent. Channels this steep would naturally set up a step pool system but only with large enough boulders in the system to form grade control structures at periodic intervals. The sandy/silty gravel/cobble and clay do not provide large enough material to create these structures. As such, downcutting is predicted to continue until large boulders begin to accumulate and self-armor the channel.

Figure 5: Maltanner Creek High Risk Area #1

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Revision: 4/4/2014
Scale: 1 in = 100 ft

Figure 5

Several of the bank failure sites in this reach are located 2,000 feet or more from an access point for heavy equipment, thus necessitating extensive access roads or traveling directly in the channel with heavy equipment. Many trips back and forth would be required in order to bring in the material required to stabilize the slope. This disruption of the streambed could initiate headcutting and further bank erosion, potentially causing more harm than good. Additionally, armoring individual bank failures in this reach is not likely to be an effective long term solution through this reach. As one or more failures are arrested, new areas will likely become vulnerable and unstable. Given the difficulty and potential damage to the streambed involved in accessing the most egregious bank failure sites and the likelihood of ongoing instability in the reach, this alternative is not recommended.

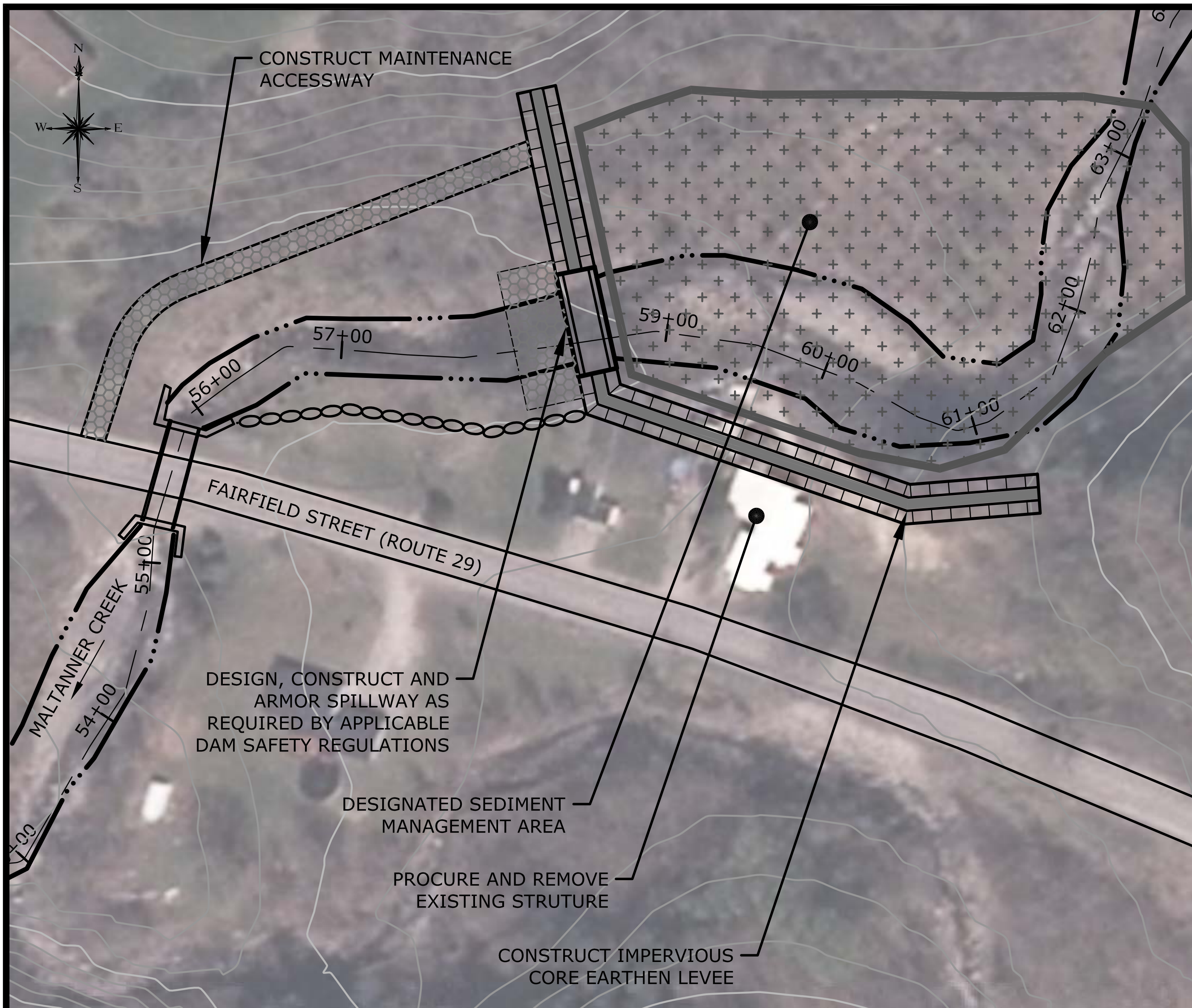
Alternative 1-2: Construction of a Sediment Retention Dam near STA 59+00

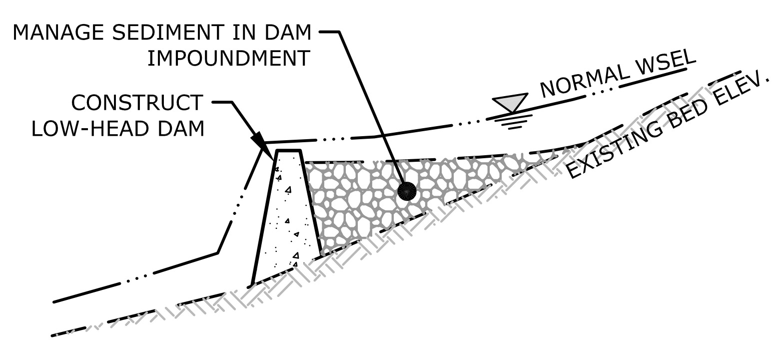
The bank failures and general instability of the upper reaches of the Maltanner Creek continue to supply a high level of bed load sediment to the lower reaches. Management of sediment that is produced at a single point source is easier to mitigate than a watershed-scale pattern of channel instability. Introducing enough roughness, armoring, and grade control throughout the 1.9-mile section of unstable channel would be exorbitantly expensive and is likely to be unsustainable.

