# Flood Inundation Maps for Elmira, Corning, Chemung, and Erwin, New York

November 2019

Prepared by NY Silver Jackets Partnership

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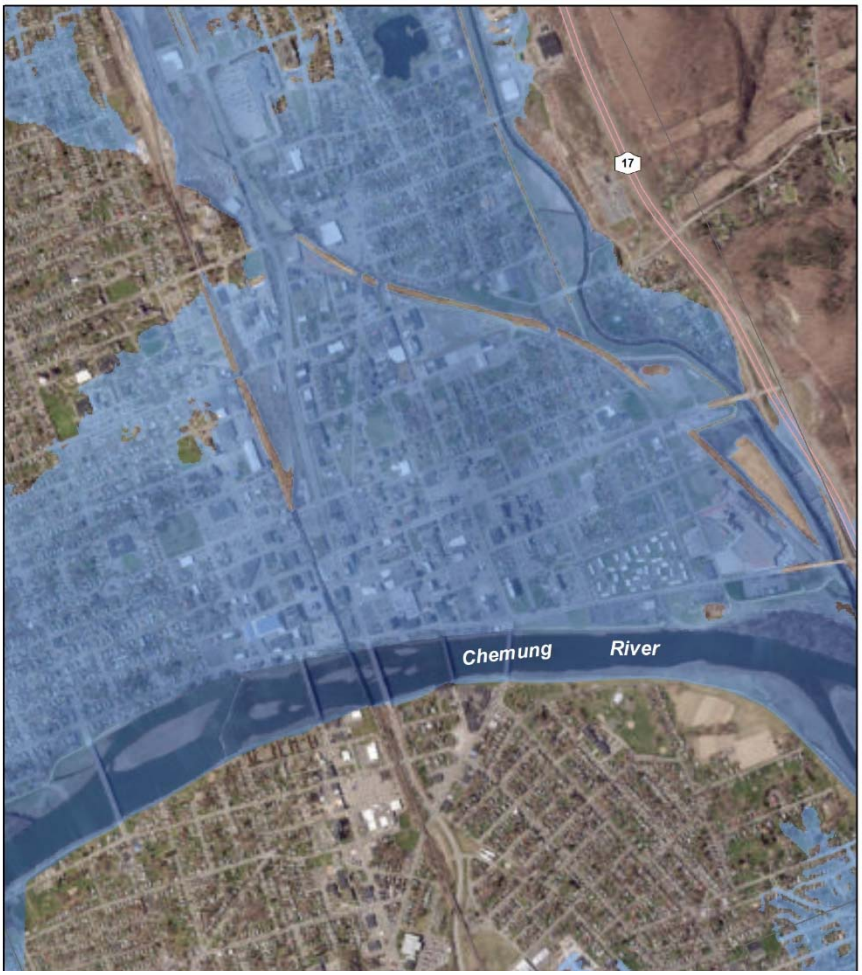



Expected area of inundation in Elmira, NY, for stage 31.1' (NAVD88 864.2') at Chemung River at Elmira, NY, streamgage.

# 1 INTRODUCTION

## 1.1 BACKGROUND

The Chemung River flows from Steuben County, New York, through Chemung County, New York, to its confluence with the Susquehanna River just below Athens, Pennsylvania. Hurricane Agnes in June 1972 devastated the region and remains the flood of record in this portion of the Susquehanna River Basin. Completed in 1980 and 1978, respectively, and subsequent to Hurricane Agnes flooding, the United States Army Corps of Engineers (USACE) constructed the Cowanesque and Tioga-Hammond flood control reservoirs. The flood control reservoirs supplement a system of levees in the region and have significantly reduced the threat of flooding in the region. However, flood risk remains a deep concern, thereby necessitating development of tools to inform and promote awareness of flood risk in the region.

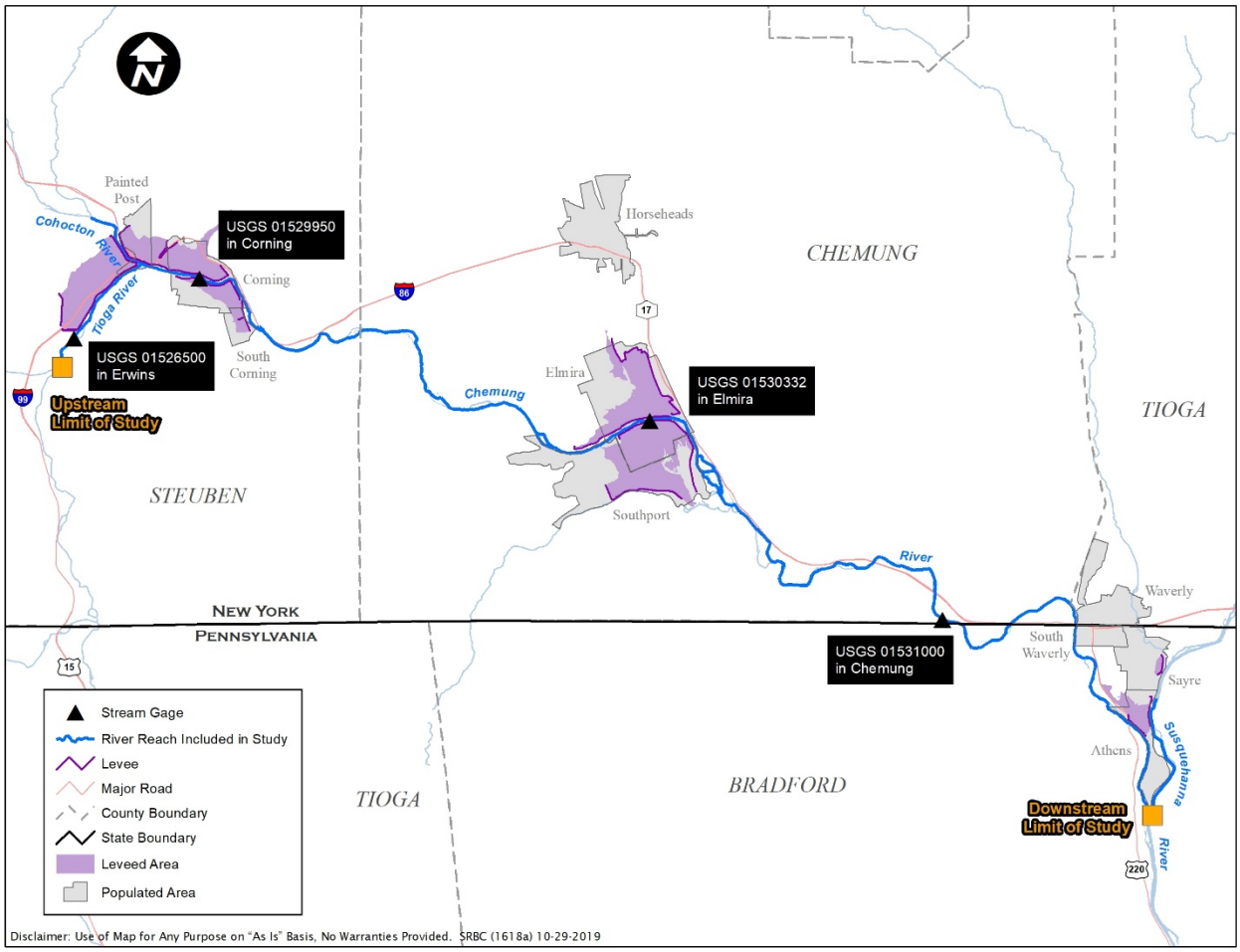
This report describes development of a non-structural flood hazard mitigation tool to inform the general public, community officials, and emergency managers of risk associated with high flow events in the study reach. The tool is a set of stage inundation map libraries for the Chemung River based on National Weather Service

(NWS) flood forecast points located at Chemung, Corning, and Elmira. Additionally, a map library is available for the Tioga River near Erwin, a NWS data only point, but no forecast is available. The stage inundation map libraries have been created for display on National Oceanic Atmospheric Administration's Advanced Hydrologic Prediction Service (NOAA AHPS) map viewer site. The inundation maps provide a graphical extension to river forecasts issued by NWS for the Chemung River and for the Tioga River near Erwin, where no forecast is available, and can be used to understand impacts associated with varying levels of flooding.

## 1.2 STUDY AREA

The study area for the HEC-RAS modeling includes the Chemung River from its confluence with the Susquehanna River to its formation where the Tioga River and Cohocton Rivers meet near Corning, New York (approximately 45.6 river miles). The study area also includes approximately 1.8 miles of the Cohocton River from its confluence with the Chemung River to just downstream of Robert Dann Drive, and approximately 4.2 miles of the Tioga River from its confluence with the Chemung River upstream to just downstream of the confluence of the Canisteo River (Figure 1.1).

Figure 1.1. Chemung River Study Area



The studied reach includes the following communities: Athens Borough and unincorporated areas of Bradford County, Pennsylvania; the Towns of Ashland, Big Flats, Chemung, Elmira, Southport, and the City of Elmira in Chemung County, New York; and the Towns of Corning, Erwin, Painted Post, and the City of Corning in Steuben County, New York.

The studied reach contains United States Geological Survey (USGS) streamflow gages (three NWS forecast points and 1 data only point), levee systems, and is significantly impacted by flow regulation of the upstream flood control reservoirs. Four USGS streamflow gages, Chemung, Elmira, and Corning on the Chemung River, and Erwin on the Tioga River, are located within the study area, with another being used in hydrologic computations on the Cohocton River (Campbell). These streamflow gages are shown on Figure 1.1, with details on these gages outlined on Table 1.1.

There are eight levees along the studied reach of the Chemung River and Tioga River (Figure 1.1). The Gang Mills Flood Damage Reduction Project (Gang Mills levee) is located on the left bank of the Tioga River. This project was completed in December 1977 by the New York Department of Environmental Conservation (NYSDEC). The project includes approximately 11,900 linear feet of levee along the Tioga River, and incorporates an existing levee on the Cohocton River completed prior to the project. The Corning and Painted Post Flood Damage Reduction Project is located on the left bank of the Cohocton and Chemung Rivers (Corning and Painted Post levee/floodwall) and along the right bank of the Chemung River (South Corning levee/floodwall). This project was fully completed in 1955 and includes several thousand feet of levee and approximately 3,300 feet of floodwall. The Elmira Flood Damage Reduction Project contains the North Elmira and South Elmira levee/floodwall along the Chemung River. This project was fully completed in 1959 and includes several thousand feet of levee and approximately 3,300 feet of floodwall. In Athens, PA, is the Athens Flood Protection Works (Athens levee) on the left bank of the Chemung River. This levee was completed in November 1949, rehabilitated in August 1977, and extended in July 1982. The project was constructed by USACE and is currently maintained by Athens Borough.

Table 1.1. USGS Streamflow Gages

| Station ID | Name | Drainage Area (Square Miles) | Period of Record |
|---|---|---|---|
| 01531000 | Chemung River at Chemung, NY | 2,506 | 1904-Current (114 years, 39 regulated years) |
| 01530332 | Chemung River at Elmira, NY | 2,162 | 1988-Current (30 Years) |
| 01529950 | Chemung River at Corning, NY | 2,006 | 1979 – Current (39 years) |
| 01526500 | Tioga River near Erwin, NY | 1,377 | 1918 – Current (100 years, 38 regulated years) |
| 01529500 | Cohocton River near Campbell, NY | 470 | 1919 – Current (98 years) |

The studied reaches of the Chemung River and Tioga River are significantly influenced by controlled flow from upstream dams. These dams include the Tioga-Hammond Lakes project and Cowanesque Lake, both constructed and operated by USACE. The Tioga-Hammond Lakes project is unique in that it consists of two separate dams, one on the Tioga River (Tioga Lake) and the other along Crooked Creek (Hammond Lake). The lakes formed by both dams are joined by a gated connecting channel. The project was operationally complete in 1978. The construction of Cowanesque Dam, which forms Cowanesque Lake, was completed in 1980. Collectively, these dams have significantly reduced the flood risk for downstream communities.

## 1.3 LEVERAGED DATA

Flood inundation map (FIM) development utilized an unfinished Federal Emergency Management Agency (FEMA) model for the Chemung River as a starting point. The hydraulic model is supported by a digital elevation model (DEM) by compiling and meshing the most recent digital elevation data available. Structure data (bridges, levees, floodwalls) was compiled from multiple sources including FEMA, New York Department of Transportation, USACE, and others and is detailed in Appendix A.

# 2 INUNDATION MAPPING

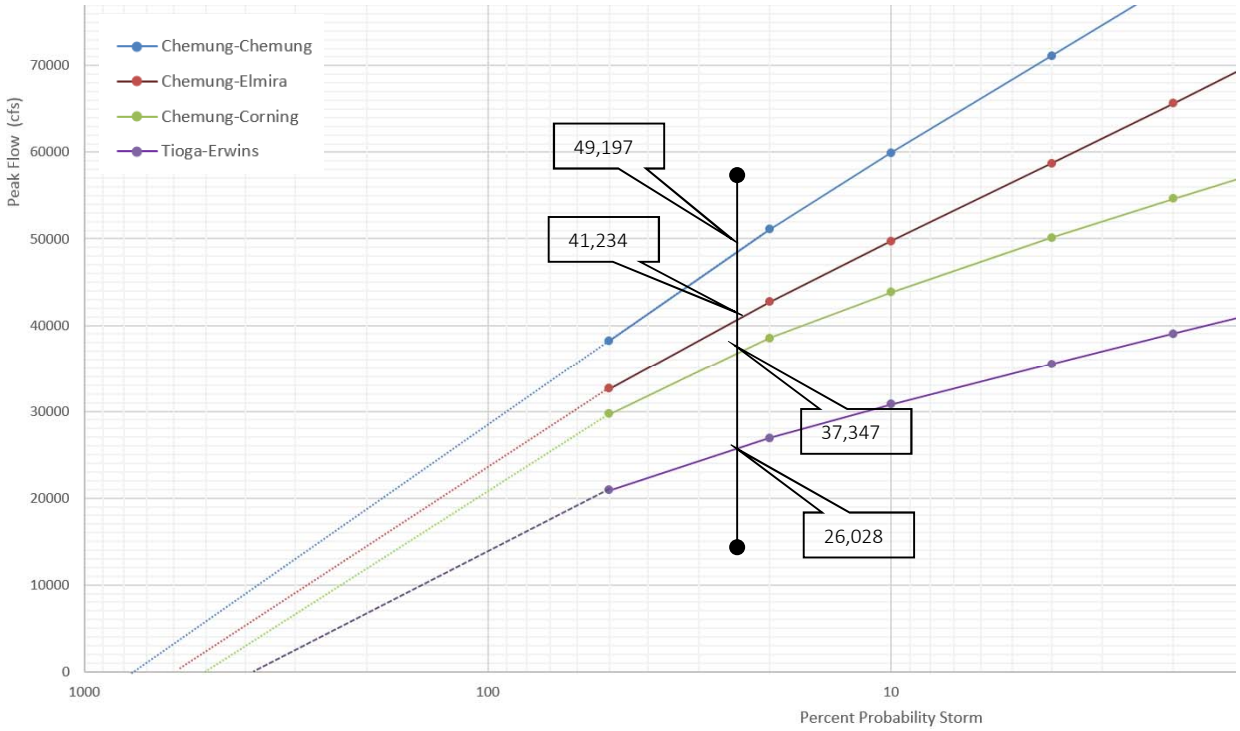
The computation of water surface elevations to produce the inundation maps in this project were completed utilizing the FEMA HEC-RAS model discussed in Section 1.3 and detailed in Appendix A. Within the completed HEC-RAS model, modification to the flow file was necessary to meet the objectives of the flood inundation mapping project. Modification to the flow file was completed as described below.

## 2.1 MODIFICATION TO HEC-RAS FLOW FILE

For FIM Project flows, a correlation must be established between gages in order to determine the number of flow profiles to meet the overall purpose of the study, which is to provide mapping for approximately every 1-ft. stage at the USGS gages. For the correlation, the process includes establishing a baseline gage, plotting the frequency curves for all gages on one graph, and determining what flow is expected at each gage when the baseline gage is measuring a certain flow value. During the correlation, effort is made to assure that the "Action," "Flood," "Moderate Flood," and "Major Flood" stages at all gages are captured in an FIM profile.

Then, once this is established, flows are translated to ungaged flow points, as described above. For this exercise, the Chemung gage was used as the baseline gage since it has the longest period of record. At the Chemung gage, the "Flood" stage is 16.0 feet, which equates to an elevation of 794.1 ft. NAVD 88. The flow that creates this stage is 49,197 cubic feet per second (cfs) based upon the most recent rating curve provided by USGS. When plotted on a frequency curve with other gages, the estimated flows at the other gages can be determined when the Chemung gage is at a flow of 49,197. This is demonstrated in Figure 2.1.

Figure 2.1. Frequency Curve Correlation Process



This process was followed for every 1 ft. increment at the Chemung gage up to the flow from Agnes 1972. After meeting all the flood stages at other gages, a total of 33 profiles were included in the FIM Project flow file, titled "ChemungRiver_FIM." Frequency curves for all the gages were only plotted up to the 0.1-percent annual (1000-year) chance flood. Thus, for flows higher than this, and less than Agnes (1972), the curves were extrapolated to provide values up to Agnes 1972. The Cohocton River was not included in the FIM Project flows because there is no direct correlation between the gages on the Chemung River and the Cohocton River. The Cohocton River is not impacted by dams and the drainage area of the Cohocton River is much smaller than the Chemung-Tioga Rivers, and this it is anticipated that the peak of the Cohocton River would pass prior to the peak of the Chemung-Tioga Rivers. For the FIM Project flows, peak flow values determined through the correlation at the USGS gages were used to translate flows to the ungaged flow points.

All computation tables and curves are provided in Appendix A of this document.

## 2.2 INUNDATION MAPPING DEVELOPMENT

FIM library layers were created for the entire study area. The layers were created in a Geographic Information System (GIS) environment by combining the water-surface elevation profiles and digital elevation model (DEM) data for the study area. The following DEMs were used:

1. FEMA Chemung Watershed 2011

2. PASDA North 2008

3. County Chemung Watershed 2005

4. County Chemung Watershed 2002

Estimated flood-inundation boundaries for each simulated profile were developed with HEC–GeoRAS software. HEC–GeoRAS is a set of procedures, tools, and utilities for processing geospatial data in ArcGIS by using a graphical user interface.

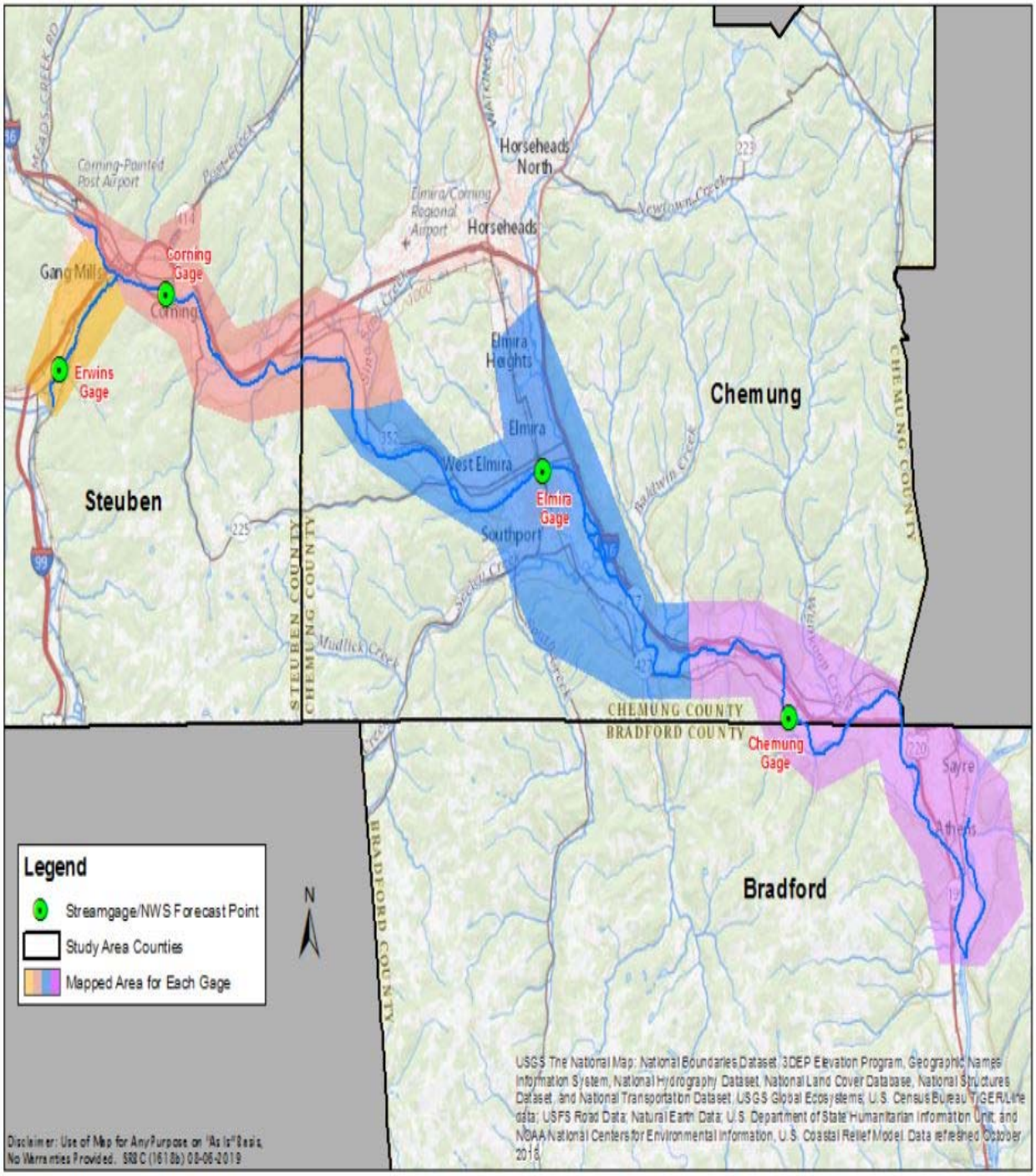
To meet the objective of providing inundation maps for approximately every 1 foot of stage at each of four gages within the study reach, 33 modeled water-surface profiles were developed within the study area. The HEC-RAS GIS Export File contains GIS coordinate-based information that describes the model cross-section locations and the resulting water surface elevations at each modeling cross-section. The export file is first read into the GIS. The next step is to create water surface Triangular Integrated Networks (TINs) for each of the modeled incremental flood profiles. The TIN created is based on the water surface elevation at each cross-section. The water surface TIN is created without considering the bare earth DEM. The next step is to delineate a floodplain for each water surface TIN. A floodplain polygon is created based on the corresponding water surface TIN. Each floodplain polygon results from intersecting the water surface TIN with the bare earth DEM. The water surface TIN is converted to a grid and compared to the bare earth DEM. A depth grid is then created with values where the water surface grid is higher than the bare earth DEM. The depth grid is clipped by the bounding polygon to remove any areas outside the hydraulic model. The depth grid is then converted into a floodplain polygon feature class. This process resulted in the study area floodplain polygons and study area depth grids.