This alternative evaluates reducing water velocities and capturing sediment in a controlled manner through construction of a low-head dam or possibly an open check dam that would impound sediment within Maltanner Creek upstream of Route 29 but downstream of the high bank failures. In this manner, suspended sediment and cobble could settle behind the dam, where it could be monitored and periodically removed, particularly preceding or following larger storm events.

This alternative would require acquisition of the house on the left bank near STA 60+00. That parcel or one nearby could serve as the access during construction and the future access for periodic operation and maintenance needs. A trucking route would have to be constructed and maintained to facilitate the removal of sediment whenever needed. Figure 6 is a conceptual design of this alternative.

Construction of a new dam carries with it ecological impacts such as habitat destruction and discontinuity for aquatic organisms and fisheries. In this case, the value of controlling sediment and of flood mitigation would need to be weighed against the biological and ecological impacts that would be created by a new dam.





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MALTANNER CREEK HIGH RISK AREA #1 SEDIMENT RETENTION BASIN

WATER BASIN ASSESSMENT AND FLOOD HAZARD MITIGATION ALTERNATIVES

MALTANNER CREEK
MIDDLEVILLE, HERKIMER COUNTY, NEW YORK

DATE	4/4/14
SCALE	AS NOTED
PROJ. NO.	5231-01
DESIGNED JCM	DRAWN DRM / CHECKED JAG
DRAWING NAME:	FIG. 6

Recommendations

Further evaluation of constructing a sediment-controlling dam (Alternative 1-2) is recommended for the upper portions of Maltanner Creek.

3.5 High-Risk Area #2 – Fairfield Street (Route 29) Bridge at STA 56+00

Figure 7 is a location plan of High Risk Area #2. Route 29 passes over Maltanner Creek at STA 56+00 in the town of Fairfield. The existing bridge consists of a narrow but tall crossing, approximately 20 feet in span. The channel directly downstream of the bridge is extremely steep and showing signs of instability. The channel was surveyed as an 18 percent slope for the 100 feet directly downstream of this bridge.

Extremely high velocities were modeled exiting this bridge and flowing down the steep channel reach coincident with a 100-year flood event. The predicted velocities were so high that they are outside of the ability of HEC-RAS to effectively model. However, the modeling does indicate that this section of creek is highly susceptible to shear strengths and erosive forces during a flood, which will continue to cause bank erosion. The instability of the channel here is evidenced by the recent bank stabilization construction that this section of channel underwent after the June 2013 floods, with stacked stone wall armoring being constructed through this reach.

Reconstruction of the bridge with a wider structure, a lower bed, and appropriate bed roughening could help stabilize the channel in this location. Creating a bridge with a span of at least 30 feet would provide a wider, shallower flood channel that would help alleviate the fast, deep flows characteristic of the current bridge crossing.

Recommendations

Replacement of the Fairfield Street (Route 29) bridge at STA 56+00 with a 30-foot or larger span structure is recommended. Additionally, the stream channel should be at a flatter slope and appropriately armored/roughened to mitigate velocities and protect the adjacent banks.

3.6 High Risk Area #3 – Mid Watershed Bank Failures and Erosion (STA 23+00 to STA 56+00)

Figure 8 is a location plan of High Risk Area #3. Multiple bank failures occur in this reach, including bank slides between STA 52+50 and STA 50+00, between STA 45+00 and STA 40+50; a failure in the vicinity of STA 35+50; as well as bank slides between STA 35+00 and STA 32+50, and between STA 25+00 and STA 23+00. In addition, there are a number of bank slides along a tributary that joins Maltanner Creek at STA 53+00, just downstream of the Route 29 crossing.

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SOURCE(S):

Figure 7: Maltanner Creek High Risk Area #2

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Figure 7

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Figure 8: Maltanner Creek High Risk Area #3

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Figure 8

Alternative 3-1: Stream Repair and Maintenance Program

A stream repair and maintenance program for this reach of Maltanner Creek could be developed and implemented to address the multiple bank failures and areas of erosion on a site-by-site basis using a combination of conventional and bioengineering techniques. Such a program could include periodic inspection to identify future areas subject to erosion, periodic removal of woody debris from the channel, and monitoring of restored areas. Bioengineering approaches could include the following:

- Construction of rock vortex vanes to deflect or redirect flows away from eroding banks
- Use of stone weirs or drop structures to stabilize the channel and dissipate the energy of the flowing water
- Use of coir logs filled with soil to provide interplanting areas in lower-flow velocity zones along the banks
- Use of vegetated natural boulder slopes in higher-flow velocity zones along the bank
- Use of brush mattresses, live fascines, live stakes, tubelings, and/or blueberry/fern sod where bare soils have been exposed [Available plant species for live stakes, fascines, mattresses, and tubelings typically include willow (*Salix* spp.), speckled alder (*Alnus rugosa*), silky dogwood (*Cornus amomum*), red twig dogwood (*Cornus sericia*), nannyberry (*Viburnum lentago*), and northern arrowwood (*Viburnum dentatum*).]
- Transplanting native plantings, such as willow (*Salix* spp.), from nearby sites, combined with seeding to reestablish vegetation on creek banks where bare soils have been exposed
- Erosion control matting to stabilize banks combined with seeding to reestablish vegetation on creek banks where bare soils have been exposed

In some cases, access to the stream channel is limited due to the steep slopes along the left bank and houses along the right bank. Use of heavy equipment will be difficult and could cause more environmental harm than benefit. At these locations, in-stream work may need to be accomplished by crews working with hand tools, using materials that could be carried in or gathered on site.

Alternative 3-2: Monitor Bank Failures

Based on an analysis of aerial photographs, many of the bank erosion and bank failure sites along Maltanner Creek have developed gradually over a long period of time and are made worse during large flow events such as the one that occurred in June 2013. During periods of time when the creek does not experience high flows, the sites tend to stabilize as they become vegetated and regenerate naturally. It is recommended that the sites be monitored closely, especially following high flow events. If the volume of sediment originating at a particular site substantially increases, or if structures are being threatened by an eroding bank or bank failure, actions similar to those discussed under Alternative 3-1 should be considered.

Recommendations

Alternatives 3-1 and 3-2 are recommended. Stabilization should be considered on a case-by-case basis, but the benefits of undertaking a bank stabilization project need to be weighed against potential further degradation of the channel that may result due to the difficulty involved in accessing many of the sites with heavy equipment.

3.7 High-Risk Area #4 – Middleville Center at North Main Street (Route 28), STA 5+50

Figure 9 is a location plan of High Risk Area #5. This reach of the Maltanner runs from STA 5+50 downstream to the outlet of the creek at STA 0+00. The Main Street bridge is not wide enough to span the bankfull width of Maltanner Creek. According to reports from municipal officials, this bridge overtops during flood events. This structure appears to be in poor condition and is clearly undersized, confirmed by modeling undertaken as part of the subject analysis.

The most severe flooding in the village of Middleville appears to be caused by the undersized capacity of the Main Street bridge. Heavy sediment aggradation in this channel reach further limits the conveyance of the bridge, causing the already-undersized bridge to be completely ineffective at conveying flood flows.

Alternative 4-1: Replace Main Street (Route 28) Bridge

Reconstruction of the Main Street bridge with a wider structure, a lower bed, and appropriate bed roughening would help stabilize the channel in this location. The existing bridge is predicted to overtop during a flood event greater or equal to the 10-year event. Creating a bridge with a span of 45 feet and deepening the channel in this location would provide more hydraulic capacity and could convey the 100-year flood with more than a foot of freeboard. This could also be completed with minimal impact to the surrounding private properties. This bridge has been identified for replacement through the Governor's Scour Critical Bridge Replacement Program.

Recommendations

Replacement of the North Main Street (Route 28) bridge at STA 5+50 with a wider span structure as discussed in Alternative 4-1 is recommended to alleviate the hydraulic flow constriction in this reach of the Maltanner.

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N W E S

SOURCE(S):

Figure 9: Maltanner Creek High Risk Area #4

NYDOT: Emergency Transportation Infrastructure Recovery

Herkimer County, New York

Map By: CMP
MMI#: 5231-01
MXD: Y:\5231-01\GIS\Maps\High Risk Areas\Maltanner High Risk #4.mxd
1st Version: 01/07/2014
Revision: 4/4/2014
Scale: 1 in = 67 ft

Figure 9

3.8 High Risk Area #5 – Sediment Management on Maltanner Creek

Maltanner Creek is a steep watercourse with a high sediment load. During high flow events, large volumes of coarse-grained sediments are being conveyed from the upper reaches to the lower part of the stream. Failing hillslopes and eroding banks that occur through the mid reaches of Maltanner Creek are contributing additional sediment load. Much of this sediment is deposited in the channel in the lower reaches. Sediments are also conveyed to West Canada Creek, resulting in the formation of a substantial sediment bar in West Canada Creek under the east span of the Route 28 (Bridge Street) bridge. Regardless of what actions are taken to control them at their source, sediments will continue to be deposited in the channel in the village of Middleville, exacerbating flooding problems.

Alternative 5-1: Develop a Sediment Management Program

Often, dredging is the first response to sediment deposition and clogging of the stream channel or bridge openings; however, over-widening or over-deepening through dredging can initiate headcutting, foster poor sediment transport, result in low habitat quality, and not necessarily provide significant flood mitigation. A comprehensive stream management approach should be considered. Removal of sediment from the channel may be appropriate when:

- the channel is confined, without space in which to laterally migrate
- for the purpose of infrastructure protection
- at bridge openings where hydraulic capacity has been compromised
- in reaches with low habitat value

In cases where removal of sediment from the stream channel is necessary, a methodology should be developed that would allow for proper channel sizing and slope. The following guidelines are provided:

1. Maintain the original channel slope and do not overly deepen or widen the channel. Removal of sediments should not extend beyond the channel's estimated bankfull width unless it is to match an even wider natural channel. Estimated bankfull widths on Maltanner Creek are provided in Table 1 of this report and range from 35.9 feet near the bank failure upstream of the upper Route 29 bridge, to 42.5 feet at its outlet.

2. Sediment removal should be limited in volume to either a single flood's deposition or to the watershed's annual sediment yield in order to preclude downstream bed degradation from lack of sediment. Annual sediment yields vary, but one approach is to use a regional average of 50 cubic yards per square mile unless a detailed study is made. The estimated annual sediment yield of Maltanner Creek is 330 cubic yards.

3. Removal of fine-grain sediment releases turbidity. Best available practices should be followed to control sedimentation and erosion.

4. Sediment removal activities require regulatory permits. Prior to initiation of any such activities, NYSDEC should be contacted, and appropriate local, state, and federal permitting should be obtained.

5. Disposal of sediments removed from the channel should always occur outside of the floodplain. If such materials are placed on the adjacent bank, they will be vulnerable to remobilization and redeposition during the next large storm event.

6. No removal of sediments should be carried out in areas where rare or endangered species are located.

4.0 RECOMMENDATIONS

1. *Further Evaluate Construction of a Sediment Control Dam near STA 59+00* – Further evaluation of constructing a sediment-controlling dam (Alternative 1-2) is recommended for the upper portions of Maltanner Creek. Construction of a new dam is generally not considered to be an ecologically beneficial activity. In this case, the value of controlling sediment and therefore mitigation of flooding needs to be weighed against the biological and ecological impacts that would be created by a new dam.