Prior to finalizing the data, the depth grids and floodplain polygons were reviewed and edited. The review and editing process consisted of general smoothing and clean-up plus two major steps: 1) removing any disconnected waterbodies, and 2) bridge clips. Step 1 involved checking all hydraulically disconnected wet areas. If there was evidence that a wet, disconnected pond was hydraulically connected (i.e., an underground pipe connects the flood source to the disconnected pond), no action was taken. Low areas or depressions that did not have some obvious connection to flood sources were removed from the inundation map representation. Step 2 involved making the depth grids and floodplain polygons as accurate as possible by clipping bridges if they were still usable during a flood event. A clipped bridge means it is not shown as flooded and will remain usable. A bridge was clipped (and shown as being usable) as long as the lowest portion of the bridge was not impacted by water. Once the lowest portion of the bridge was impacted, all subsequent and higher elevation flood profiles were not clipped. For the non-mainstem bridges, if the road-surface elevation of the bridge was not flooded, the bridge was clipped and shown to be usable for that flood profile. Once the lowest road-surface elevation associated with a bridge was impacted by water, all subsequent and higher elevation flood profiles would not be clipped.

## 2.3 FINAL MAPPING AREAS

The final step in the FIM library development was to separate the study area into four (4) reaches as they will be displayed on NWS AHPS. This was done in consultation with the NWS and the cooperating partners. To ensure seamless coverage throughout the study area, the extent of each of the individual reaches is coincident with the adjacent reach. In the development of the final mapping areas, consideration was given to hydraulic and geographic changes, political boundaries, and distance from the nearest forecast point. The final mapping areas are shown in Figure 2.2.

Figure 2.2. Final Mapping Areas



# 3 INUNDATION MAPPING LIMITATIONS

## 3.1 UNCERTAINTY

Flood-inundation maps provide expected boundaries of inundated areas with a distinct line related to stage at a reference stream gage within the study reach. However, there exists some uncertainty with the distinct line and the boundaries depicted should be considered a reasonable approximation of expected flooding. The flood boundaries displayed are estimated based on water stages/flows at selected USGS streamgages. Water-surface elevations along the stream reaches are estimated by steady-state hydraulic modeling, assuming unobstructed flow, and using discharges and hydrologic conditions anticipated at the USGS streamgages. The hydraulic model reflects the land-cover characteristics and any bridge, dam, levee, or other hydraulic structures existing as of the date of the published map. Unique meteorological factors (timing and distribution of precipitation) may cause actual discharges along the modeled reach to vary from assumed during a flood and lead to deviations in the water-surface elevations and inundation boundaries shown. Additional areas may be flooded due to unanticipated backwater from major tributaries along the mainstem or from localized debris or ice jams. Inundated areas shown should not be used for navigation, regulatory, permitting, or other legal purposes. These maps are provided as a quick reference, emergency planning tool. The NT Silver Jackets team assumes no legal liability or responsibility for any direct, indirect, incidental, consequential, special, or exemplary damages, or lost profit resulting from the use or misuse of this information.

The user should be aware of additional uncertainties that may be inherent or factored into NWS forecast procedures. The NWS uses forecast models to estimate the quantity and timing of water flowing through selected stream reaches in the United States. These forecast models (1) estimate the amount of runoff generated by a precipitation or snowmelt event, (2) simulate the movement of floodwater as it proceeds downstream, and (3) predict the flow and stage (water-surface elevation) for the stream at a given location (AHPS forecast point) throughout the forecast period (every 6 hours and 3 to 5 days out in many locations).

For more information on AHPS forecasts, please see:
http://water.weather.gov/ahps/pcpn_and_river_forecasting.pdf

# APPENDIX A

## Technical Memorandum

# TECHNICAL MEMORANDUM

## Task 1 of the Silver Jackets Interagency Project-

## Chemung River Flood Inundation Mapping (FIM) Tool

HEC-RAS Model Development for the Chemung River and Portions of the Tioga River and Cohocton River

Prepared by:

New York Silver Jackets Team

Planning Division-U.S. Army Corps of Engineers

Baltimore District

OCTOBER 2018

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# 1 INTRODUCTION

## 1.1 BACKGROUND AND STUDY PURPOSE

This technical memorandum was prepared to outline the development of a calibrated, geo-referenced, steady-state HEC-RAS model for the Chemung River and portions of the Tioga and Cohocton Rivers in southcentral New York and northcentral Pennsylvania. The model was developed under Task 1 of the "Silver Jackets Interagency Project-Chemung River Flood Inundation Mapping (FIM) Tool -Scope of Study" (referred to as the "FIM Project"), prepared by the New York Silver Jackets Team in July 2017.

The model will serve two purposes. First, it will be used in future tasks of the FIM Project to create a set of stage inundation map libraries for the project area based on three National Oceanographic and Atmospheric Administration National Weather Service (NWS) flood forecast points on the Chemung River at Chemung, Elmira, and Corning (and possibly Erwin on the Tioga River). The stage inundation map libraries will be displayed digitally for public consumption on the NWS's Advanced Hydrologic Prediction Service (AHPS) map viewer site.

A second purpose of the model is to provide the Federal Emergency Management Agency (FEMA) with updated modeling for the study area to be used for regulatory and non-regulatory products, at their discretion. All modeling was completed to FEMA guidelines and specifications for flood mapping partners, and the modeling can be used for updates to the Flood Insurance Studies (FIS) or for levee freeboard evaluations.

## 1.2 STUDY AREA

The study area for the HEC-RAS modeling includes the Chemung River from its confluence with the Susquehanna River to its formation where the Tioga River and Cohocton Rivers meet near Corning, New York (approximately 45.6 river miles). The study area also includes approximately 1.8 miles of the Cohocton River from its confluence with the Chemung River to just downstream of Robert Dann Drive, and approximately 4.2 miles of the Tioga River from its confluence with the Chemung River upstream to just downstream of the confluence of the Canisteo River (Figure 1.1).

The studied reach includes the following communities: Athens Borough and unincorporated areas of Bradford County, Pennsylvania; the Towns of Ashland, Big Flats, Chemung, Elmira, Southport, and the City of Elmira in Chemung County, New York; and the Towns of Corning, Erwin, Painted Post and the City of Corning in Steuben County, New York.

The studied reach contains several United States Geological Survey (USGS) streamflow gages, levee systems, and the flow is significantly impacted by flow regulation by dams. Four USGS streamflow gages, Chemung, Elmira, and Corning on the Chemung River, and Erwins on the Tioga

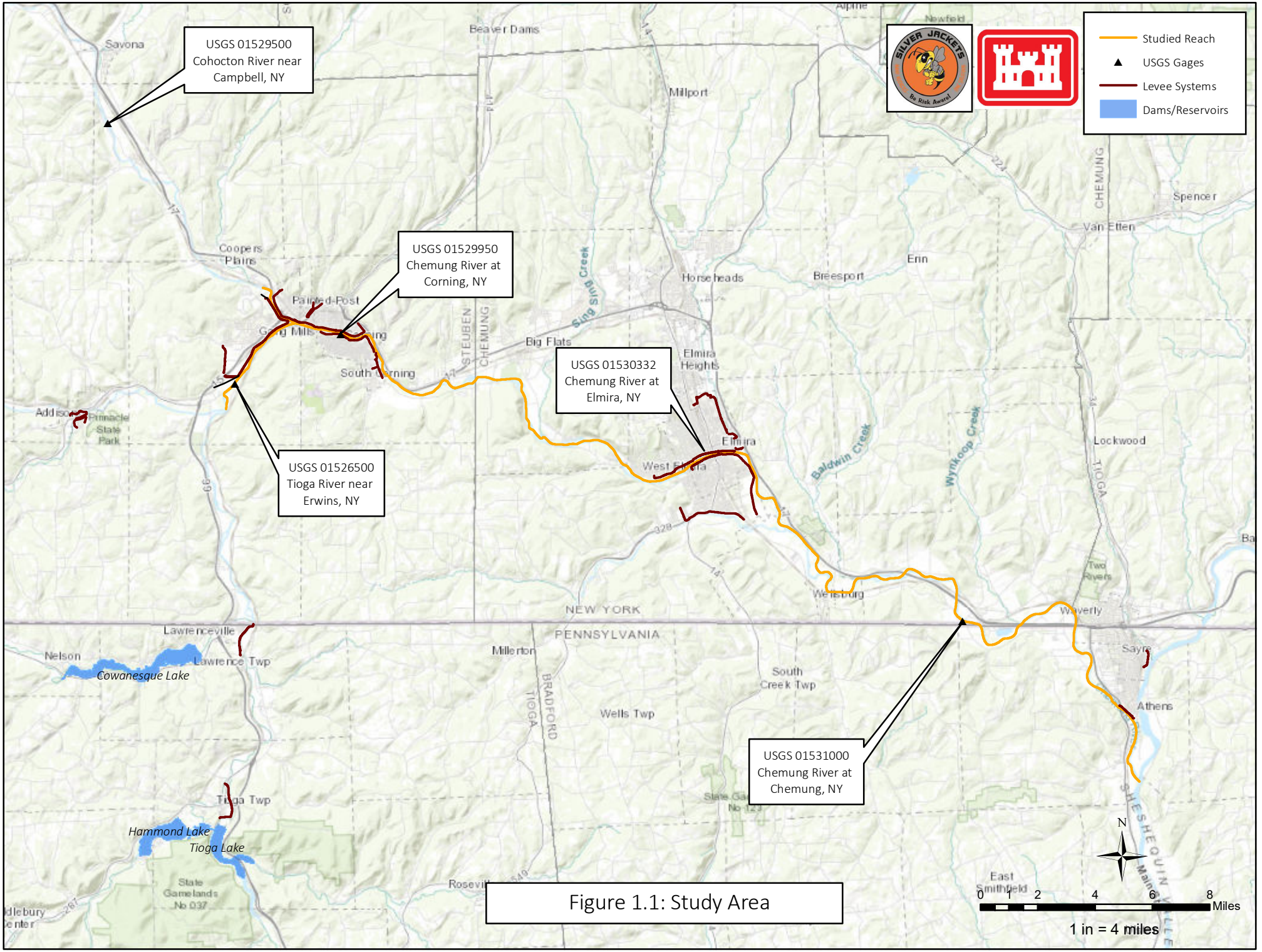


Figure 1.1: Study Area

River are located on the studied reach, with another being used in hydrologic computations on the Cohocton River (Campbell). These streamflow gages are shown on Figure 1.1, with details on these gages outlined on Table 1.1.

Table 1.1: USGS Streamflow Gages on Studied Reach

| *Station #* | *Name* | *Drainage Area (square miles)* | *Period of Record* |
|---|---|---|---|
| 01531000 | Chemung River at Chemung, NY | 2,506 | 1904-Current (114 years, 39 regulated years) |
| 01530332 | Chemung River at Elmira, NY | 2,162 | 1988-Current (30 years) |
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There are eight levees along the studied reach of the Chemung River and Tioga River (Figure 1.1). The Gang Mills Flood Damage Reduction Project (Gang Mills levee) is located on the left bank of the Tioga River. This project was completed in December 1977 by the New York Department of Environmental Conservation. The project includes approximately 11,900 linear feet of levee along the Tioga River, and incorporates an existing levee on the Cohocton River completed prior to the project. The Corning and Painted Post Flood Damage Reduction Project is located on the left bank of the Cohocton and Chemung Rivers (Corning and Painted Post levee/floodwall) and along the right bank of the Chemung River (South Corning levee/floodwall). This project was fully completed in 1955 and includes several thousand feet of levee and approximately 3,300 feet of floodwall. The Elmira Flood Damage Reduction Project contains the North Elmira and South Elmira levee/floodwall along the Chemung River. This project was fully completed in 1959 and includes several thousand feet of levee and approximately 3,300 feet of floodwall. In Athens, Pennsylvania is the Athens Flood Protection Works (Athens levee) on the left bank of the Chemung River. This levee was completed in November 1949, rehabilitated in August 1977, and extended in July 1982. The project was constructed by USACE and is currently maintained by Athens Borough.

The studied reaches of the Chemung River and Tioga River are significantly influence by controlled flow from upstream dams. These dams include the Tioga-Hammond Lakes project and Cowanesque Lake, both constructed and operated by USACE. The Tioga-Hammond Lakes project is unique in that it consists of two separate dams, one on the Tioga River (Tioga Lake) and the other along Crooked Creek (Hammond Lake). The lakes formed by both dams are joined by a gated connecting channel. The project was operationally complete in 1978. The construction of Cowanesque Dam, which forms Cowanesque Lake, was completed in 1980. These dams, collectively, have significantly reduced the flood risk for downstream communities.

## 1.3 GENERAL MODELING APPROACH

Unfinished modeling was provided by FEMA for the study reach as a starting point for this effort. This work was completed by RAMPP in November 2013, as outlined in the *"Status Report of Hydraulic Analysis for Chemung Watershed, New York- Task HSFE-02-10-J-0001-FEMA Contract HSFEHQ-09-D-0369"* and *"Hydrologic Analysis Technical Support Data Notebook- Task HSFE-02-10-J-0001-FEMA Contract HSFEHQ-09-D-0369"*. The FEMA modeling was partially completed for the non-leveed reaches only, and the portions that were modeled were incomplete in that calibration was never achieved. USACE used the survey data for the channel and bridges and the general cross-section layout that were included in these models, but essentially revised all other hydraulic variables in order to achieve calibration.

A general modeling approach was developed in order to assure the HEC-RAS modeling is fully calibrated and was set-up to meet the two purposes of the study (FIM Project and FEMA product). This involved hydrologic computations to develop flow files for historical storms, frequency storms, and FIM stages. These computations were then input into the HEC-RAS model and the calibration process involved three steps.

1. Calibration to historical storm events. This was the first step in order to assure the model computed water surface elevations that match a range of historical flood events, ranging from smaller, more frequent events, to larger, less frequent events. The storms chosen are shown in Table 1.2.

Table 1.2: Historical Storms Modeled

| *Storm* |
|---|
| 10/20/2011 |
| 1/24/1999 |
| 1/31/2013 |
| 1/25/2010 |
| 2/6/2008 |
| 3/15/2007 |
| 1/19/1996 |
| Eloise 1975 |
| Agnes 1972 |

For this step, the Cohocton River, Tioga River, and Chemung River were all included in the same geometry file for ease of calibration. The model was adjusted in order to match observed flood elevations at the USGS gages and high water marks for Agnes 1972 for numerous locations in the studied reach. The Tioga River was also separated out specifically for the Eloise 1975 and Agnes 1972 storms because the Gang Mills levee was not in place at the time of those events.

2. Refinement of calibration to frequency flow events. Flood frequency flows were provided by USGS (discussed in Section 2) and were used to further validate/refine the calibration process. The frequency storms included in this step are shown in Table 1.3.

Table 1.3: Frequency Storms Modeled

| *Recurrence Interval* | *Percent Chance Flood* |
|---|---|
| 2-year | 50% |
| 5-year | 20% |
| 10-year | 10% |
| 25-year | 4% |
| 50-year | 2% |
| 100-year | 1% |
| 200-year | 0.4% |
| 500-year | 0.2% |
| 1000-year | 0.1% |

For this step, the Cohocton River was separated into its own geometry file as to assume a non-coincident peak downstream boundary condition, and the Tioga River and Chemung River were merged into one reach. The model was further refined to match the USGS rating curves at the gages for these events.

3. Finalization of calibration to rating curves at USGS gaging stations for FIM Project flows. The FIM Project Flows were broken up into 33 separate profiles to match approximately 1 ft. stages at the NWS forecast points (this process discussed in Section 2). The model was finalized by calibrating the model to the USGS rating curves at the gages for all 33 flows included in the model.

# 2 HYDROLOGY

Three separate flow files were developed to input into the HEC-RAS model: historical events, frequency events, and FIM Project flows. Each flow file involved identifying the flow values at the USGS gages via observed or computed frequency values and then translating the values to other non-gaged flow points along the studied reach. There are 23 flow points identified along the Chemung River (CR), Tioga River (TR), and Cohocton River (COH). The locations of these points is shown on Figure 2.1 and are listed in Table 2.1.

Table 2.1: Flow Points

| *Flow Point* | *Name* | *Drainage Area (square miles)* |
|---|---|---|
| TR2 | At USGS 01526500-Tioga River near Erwins, NY | 1377.0 |
| TR1 | At confluence with Cohocton River | 1380.0 |
| COH2 | Upstream of confluence of Hodgmans Creek | 597.0 |
| COH1 | At confluence with Tioga River | 604.0 |
| CR25 | Upstream of the confluence of Cutler Creek | 1984.0 |
| CR24 | At USGS 01529950-Chemung River at Corning, NY | 2006.0 |
| CR23 | Downstream of confluence of Post Creek | 2040.0 |
| CR22 | Downstream of confluence of Whiskey Creek | 2070.0 |
| CR21 | At South Corning Road | 2070.0 |
| CR20 | Downstream of confluence of Sing-Sing Creek | 2130.0 |
| CR19 | Downstream of confluence of Herdy Creek | 2140.0 |
| CR18 | At South Main Street | 2160.0 |
| CR17 | Downstream of confluence of Newtown Creek | 2240.0 |
| CR15 | Downstream of confluence of Seeley Creek | 2390.0 |
| CR14 | At Lowman Crossover Road | 2450.0 |
| CR13 | At U.S. Route 86 | 2500.0 |
| CR12 | At USGS 01531000-Chemung River at Chemung, NY | 2506.0 |
| CR11 | 0.1 miles upstream of the confluence of Orcutt Creek | 2507.2 |
| CR9 | Immediately north of the State boundary | 2518.7 |
| CR8 | Immediately upstream of the confluence of Dry Creek | 2565.7 |
| CR5 | Immediately upstream of the confluence of Tutelow Creek | 2570.4 |
| CR4 | 1.3 miles upstream of the confluence of Murray Creek | 2577.5 |
| CR1 | At confluence with Susquehanna River | 2594.1 |

For translation to ungaged flow points directly upstream or downstream of a gage, the translation equation below was utilized:

$$Q_u = (A_u/A_g)\, Q_g$$

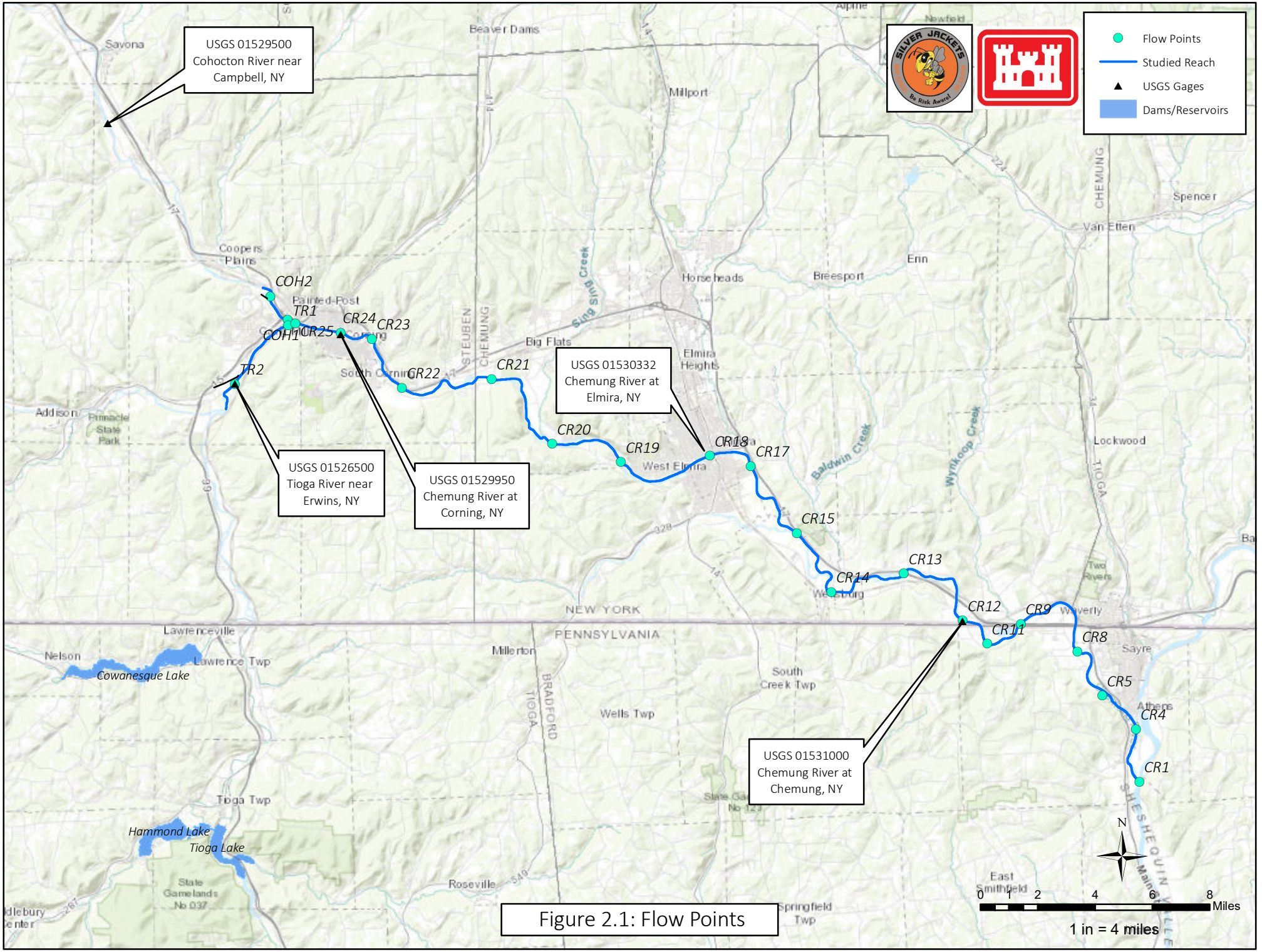



Figure 2.1: Flow Points

Where $Q_u$ = the flow at the ungaged site, in cfs.
$A_u$ = the drainage area of the ungaged site, in square miles.
$A_g$ = the drainage area of the gage site, in square miles.
$Q_g$ = the flow at the gaged site, in cfs.

The drainage area to all ungaged flow points was determined using the USGS StreamStats program. For translation to ungaged flow points between two gages, the following equation was utilized:

$$Q_{T(C)} = Q_{T(AC)} \times \frac{DA_B - DA_C}{DA_B - DA_A} + Q_{T(BC)} \times \frac{DA_C - DA_A}{DA_B - DA_A}$$

where $Q_{T(C)}$ is the final weighted discharge at ungaged site C, in cubic feet per second;
$Q_{T(AC)}$ is the weighted and moved discharge from upstream streamflow-gaging station (gage A), in cubic feet per second;
$Q_{T(BC)}$ is the weighted and moved discharge from downstream streamflow-gaging station (gage B), in cubic feet per second;
$DA_A$ is the drainage area of the upstream streamflow gage A;
$DA_B$ is the drainage area of the downstream streamflow gage B; and
$DA_C$ is the drainage area of ungaged site C.