2. *Replace Fairfield Street (Route 29) Bridge at STA 55+00* – The bridge at Fairfield Street (Route 29) is undersized and in poor condition. Replacement of this bridge with a larger structure with an approximate 30-foot span is recommended. The work should also include stabilization of the channel and banks in a way that reduces velocities and depths to prevent future erosion. A detailed hydraulic analysis should be undertaken as part of the detailed design process.

3. *Develop and Implement a Stream Monitoring, Repair, and Maintenance Program* – The fundamental issue within the middle segment of Maltanner Creek is multiple small and large bank failures. Collectively, they contribute a significant amount of sediment loading in Maltanner Creek. Once mobilized, this sediment restricts channel and bridge capacity and exacerbates flooding. Arresting local bank failures and erosion is recommended through a combination of conventional and bioengineering techniques. These include planting of native vegetation to stabilize failing slopes, construction of stone weirs or drop structures to stabilize the channel and dissipate the energy of the flowing water, and other measures to improve the condition and stability of the stream channel.

4. *Replace the North Main Street (Route 28) Bridge at STA 5+50* – The bridge at North Main Street (Route 28) is undersized and in poor condition. This bridge has been identified for replacement through the Governor's Scour Critical Bridge Replacement Program. Replacement of this bridge with an approximate 45-foot span structure is recommended as a top priority. Design criteria should be

established relative to the target storm event such that the new structure does not act as a hydraulic constriction or cause flooding. A detailed hydraulic analysis should be undertaken as part of the detailed design process.

5. *Adopt Sediment Management Standards* – Maltanner Creek is a steep watercourse for much of its length. Sediments will continue to be transported downstream regardless of what actions are taken to control sediments in the upper reaches. These sediments will be deposited in the lower reaches, reducing channel capacity and contributing to flooding in the village. When excavation of depositional areas is necessary, it should be undertaken in a manner that maintains channel stability, avoiding over-widening and/or over-deepening the channel. Development of sediment management standards is recommended to provide guidance to contractors and local municipal and county public works departments on how to maintain proper channel sizing and slope as well as the application of best practices.

6. *Evaluate Floodplain Regulations* – A critical evaluation of existing floodplain law and policies should be undertaken to evaluate the effectiveness of current practices and requirements. Identification of a floodplain coordinator and development of a detailed site plan review process for all proposed development within the floodplain would provide a mechanism to quantify floodplain impacts and ascertain appropriate mitigation measures.

7. *Develop Design Standards* – There is currently no requirement to design stream crossings to certain capacity standards. For critical crossings such as major roadways or crossings that provide sole ingress/egress, design to the 50- or 100-year storm event may be appropriate. Less critical crossings in flat areas may be sufficient to pass only the 10-year event. Crossings should always be designed in a manner that does not cause flooding. When a structure that is damaged or destroyed is replaced with a structure of the same size, type, and design, it is reasonable to expect that the new structure will be at risk for future damage as well. Development of design standards is recommended for all new and replacement structures.

The above recommendations are graphically depicted on the following pages. Table 5 provides an estimated cost range for key recommendations.

TABLE 5
Cost Range of Recommended Actions

Maltanner Creek Recommendations	**Approximate Cost Range** <$100k	$100k-$500k	$500k-$1M	$1M-$5M	>$5M
Further Evaluate Construction of a Sediment Control Dam	X				
Replace the North Main Street (Route 28) Bridge				X	
Develop and Implement a Stream Monitoring, Repair, and Maintenance Program		X			
Replace Fairfield Street (Route 29) Bridge				X	

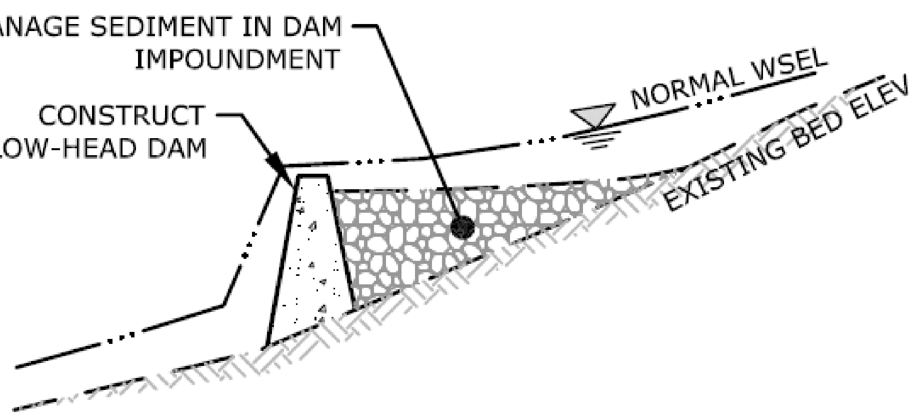
WATER BASIN ASSESSMENT AND FLOOD HAZARD MITIGATION ALTERNATIVES
MALTANNER CREEK, HERKIMER COUNTY, NEW YORK

High-Risk Area #1 – Upper Watershed Bank Failures and Erosion

Site Description: This reach includes multiple high bank failures between STA 78+00 and 56+00, that actively contribute sediment to the creek and exacerbate flooding conditions downstream.

Recommendation:

- Further evaluation of constructing a sediment control dam.



	BENEFITS
✓	Improved safety
✓	Reduction in sediment transport
✓	Improved downstream hydraulic capacity
✓	Reduced downstream flood hazard

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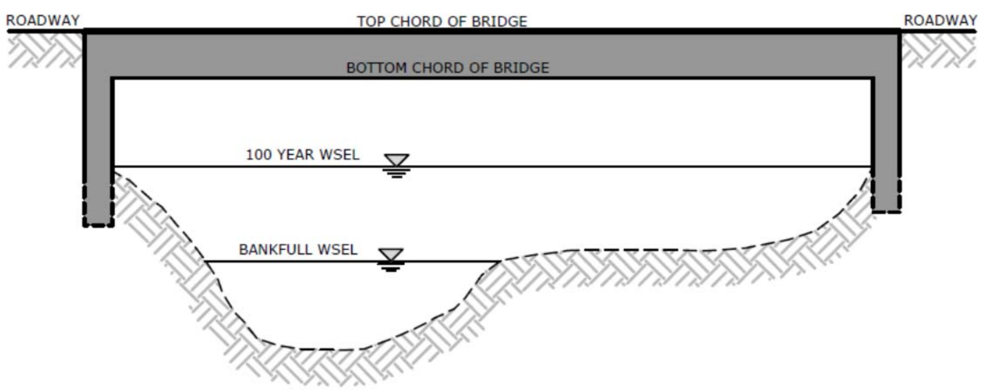
WATER BASIN ASSESSMENT AND FLOOD HAZARD MITIGATION ALTERNATIVES
MALTANNER CREEK, HERKIMER COUNTY, NEW YORK

High-Risk Area #2 – Fairfield Street (Route 29) Bridge

Site Description: Located at STA 56+00 is the Route 29 Bridge crossing over Maltanner Creek. The existing bridge consists of a narrow but tall crossing with a steep channel gradient directly downstream of the crossing.

Recommendation:

- Replace the Route 29 bridge with a wider span, flatter channel, and appropriately armored/roughened channel to mitigate velocities and protect adjacent banks.



TYPICAL UNCONSTRAINED BRIDGE CROSSING

	BENEFITS
✓	Improved safety
✓	Reduction in sediment transport
✓	Improved hydraulic capacity
✓	Reduced flood hazard
✓	Improved ecological connectivity

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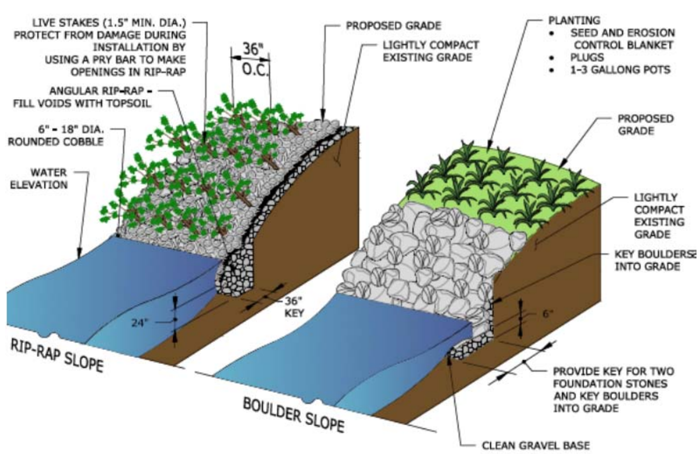
WATER BASIN ASSESSMENT AND FLOOD HAZARD MITIGATION ALTERNATIVES
MALTANNER CREEK, HERKIMER COUNTY, NEW YORK

High-Risk Area #3: Mid Watershed Bank Failures and Erosion (STA 23+00 to 56+00)

Site Description: From the Route 29 bridge downstream to STA 23+00 are multiple bank failures and bank slides. Included in this area is the tributary just downstream of the Route 29 bridge which has a number of bank failures as it joins Maltanner Creek. The left photo views from the convergence of Maltanner Creek and the unnamed tributary, downstream. The right photo is a large bank failure located at STA 35+00.

Recommendation:

- A stream repair and maintenance program for this reach of Maltanner Creek is recommended to be developed and implemented including conventional and bioengineering bank stabilization techniques.



	BENEFITS
✓	Improved safety
✓	Reduction in sediment transport
✓	Improved downstream hydraulic capacity
✓	Reduced downstream flood hazard
✓	Improved ecological connectivity

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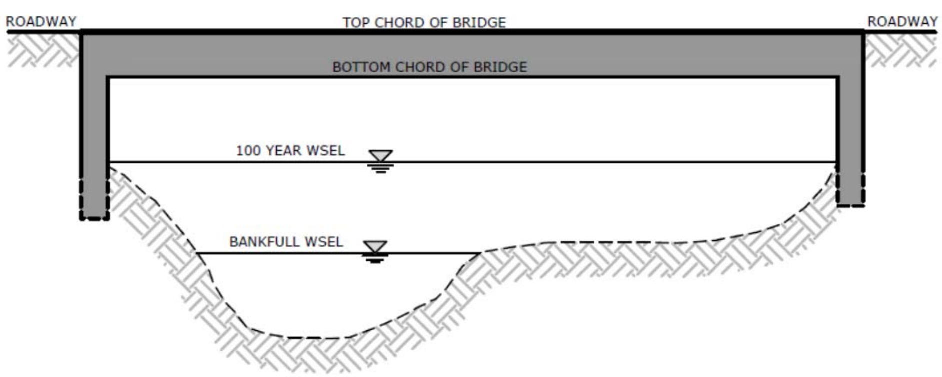
WATER BASIN ASSESSMENT AND FLOOD HAZARD MITIGATION ALTERNATIVES
MALTANNER CREEK, HERKIMER COUNTY, NEW YORK

High-Risk Area #4: Middleville Center at North Main Street (Route 28)

Site Description: This high risk area includes the stretch of creek from North Main Street downstream to mouth, STA 5+50 to STA 0+00. The North Main Street Bridge is not large enough to span the full bankfull width of Maltanner Creek and causes severe flooding in the Village of Middleville during flood events.

Recommendation:

- Reconstruct the North Main Street Bridge with a wider structure, a lower bed, and appropriate bed roughening to help stabilize the channel in this section.