## *Historical Events*

For historical events, peak flow values for the storm events shown in Table 1.2 at the USGS gages were used to translate flows to the ungaged flow points. This flow data was entered into the HEC-RAS model as the flow file "ChemungRiver_Calibration". The Agnes 1972 storm was a major flood event that occurred prior to the construction of the Tioga-Hammond and Conewesque dams. During Agnes, the levees in Corning and Elmira overtopped, which resulted in significant losses in flow in the system. This is evident by the flow readings at the USGS gages, shown in Table 2.2, where flow at the Chemung gage is lower than the estimated flow at the Elmira gage, even though the Chemung gage is located downstream.

Table 2.2: Agnes 1972 Peak Flows at USGS Gages

| *Station #* | *Name* | *Drainage Area (square miles)* | *Agnes 1972 Peak Flow (cfs)* |
|---|---|---|---|
| 01531000 | Chemung River at Chemung, NY | 2,506 | 189,000 |
| 01530332 | Chemung River at Elmira, NY | 2,162 | 235,000 |
| 01529950 | Chemung River at Corning, NY | 2,006 | 228,000 |
| 01526500 | Tioga River near Erwins, NY | 1,377 | 190,000 |
| 01529500 | Cohocton River near Campbell, NY | 470 | 32,000 |

This loss of flow created a challenge in a one-dimensional, steady-state HEC-RAS environment; however, to be discussed in Section 3, the situation was handled by inputting select levees as lateral structures in the model to account for the flow losses.

### *Frequency Events*

Based upon the agreed upon scope for this project, the USGS was to provide USACE with the frequency flows to input into the HEC-RAS model. USGS provided the frequency flows computed in the *"USGS Scientific Investigations Report (SIR) 2014-5084, Maximum Known Stages and Discharges of New York Streams and their Annual Exceedance Probabilities through September 2011".* This publication, dated July 2014, provides frequency flow estimates for all gages in the study area utilizing the Log-Pearson Type III method to Water Year 2011, utilizing only the regulated years of the period of record. The 0.1-percent chance (1000-year) flood event was estimated by plotting a frequency curve and extrapolating the curve to this event. The frequency values used at the USGS gages in this project are shown in Table 2.3.

Table 2.3: Frequency Flows at USGS Gages

| *Frequency Storm* | 01531000 Chemung River at Chemung, NY | 01530332 Chemung River at Elmira, NY | 01529950 Chemung River at Corning, NY | 01526500 Tioga River near Erwins, NY | 01529500 Cohocton River near Campbell, NY |
|---|---|---|---|---|---|
| 2-year | 38,200 | 32,600 | 29,700 | 20,900 | 7,140 |
| 5-year | 51,100 | 42,700 | 38,500 | 26,900 | 11,200 |
| 10-year | 59,900 | 49,700 | 43,800 | 30,800 | 14,600 |
| 25-year | 71,100 | 58,700 | 50,100 | 35,500 | 19,500 |
| 50-year | 79,600 | 65,600 | 54,600 | 39,000 | 23,900 |
| 100-year | 88,300 | 72,700 | 58,900 | 42,500 | 28,700 |
| 200-year | 97,100 | 80,100 | 63,000 | 46,000 | 34,200 |
| 500-year | 109,000 | 90,200 | 68,300 | 50,600 | 42,600 |
| 1000-year | 120,000 | 100,000 | 74,000 | 56,000 | 50,500 |

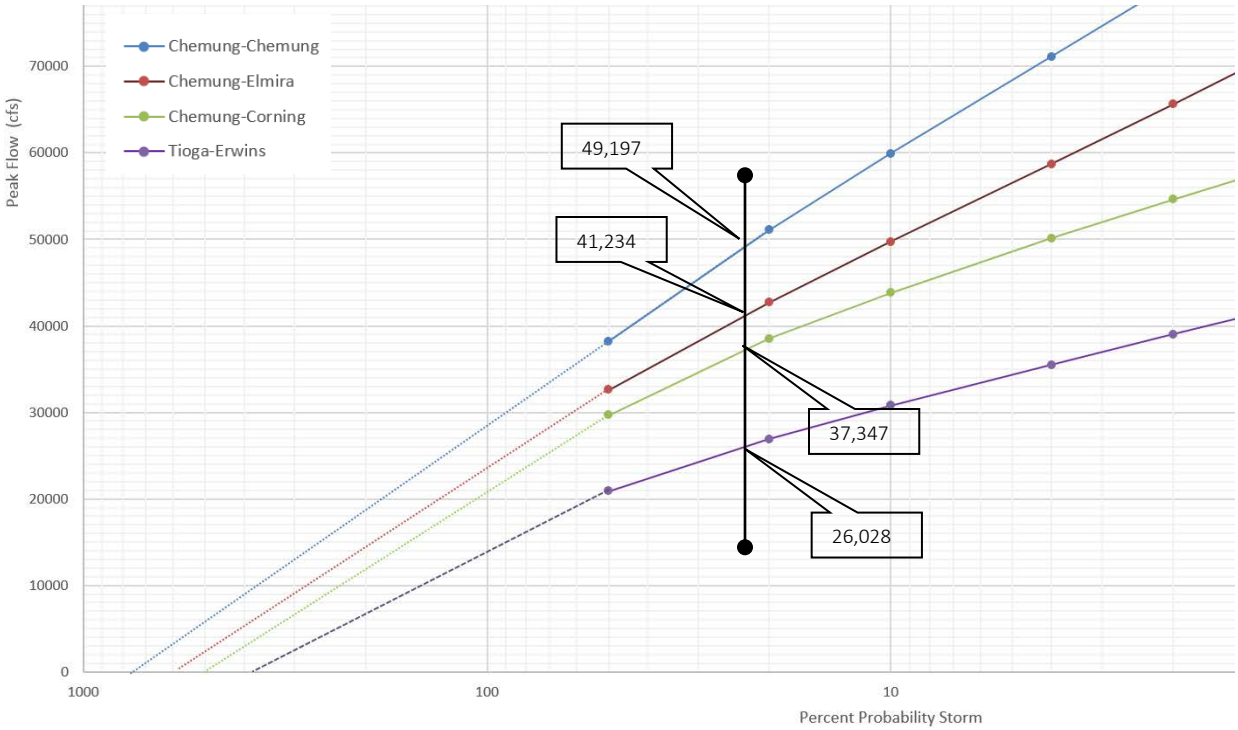
For the frequency events, peak flow values shown in Table 2.2 at the USGS gages were used to translate flows to the ungaged flow points. This flow data was entered into the HEC-RAS model as the flow files "ChemungRiver_FrequencyFlows" and "CohoctonRiver_FrequencyFlows".

## *FIM Project Flows*

For the FIM Project flows, a correlation must be established between gages in order to determine the number of flow profiles to meet the overall purpose of the study, which is to provide mapping for approximately every 1-ft. stage at the USGS gages. For the correlation, the process includes establishing a baseline gage, plotting the frequency curves for all gages on one graph, and determining what flow is expected and each gage when the baseline gage is measuring a certain flow value. During the correlation, effort is made to assure that the "Action", "Flood", "Moderate Flood", and "Major Flood" stages at all gages are captured in an FIM profile.

Then, once this is established, translating the flows to ungaged flow points, as described above. For this exercise, the Chemung gage was used as the baseline gage since it has the longest period of record. At the Chemung gage, the "Flood" stage is 16.0 feet, which equates to an elevation of 794.1 ft. NAVD 88. The flow that creates this stage is 49,197 cfs based upon the most recent rating curve provided by USGS. When plotted on a frequency curve with other gages, the estimated flows at the other gages can be determined when the Chemung gage is at a flow of 49,197. This is demonstrated on Figure 2.2.

Figure 2.2: Frequency Curve Correlation Process




This process was followed for every 1 ft. increment at the Chemung gage up to the flow from Agnes 1972. After meeting all the flood stages at other gages, a total of 33 profiles were included in the FIM Project flow file, titled "ChemungRiver_FIM". Frequency curves for all the

gages were only plotted up to the 0.1-percent annual (1000-year) chance flood. Thus, for flows higher than this, and less than Agnes (1972), the curves were extrapolated to provide values up to Agnes 1972. The Cohocton River was not included in the FIM Project flows because there is no direct correlation between the gages on the Chemung River and the Cohocton River. The Cohocton River is not impacted by dams and the drainage area of the Cohocton River is much smaller than the Chemung-Tioga Rivers, and this it is anticipated that the peak of the Cohocton River would pass prior to the peak of the Chemung-Tioga Rivers. For the FIM Project flows, peak flow values determined through the correlation at the USGS gages were used to translate flows to the ungaged flow points.

All computation tables and curves are provided in Appendix A of this document.

# 3 HEC-RAS MODELING

The USACE HEC-RAS (River Analysis System), version 5.0.3, was used to develop a geo-referenced, steady-state hydraulic model for the studied reaches. The HEC-GeoRAS pre- and post-processor utilities were used to assist in the development of cross-sections. All elevations in the modeling are referenced to the NAVD88 vertical datum with a horizontal coordinate system of New York State Plane Central feet.

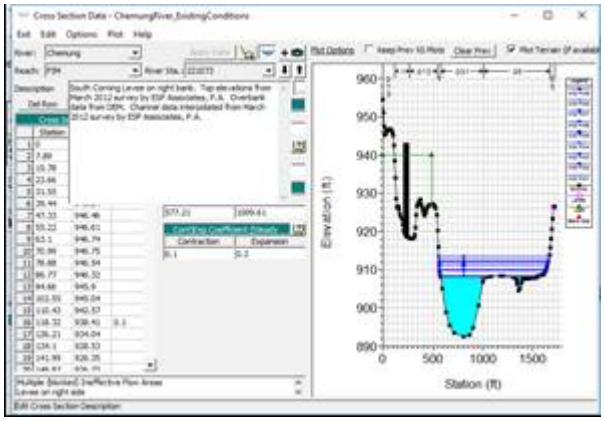
The model contains five plan files, utilizing four geometry files and four flow files. A list of the plan files included, and their relevance are shown in Table 3.1, with explanations of the data used and methodology described in this section.