TYPICAL UNCONSTRAINED BRIDGE CROSSING

	BENEFITS
✓	Improved safety
✓	Reduction in sediment transport
✓	Improved hydraulic capacity
✓	Reduced flood hazard

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APPENDIX A

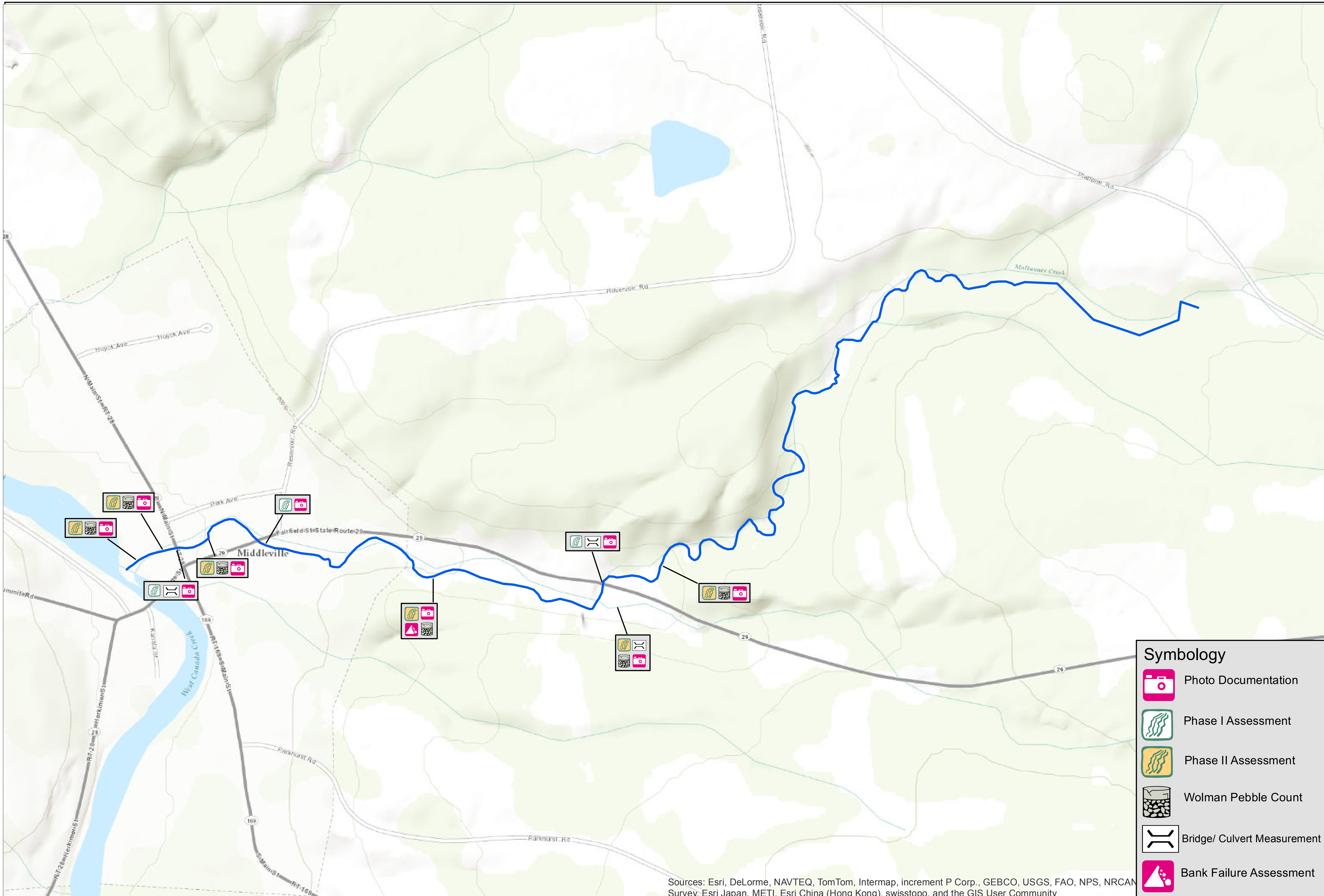
Summary of Data and Reports Collected

ATTACHMENT A: DATA INVENTORY

Year	Data Type	Document Title	Author
2013	Presentation	Flood Control Study for Fulmer Creek	Schnabel Engineering
2012	Map	Sauquoit Creek Watershed/Floodplain Map	Herkimer-Oneida Counties Comprehensive Planning Program
2011	Report	Oriskany Creek Conceptual Plan and Feasibility Study for Watershed Project	Oneida County SWCD
2009	Presentation	Ice Jam History and Mitigation Efforts	National Weather Service, Albay NY
2007	Report	Cultural Resources Investigations of Fulmer, Moyer, and Steele Flood Control Projects	United States Army Corps of Engineers (USACE)
2006	Report	Riverine High Water Mark Collection, Unnamed Storm	Federal Emergency Management Agency (FEMA)
2005	Report	Fulmer Creek Flood Damage Control Feasibility Study	United States Army Corps of Engineers (USACE)
2005	Report	Steele Creek Flood Damage Control Feasibility Study	United States Army Corps of Engineers (USACE)
2004	Report	Fulmer Creek Basin Flood Hazard Mitigation Plan	Herkimer-Oneida Counties Comprehensive Planning Program
2004	Report	Moyer Creek Basin Flood Hazard Mitigation Plan	Herkimer-Oneida Counties Comprehensive Planning Program
2004	Report	Steele Creek Basin Flood Hazard Mitigation Plan	Herkimer-Oneida Counties Comprehensive Planning Program
2003	Report	Fulmer, Moyer, Steele Creek - Stream Bank Erosion Inventory	Herkimer-Oneida Counties Comprehensive Planning Program
1997	Report	Sauquoit Creek Watershed Management Strategy	Herkimer-Oneida Counties Comprehensive Planning Program
2011	Report	Flood Insurance Study (FIS), Herkimer County	Federal Emergency Management Agency (FEMA)
2011	Report	Flood Insurance Study (FIS), Montgomery County	Federal Emergency Management Agency (FEMA)
2013	Report	Flood Insurance Study (FIS), Oneida County	Federal Emergency Management Agency (FEMA)
2010	Report	Bridge Inspection Summaries, Multiple Bridges	National Bridge Inventory (NBI)
2002	Hydraulic Models	Flood Study Data Description and Assembly - Rain CDROM	New York Department of Enviromental Conservation (NYDEC)
2013	Data	June/July 2013 - Post-Flood Stream Assessment	New York State Department of Transportation (NYSDOT)
2013	GIS Data	LiDAR Topography, Street Mapping, Parcel Data, Utility Info, Watersheds	Herkimer-Oneida Counties Comprehensive Planning Program
2013	GIS Data	Aerial Orthographic Imagery, Basemaps	Microsoft Bing, Google Maps, ESRI
2011	GIS Data	FEMA DFIRM Layers	Federal Emergency Management Agency (FEMA)
2013	Data	Watershed Delineation and Regression Calculation	US Geological Survey (USGS) - Streamstats Program

APPENDIX B

Field Data Collection Forms



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SOURCE(S):

Maltanner Brook: Data Collection Points

NYDOT: Emergency Transportation Infrastructure Recovery

Herkimer County, New York

MXD: Y:\5231-01\GIS\Maps\Phase II Icon Maps\Maltanner Brook 4-1.mxd

Map By: CMP
MMI#: 5231-01-02
1st Version: 12/4/2013
Revision: 3/20/2014
Scale: 1 in = 833 ft

App. B

MMI Project #5231-01 Phase I River Assessment Reach Data

River ________________ Reach _____________ U/S Station _______________ D/S Station ___________

Inspectors __________________ Date ______________ Weather ___________________________________

Photo Log ____

A) Channel Dimensions: Bankfull
Width (ft) __________
Depth (ft) __________

Watershed area at D/S end of reach (mi^2) ___________

B) Bed Material:

Bedrock	Boulders	Cobble
Gravel	Sand	Clay
Concrete	Debris	Riprap

Notes: ____

C) Bed Stability: Aggradation Degradation Stable Note: ___________________

D) Gradient: Flat Medium Steep Note: ___________________

E) Banks: Natural Channelized Note: _________________

F) Channel Type: Incised Colluvial Alluvial Bedrock Note: __________

G) Structures: Dam Levee Retaining Wall Note: ________________

H) Sediment Sources: ____

I) Storm Damage Observations: ____

____

J) Vulnerabilities: Riverbank Development Floodplain Development Road Trail Railroad

Utility Bridge Culvert Retaining Wall Ball field Notes: _________________

K) Bridges: Structure # _____________ Inspection Report? Y N Date _________________

Notes: ____

Record span measurements if not in inspection report: ______________________________________

Damage, scour, debris: ____

L) Culverts: complete culvert inspection where necessary. Size: ____________________________________

Type: _________________ Notes: ____

____

Phase II River Assessment
Reach Data

River ____________________ Reach ____________ Road _____________ Station ______________

Inspector _________________ Date _____________ Town ____________ County _____________

Identification Number _____________________ GPS # ________________ Photo # ________________

A) River Reach ID _________________________ Drainage Area, sm ________________________
D/S Boundary _____________________________, U/S Boundary ____________________________
D/S STA __________________________________, U/S STA ________________________________
D/S Coordinates __________________________, U/S Coordinates __________________________

B) Valley Bottom Data:

Valley Type (Circle one)	Confined >80% L	Semiconfined 20-80%	Unconfined <20%
Valley Relief	<20'	20-100'	>100
Floodplain Width	<2 W_b	2-10 W_b	>10 W_b

	Left Side	Right Side
Natural floodplain	_______%	_______%
Developed floodplain	_______%	_______%
Terrace	_______%	_______%
Floodplain Land Use	____________	____________

C) Pattern: Straight S=1-1.05 Sinuous S=1.05 – 1.25 Meanders S=1.25 – 2.0 Highly Meandering S>2.0 Braided Wandering Irregular

D) Channel Profile Form: (Percent by Class in Reach)

Cascades	__________	Alluvial	__________	Channel Transport
Steep Step/Pool	__________	Semi Alluvial	__________	Sed. Source Area
Fast Rapids	__________	Non Alluvial	__________	Eroding
Tranquil Run	__________	Channelized	__________	Neutral
Pool & Riffle	__________	Incised	__________	Depositional
Slow Run	__________	Headcuts	__________	

E) Channel Dimensions (FT):

	Bankfull	Actual Top of Bank	Regional HGR
Width	__________	__________	__________
Depth	__________	__________	__________
Inner Channel Base Width	__________		
W/D Ratio	__________		

F) Hydraulic Regime:
Mean Bed Profile Slope ________________ Ft/Ft
Observed Mean Velocity ______________________ FPS

G) Bed Controls:

Bedrock	Weathered Bedrock	Dam
Static Armor	Cohesive Substrate	Bridge
Boulders	Dynamic Armor	Culvert
Debris	Riprap	Utility Pipe/Casing

Overall Stability _______________________

H) Bed Material:

D50 __________

Bedrock	__________	Sand	__________	Riprap	__________
Boulders	__________	Silt and Clay	__________	Concrete	__________
Cobble and Boulder	__________	Glacial Till	__________		
Gravel and Cobble	__________	Organic	__________		
Sand and Gravel	__________				

I) Flood Hazards:

Developed Floodplains	Bank Erosion
Buildings	Aggradation
Utilities	Sediment Sources
Hyd. Structures	Widening

Bridge Waterway Inspection Summary

River ____________________ Reach ____________ Road _____________ Station ______________

Inspector _________________ Date _____________ NBIS Bridge Number ____________________

NBIS Structure Rating _____________________ Year Built __________________________________

Bridge Size & Type _______________________ Skew Angle ________________________________

Waterway Width (ft) ______________________ Waterway Height (ft) _________________________

Abutment Type (circle) Vertical Spill through Wingwalls

Abutment Location (circle) In channel At bank Set back

Bridge Piers _____________________________ Pier Shape __________________________________

Abutment Material ________________________ Pier Material _________________________________

Spans % Bankfull Width ____________________ Allowance Head (ft) __________________________

Approach Floodplain Width _________________ Approach Channel Bankfull Width _______________

Tailwater Flood Depth or Elevation ___________ Flood Headloss, ft ____________________________

	Left Abutment	Piers	Right Abutment
Bed Materials, D_{50}			
Footing Exposure			
Pile Exposure			
Local Scour Depth			
Skew Angle			
Bank Erosion			
Countermeasures			
Condition			
High Water Marks			
Debris			