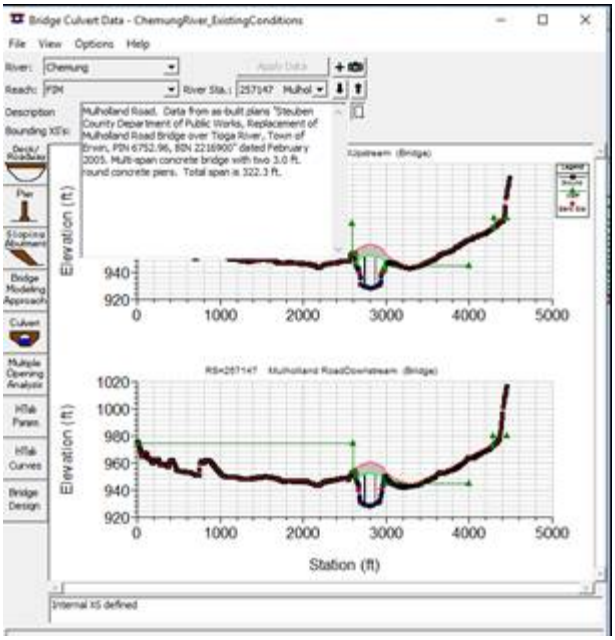
Table 3.1: Plan Files in HEC-RAS Model

| *Title* | *Filename* | *Details* |
|---|---|---|
| ChemungRiver_Calibration | ChemungRiver.p01 | Calibration plan. The calibration for the Tioga River for Agnes is not accurate in this plan due to the levee being constructed after Agnes. Refer to "TiogaRiver_Calibration" plan for calibration results for Tioga River. |
| TiogaRiver_Calibration | ChemungRiver.p02 | Tioga River calibration plan. This plan contains geometry that reflects conditions pre-1976, when Gang Mills levee on the Tioga River was constructed. |
| ChemungRiver_FrequencyFlows | ChemungRiver.p03 | Existing-conditions plan for Chemung River and Tioga River. Calibrated to rating curve at USGS gaging stations. Tioga River is XS 241800 and upstream. Flow values from USGS SIR 2014-5084 (2014). This plan is the EXISTING-CONDITIONS plan for FEMA for the Chemung River and Tioga River. |
| CohoctonRiver_FrequencyFlows | ChemungRiver.p04 | Plan for Cohocton River only, using non-coincident peak as downstream boundary condition. This plan is the EXISTING-CONDITIONS plan for FEMA for the Cohocton River. |
| ChemungRiver_FIM | ChemungRiver.p05 | FIM plan for Chemung River and Tioga River. 33 profiles used and model calibrated in previous plans and to rating curves at all USGS gages. |

The model is fully documented to allow the user to know what sources of data were used for each cross-section and bridge. The information is in the description boxes of the cross-sections and bridges, as shown in Figure 3.1. The information includes sources and channel and overbank elevation data; sources of levee data; and a correlation to effective FEMA lettered cross-section locations.

Figure 3.1: Model Documentation



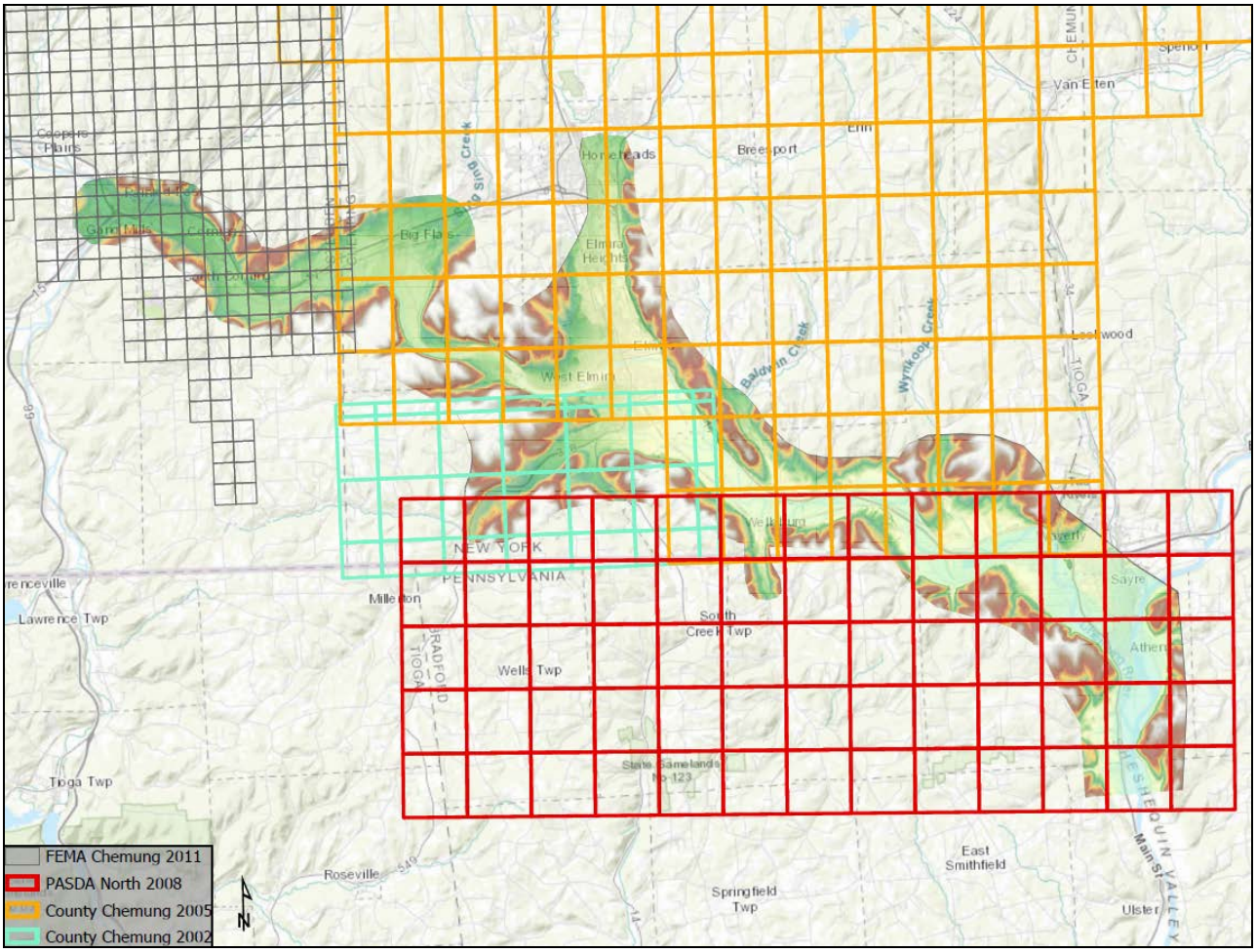



## *Topographic Data*

A project digital elevation model (DEM) was created for the studied reach by meshing together the most recent available digital elevation data available. This project DEM was used for the overbank elevation data for the HEC-RAS model and will be used for the creation of the inundation mapping and depth grids. The project DEM is a compilation of the following data sets, as shown on Figure 3.2: FEMA Chemung Watershed 2011; PASDA North 2008; County Chemung Watershed 2005; and County Chemung Watershed 2002. The resolution of the project DEM is 8.0 ft., which is based on the spacing of points in the Chemung 2002 and 2005 collections. These are older collections and are roughly spaced out at 8.0 to 10.0 feet. Any resolution at greater than 8.0 ft. would be increasing precision without necessarily increasing accuracy. Since the bulk of the area is within these two datasets, a resolution of 8.0 ft. was selected for the entire dataset.

The HEC-GeoRAS pre-processor, using the project DEM, was used to develop cross-sections for the studied reach. The overbank portions of the cross-sections are from the DEM. The "wet sections" of the cross-sections for the Chemung River were input based upon a channel field survey data provided by FEMA, completed in March 2012 by ESP Associates, P.A. under FEMA Task Order HSFE-02-10-J-0002. For the Tioga River and Cohocton River, channel data was input based upon a USACE field survey in April 2018. For intermediate cross-sections between surveyed sections, the channel dimensions and elevations were interpolated.

Figure 3.2: Project DEM Data Sources




## *Bridges*

Data for bridges were obtained from several sources. For the majority of the bridges on the Chemung River, data was provided by FEMA via a field survey completed between November 2009 and February 2012 by ESP Associates, P.A. under FEMA Task Order HSFE-02-10-J-0002. For a few bridges on the Chemung River and the Tioga River, bridge data was obtained from a field survey completed by USACE in April 2018. For the Cohocton River, all bridge data was obtained from as-built plans provided by the New York Department of Transportation, except for a railroad, which was field surveyed by USACE in April 2018.

## *Levees and Floodwalls*

Top of protection for levees and floodwalls were input into the HEC-RAS model based upon the most recent data available. The data source for each levee/floodwall is shown in Table 3.2. During the calibration process, calibration could not be achieved for Agnes 1972 because of the

Table 3.2: Levees/Floodwalls in Chemung River HEC-RAS Model

| *Levee/Floodwall* | *Project* | *River* | *Data Source* |
|---|---|---|---|
| Gang Mills | Gang Mills Flood Damage Reduction Project | Tioga River | National Levee Database |
| Gang Mills | Gang Mills Flood Damage Reduction Project | Cohocton River | March 2012 survey by ESP Associates, P.A under FEMA Task Order HSFE-02-10-J-0002 |
| Painted Post | Corning and Painted Post Flood Damage Reduction Project | Cohocton River | March 2012 survey by ESP Associates, P.A under FEMA Task Order HSFE-02-10-J-0002 |
| Corning | Corning and Painted Post Flood Damage Reduction Project | Chemung River | March 2012 survey by ESP Associates, P.A under FEMA Task Order HSFE-02-10-J-0002 |
| South Corning | Corning and Painted Post Flood Damage Reduction Project | Chemung River | March 2012 survey by ESP Associates, P.A under FEMA Task Order HSFE-02-10-J-0002 |
| Elmira North | Elmira Flood Damage Reduction Project | Chemung River | Survey dated November 2007 from National Levee Database as described in "Baltimore District National Levee Database Surveys Part I Project Report" dated October 20, 2008. |
| Elmira South | Elmira Flood Damage Reduction Project | Chemung River | Survey dated November 2007 from National Levee Database as described in "Baltimore District National Levee Database Surveys Part I Project Report" dated October 20, 2008. |
| Athens | Athens Flood Protection Works | Chemung River | National Levee Database |

levee/floodwalls overtopping in Corning and Elmira. The calibration was difficult because of the flood losses associated with the levee overtopping. Based upon high water marks during the Agnes 1972 flood event, in both Elmira and Corning the overtopping on the north side of the levee system was held and stored inside the interior flood area due to high ground and tributary levees trapping the flow, and the overtopping on the south side of the levee system overtopped and reconnected back into the system downstream of the levee. This is shown in Figure 3.3 in Elmira.

Because of this historical high water mark evidence, the South Corning levee/floodwall and the Elmira South levee/floodwall were input as lateral structures in the model, and the flow loss was optimized using the optimization tool in HEC-RAS. Using this approach, calibration for the Agnes 1972 flood event was obtained in most locations.

### *Manning's Roughness Values*

Roughness factors (Manning's "n") were chosen based upon engineering judgment, land use, aerial photography, and field observation. Base values for the Chemung River channel were set at .027-.031, and base values for the Tioga River and Cohocton River channels were set at .033 and .030, respectively. Base overbank values for all flooding sources were set at .013-.20, with .013 representing concrete areas such as roads, and .20 being used for areas with numerous buildings causing obstructions to flow. These values were adjusted during the calibration process using the "Flow Roughness Factors" option in HEC-RAS, where n values were reduced or increased as flood elevations increased. The "Flow Roughness Factors" option in HEC-RAS was the primary method of calibration in the HEC-RAS model, although minor tweaks to ineffective flow areas and bridge modeling approaches were also utilized to obtain calibration.

### *Ineffective Flow Areas and Obstructions*

Ineffective flow areas were set appropriately at bridges and other areas where flood flow would not be effective. Obstructions in the model represent buildings that would occupy storage space for floodwaters. For areas with widespread development, such as Corning or Elmira, the building areas were represented with high Manning's n values (.20) instead of obstructions.

### *Contraction/Expansion Coefficients*

Contraction/expansion values for the cross-sections at most bridges were set at the FEMA recommended values of .3 and .5, respectively; however, in areas with constricted flow from levees and floodwalls, such as in Corning and Elmira, the values at the bridges were set at .1 and .3, respectively. At these locations, the contraction/expansion into the constructed bridges is minimal. All other cross-sections not associated with bridges were assigned contraction/expansion coefficients of .1 and .3, respectively.