Bed Slope	Low	Medium	Steep
Vertical Channel Stability	Stable	Aggrading	Degrading
Observed Flow Condition	Ponded	Flow Rapid	Turbulent

Lateral Channel Stability ____

Fish Passage ____

Upstream Headwater Control ____

Project Information

Project Name	
Project Number	
Stream / Station	
Town, State	
Sample Date	
Sampled By	
Sample Method	Wolman Pebble Count

Particle Distribution (%)

silt/clay	
sand	
gravel	
cobble	
boulder	
bedrock	

Sample Site Descriptions by Observations

Channel type	
Misc. Notes	

Particle Sizes (mm)

D16	
D35	
D50	
D84	
D95	

(Bunte and Abt, 2001)

Particle Name	Size Limits (mm) lower	upper	Tally	Count	Percent Passing	Cumulative % Finer
silt/clay	0	**0.063**			0.0	0.0
very fine sand	0.063	**0.125**			0.0	0.0
fine sand	0.125	**0.250**			0.0	0.0
medium sand	0.250	**0.500**			0.0	0.0
coarse sand	0.500	**1**			0.0	0.0
very coarse sand	1	**2**			0.0	0.0
very fine gravel	2	**4**			0.0	0.0
fine gravel	4	**5.7**			0.0	0.0
fine gravel	5.7	**8**			0.0	0.0
medium gravel	8	**11.3**			0.0	0.0
medium gravel	11.3	**16**			0.0	0.0
coarse gravel	16	**22.6**			0.0	0.0
coarse gravel	22.6	**32**			0.0	0.0
very coarse gravel	32	**45**			0.0	0.0
very coarse gravel	45	**60**			0.0	0.0
small cobble	60	**90**			0.0	0.0
medium cobble	90	**128**			0.0	0.0
large cobble	128	**180**			0.0	0.0
very large cobble	180	**256**			0.0	0.0
small boulder	256	**362**			0.0	0.0
small boulder	362	**512**			0.0	0.0
medium boulder	512	**1024**			0.0	0.0
large boulder	1024	**2048**			0.0	0.0
very large boulder	2048	**4096**			0.0	0.0
bedrock	4096	**-**			0.0	0.0
			Total	0	0.0	-

(Wenthworth, 1922)

F-T Particle Sizes (mm)

F-T n-value	0.5
D16	
D5	

(Fuller and Thompson, 1907)

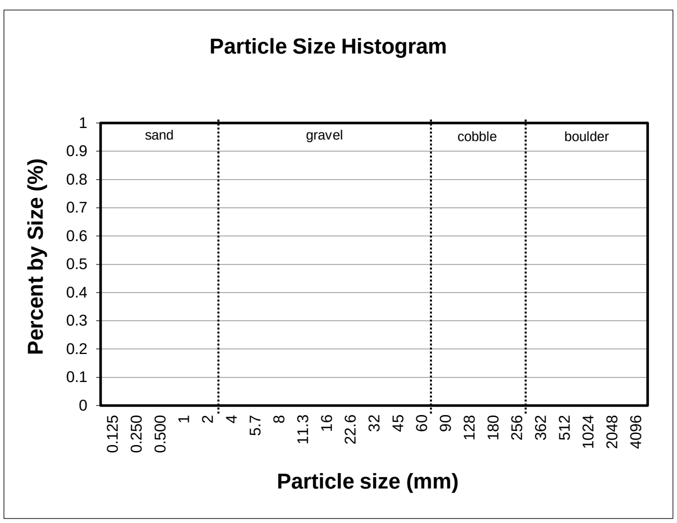
D (mm) of the largest mobile particles on bar

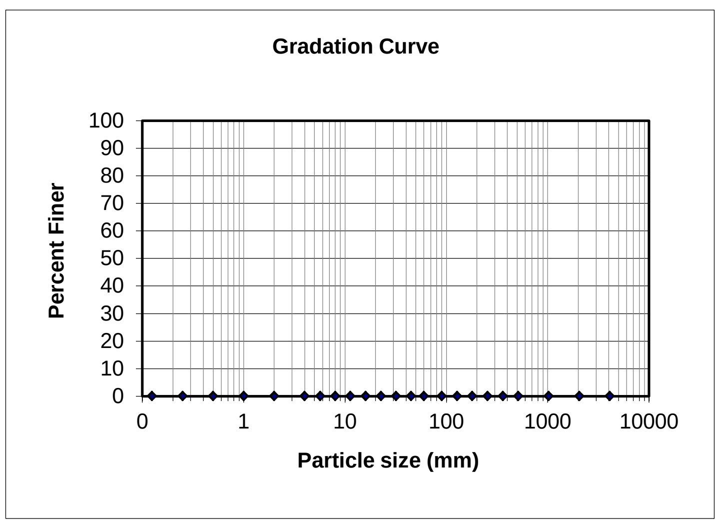
Mean	

Riffle Stability Index (%)

(Kappesser, 2002)

Notes





APPENDIX C

Maltanner Creek Photo Log

Engineering, Landscape Architecture and Environmental Science
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Cheshire, Connecticut 06410
(203 271-1773

Maltanner Creek
Photo Log

MMI# 5231-01
NYDOT
January 2014

PROJECT PHOTOS

PHOTO NO.: **1** DESCRIPTION: In the upstream reaches of Maltanner Creek are several large bankfailures that contribute to sediment load downstream.	
PHOTO NO.: **2** DESCRIPTION: After the convergence of Maltanner Creek and an unnamed tributary, looking downstream are continuous bankfailures that line the channel.	

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Maltanner Creek
Photo Log

MMI# 5231-01
NYDOT
January 2014

PHOTO NO.: **3** DESCRIPTION: Looking upstream from the N Main Street Bridge crossing, the channel has been heavily dredged and widened with a stacked revetment wall constructed to protect commercial property.	
PHOTO NO.: **4** DESCRIPTION: A downstream view of the N Main Street Bridge shows its undersized crossing width which creates hydraulic constriction and overtopping during flood conditions.