Figure 3.3: Lateral Structure in Elmira

### *Reach Boundary Conditions*

The downstream boundary condition used for the all the Chemung River flow/plan files was normal depth, as the peak of the Chemung River for most storm events would pass prior to the peak of the Susquehanna River; however, for the Chemung River FIM Project, it should be noted that the downstream boundary condition on the Susquehanna River may have an impact on water surface elevations in Athens Borough. On the AHPS site, a note should be made that the map layers shown are assuming a normal or low flow condition on the Susquehanna River. The downstream boundary condition used for the Cohocton River frequency flow/plan file was also set at normal depth.

### *Calibration*

The HEC-RAS models were calibrated to the historical storm events, frequency flow events, and FIM Project flows, using the current rating curves, at all USGS gages. For the historical storm events, the model was also calibrated to Agnes 1972 high water marks at numerous locations in the studied reach. High water mark data for Agnes 1972 was obtained from the document *"Letter Report-Susquehanna River Basin Flood Hydrology Study, Floodplain Delineation for Department of the Army, North Atlantic Division, Corps of Engineers".* This report was completed in January 1973 by Anderson-Nichols for USACE. The goal was to have the HEC-RAS model computed water surface elevations within +/- 0.5 ft. This goal was generally achieved at most locations, with the Agnes 1972 calibration varying tremendously, especially in Corning and Elmira, where the overtopping of the levee caused stability issues in the model. Calibration results are shown in Appendix B.

### *Results*

The HEC-RAS modeling results for the ChemungRiver_FIM plan will be displayed as map layers and depth grids on AHPS. The results of the ChemungRiver_FrequencyFlows and CohoctonRiver_FrequencyFlows, which may be utilized by FEMA to update regulatory and non-regulatory products, or for levee analyses, are provided in Appendix C. The data provided in Appendix C includes a table that shows the difference in 1-percent annual (100-year) flood elevations at all effective FEMA lettered cross-sections as well as a table that shows the 1-percent annual (100-year) flood freeboard at all levee systems in the studied reach.

In general, 1-percent annual (100-year) flood elevations are reduced significantly between the effective FEMA study and the existing-conditions (frequency flows) analysis in this study. This is primarily due to an approximately 10-percent reduction in 1-percent annual (100-year) peak flows in the studied reach. For example, in Elmira, the 1-percent annual (100-year) peak flow in the effective FIS is 80,000 cfs. The existing-conditions value is 72,700 cfs. At the Chemung gage, the effective FIS peak flow is 100,000 cfs, while the existing-conditions value is 88,300 cfs. Other factors that may contribute to the reduction in water surface elevations is better survey and topographic data as well as better modeling technology.

Significant freeboard exists on most levee systems in the studied reach (Table 3.3). This is due to the fact that the Tioga-Hammond Lakes and Cowanesque Lake projects reduced the peak flows at these locations, adding another level of flood risk reduction to the already existing risk reduction associated with the construction of the levees.

Table 3.3: Freeboard at Levees

| *Levee/Floodwall* | *River* | *Freeboard Range (ft.)* |
|---|---|---|
| Gang Mills | Tioga River | 9.2-14.2 |
| Gang Mills | Cohocton River | 7.3-19.7 |
| Painted Post | Cohocton River | 7.6-18.1 |
| Corning | Chemung River | 10.0-29.2 |
| South Corning | Chemung River | 8.9-16.5 |
| Elmira North | Chemung River | 5.9-9.3 |
| Elmira South | Chemung River | 2.2-8.8 |
| Athens | Chemung River | 5.0-7.5 |

# 4 NEXT STEPS

This model will be used in future tasks of the FIM Project and may be used by FEMA to update regulatory and non-regulatory products, or for levee analyses.

## *FIM Project*

Cross-sections were aligned in order to capture the full extent of backwater areas wherever possible, to simplify the mapping process; however, in some cases, this was not possible, and the mapping team will need to manually generate inundation boundaries and depth grids for some areas. The modeling team will work with the mapping team to highlight these areas.

## *FEMA Usage of Model*

A floodway encroachment analysis is required if the data developed in this effort were to be used by FEMA. This task was outside the scope of the FIM Project. In addition, tie-in issues would need to be resolved on the upstream ends of the Cohocton River and Tioga Rivers. On the Tioga River, there is a -1.3 ft. difference between the effective FEMA model and the existing-conditions model in this FIM Project. On the Cohocton River, this difference is + 1.1 ft.

# APPENDIX A


Hydrologic Computations Tables and Curves

FREQUENCY FLOWS PROVIDED BY USGS

| Station number | Station name and location | Drainage area (mi2) | Source | Methodology | Recurrence interval (years) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | *1000 |
| | | | | | Associated discharge (ft3/s) | | | | | | | | |
| 1531000 | CHEMUNG R AT CHEMUNG, NY | 2,506 | USGS SIR 2014-5084 (2014) | Log-Pearson Type III, Bulletin 17B to Water Year 2011-Only Regulated Years (33) | 38,200 | 51,100 | 59,900 | 71,100 | 79,600 | 88,300 | 97,100 | 109,000 | 120,000 |
| 1530332 | CHEMUNG R AT ELMIRA, NY | 2,162 | USGS SIR 2014-5084 (2014) | Log-Pearson Type III, Bulletin 17B to Water Year 2011-Only Regulated Years (24) | 32,600 | 42,700 | 49,700 | 58,700 | 65,600 | 72,700 | 80,100 | 90,200 | 100,000 |
| 1529950 | CHEMUNG R AT CORNING, NY | 2,006 | USGS SIR 2014-5084 (2014) | Log-Pearson Type III, Bulletin 17B to Water Year 2011-Only Regulated Years (33) | 29,700 | 38,500 | 43,800 | 50,100 | 54,600 | 58,900 | 63,000 | 68,300 | 74,000 |
| 1526500 | TIOGA R NR ERWINS, NY | 1,377 | USGS SIR 2014-5084 (2014) | Log-Pearson Type III, Bulletin 17B to Water Year 2011-Only Regulated Years | 20,900 | 26,900 | 30,800 | 35,500 | 39,000 | 42,500 | 46,000 | 50,600 | 56,000 |
| 1529500 | COHOCTON R NR CAMPBELL, NY | 470 | USGS SIR 2014-5084 (2014) | Log-Pearson Type III, Bulletin 17B to Water Year 2011 | 7,140 | 11,200 | 14,600 | 19,500 | 23,900 | 28,700 | 34,200 | 42,600 | 50,500 |

## USGS 01531000-Chemung River at Chemung, New York

| | |
|---|---|
| Gage Elevation (NGVD29) | 778.63 |
| Conversion to NAVD88 (per VERTCON) | -0.55 |
| Gage Elevation (NAVD88) | 778.08 |
| Rating Used | 60.1 |

| Category | Depth (feet) | Elevation (NAVD88) |
|---|---|---|
| Action | 12 | 790.08 |
| Flood | 16 | 794.08 |
| Moderate Flood | 20 | 798.08 |
| Major Flood | 24 | 802.08 |

| | USGS Rating Curve (60.1) | | | |
|---|---|---|---|---|
| FIM Profile | Depth (feet) | Elevation (NAVD88) | Flow (cfs) | Notes |
| 1_ActionCorning | 11.8 | 789.8 | 25506 | |
| 2_ActionChemung | 12.0 | 790.1 | 26557 | Action |
| 3 | 13.0 | 791.1 | 31590 | |
| 4_ActionElmira | 13.3 | 791.4 | 33031 | |
| 5 | 14.0 | 792.1 | 37069 | |
| 6 | 15.0 | 793.1 | 42940 | |
| 7_FloodElmira | 15.2 | 793.3 | 44038 | |
| 8_FloodChemung | 16.0 | 794.1 | 49197 | Flood |
| 9 | 17.0 | 795.1 | 55836 | |
| 10 | 18.0 | 796.1 | 63194 | |
| 11_ModElmira | 18.1 | 796.2 | 64006 | |
| 12 | 19.0 | 797.0 | 71117 | |
| 13_ModChemung | 20.0 | 798.1 | 80429 | Moderate Flood |
| 14 | 20.3 | 798.4 | 83011 | |
| 15 | 21.0 | 799.1 | 89840 | |
| 16_MajElmira | 21.4 | 799.5 | 93851 | |
| 17 | 22.0 | 800.1 | 99781 | |
| 18 | 23.0 | 801.1 | 111578 | |
| 19_FloodErwin | 23.2 | 801.3 | 114096 | |
| 20_ModErwin | 23.9 | 802.0 | 122485 | |
| 21_MajChemung | 24.0 | 802.1 | 123055 | Major Flood |
| 22_FloodCorning | 24.2 | 802.3 | 125464 | |
| 23_MajErwins | 24.4 | 802.5 | 127547 | |
| 24_ModCorning | 24.8 | 802.9 | 132023 | |
| 25 | 25.0 | 803.1 | 134275 | |
| 26 | 26.0 | 804.1 | 145236 | |
| 27 | 27.0 | 805.1 | 155972 | |
| 28 | 28.0 | 806.1 | 164797 | |
| 29_MajCorning | 28.5 | 806.5 | 168018 | |
| 30 | 29.0 | 807.1 | 171702 | |
| 31 | 30.0 | 808.1 | 178467 | |
| 32 | 31.0 | 809.1 | 185246 | |
| 33_Agnes | 31.6 | 809.7 | 189253 | Agnes 1972 |

## USGS 01530332-Chemung River at Elmira, NY

| | |
|---|---|
| Gage Elevation (NGVD29) | 833.65 |
| Conversion to NAVD88 (per VERTCON) | -0.6 |
| Gage Elevation (NAVD88) | 833.05 |
| Rating Used | 8.0 |

| Category | Depth (feet) | Elevation (NAVD88) |
|---|---|---|
| Action | 10 | 843.05 |
| Flood | 12 | 845.05 |
| Moderate Flood | 15 | 848.05 |
| Major Flood | 19 | 852.05 |

| USGS Rating Curve (8.0) | | | |
|---|---|---|---|
| Depth (feet) | Elevation (NAVD88) | Flow (cfs) | Notes |
| 8.3 | 841.4 | 20505 | |
| 8.6 | 841.6 | 21519 | |
| 9.7 | 842.7 | 26226 | |
| 10.0 | 843.1 | 27643 | Action |
| 10.9 | 843.9 | 31723 | |
| 11.9 | 844.9 | 36540 | |
| 12.0 | 845.1 | 37085 | Flood |
| 12.8 | 845.9 | 41234 | |
| 13.8 | 846.9 | 46502 | |
| 14.9 | 847.9 | 52329 | |
| 15.0 | 848.1 | 53004 | Moderate Flood |
| 16.0 | 849.0 | 58688 | |
| 17.4 | 850.4 | 66826 | |
| 17.6 | 850.7 | 68486 | |
| 18.5 | 851.6 | 74060 | |
| 19.0 | 852.1 | 77195 | Major Flood |
| 19.9 | 852.9 | 83005 | |
| | | 92500 | |
| | | 94000 | |
| | | 103500 | |
| | | 105500 | |
| | | 109000 | |
| | | 111800 | |
| | | 120000 | |
| | | 125500 | |
| | | 143000 | |
| | | 161500 | |
| | | 177000 | |
| | | 182500 | |
| | | 188000 | |
| | | 199000 | |
| | | 212000 | |
| 25.3 | 858.4 | 235000 | Agnes |

## USGS 01529950-Chemung River at Corning, NY

| | |
|---|---|
| Gage Elevation (NGVD29) | 900.00 |
| Conversion to NAVD88 (per VERTCON) | -0.52 |
| Gage Elevation (NAVD88) | 899.48 |
| Rating Used | 10.0 |

| Category | Depth (feet) | Elevation (NAVD88) |
|---|---|---|
| Action | 21 | 920.48 |
| Flood | 29 | 928.48 |
| Moderate Flood | 30 | 929.48 |
| Major Flood | 36 | 935.48 |

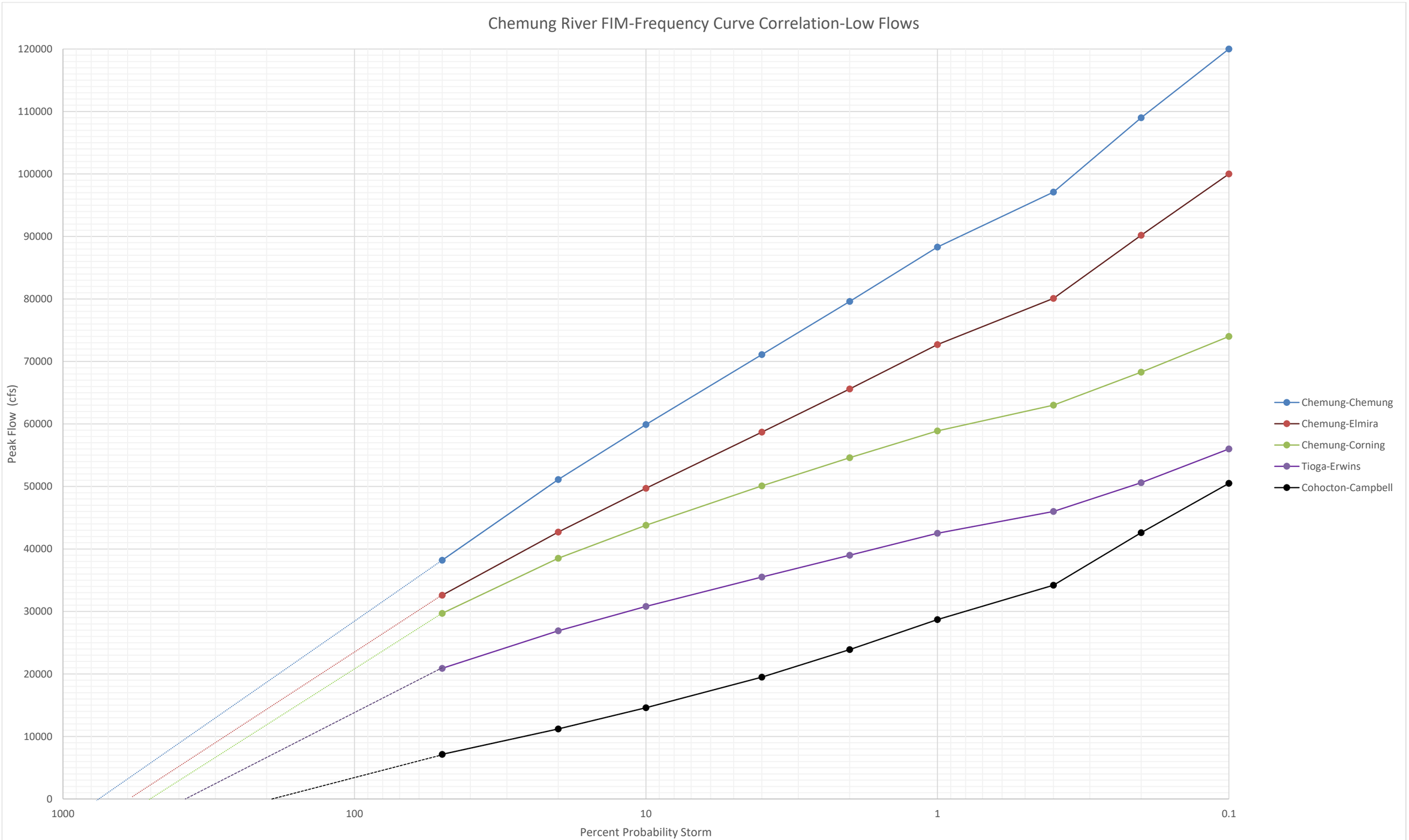
| USGS Rating Curve (10.0) | | | |
|---|---|---|---|
| Depth (feet) | Elevation (NAVD88) | Flow (cfs) | Notes |
| 21.0 | 920.5 | 18001 | Action |
| 21.2 | 920.7 | 19023 | |
| 22.1 | 921.6 | 23889 | |
| 22.3 | 921.8 | 25020 | |
| 22.9 | 922.4 | 29046 | |
| 23.5 | 923.0 | 32842 | |
| 23.6 | 923.1 | 33831 | |
| 24.1 | 923.6 | 37347 | |
| 24.6 | 924.1 | 41295 | |
| 25.1 | 924.6 | 45630 | |
| 25.2 | 924.7 | 45967 | |
| 25.7 | 925.1 | 50117 | |
| 26.3 | 925.7 | 55585 | |
| 26.6 | 926.0 | 58533 | |
| 26.7 | 926.2 | 60087 | |
| 26.9 | 926.4 | 61863 | |
| 27.2 | 926.7 | 64581 | |
| 27.7 | 927.1 | 69572 | |
| 27.8 | 927.3 | 70851 | |
| 28.4 | 927.9 | 78009 | |
| 28.6 | 928.1 | 80058 | |
| 29.0 | 928.5 | 84718 | Flood |
| 29.3 | 928.8 | 88067 | |
| 30.0 | 929.5 | 97008 | Moderate Flood |
| 30.4 | 929.9 | 102577 | |
| 32.2 | 931.7 | 123093 | |
| 33.9 | 933.4 | 144107 | |
| 35.4 | 934.9 | 161007 | |
| 36.0 | 935.5 | 168235 | Major Flood |
| 36.5 | 936.0 | 174493 | |
| 37.6 | 937.1 | 188022 | |
| 38.7 | 938.2 | 201556 | |
| 40.7 | 940.2 | 227953 | Agnes 1972 |

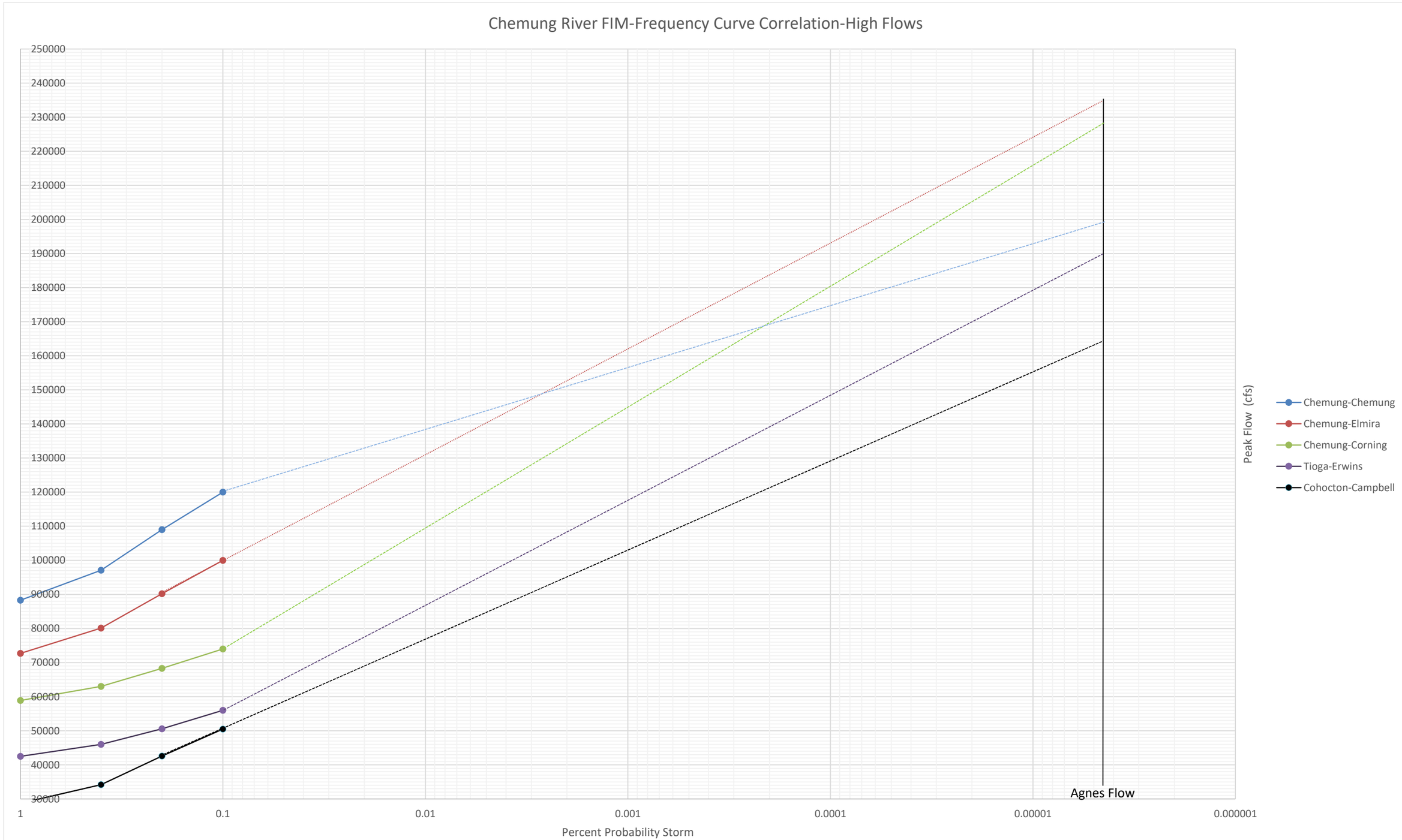
## USGS 1526500-Tioga River at Erwins, NY

| | |
|---|---|
| Gage Elevation (NGVD29) | 931.24 |
| Conversion to NAVD88 (per VERTCON) | -0.52 |
| Gage Elevation (NAVD88) | 930.72 |
| Rating Used | 51.0 |

| Category | Depth (feet) | Elevation (NAVD88) |
|---|---|---|
| Action | 16 | 946.72 |
| Flood | 18 | 948.72 |
| Moderate Flood | 19 | 949.72 |
| Major Flood | 20 | 950.72 |

| USGS Rating Curve (51.0) | | | |
|---|---|---|---|
| Depth (feet) | Elevation (NAVD88) | Flow (cfs) | Notes |
| 8.5 | 939.2 | 11599 | |
| 8.9 | 939.7 | 12906 | |
| 10.0 | 940.8 | 16203 | |
| 10.4 | 941.2 | 17506 | |
| 11.3 | 942.0 | 20511 | |
| 12.0 | 942.8 | 23212 | |
| 12.2 | 943.0 | 24006 | |
| 12.8 | 943.5 | 26028 | |
| 13.5 | 944.2 | 29041 | |
| 14.2 | 945.0 | 32214 | |
| 14.3 | 945.0 | 32522 | |
| 15.0 | 945.7 | 35500 | |
| 15.9 | 946.6 | 39813 | |
| 16.0 | 946.7 | 40400 | Action |
| 16.5 | 947.2 | 43238 | |
| 16.8 | 947.5 | 44847 | |
| 17.1 | 947.8 | 47044 | |
| 17.9 | 948.6 | 52006 | |
| 18.0 | 948.7 | 52662 | Flood |
| 19.0 | 949.7 | 59476 | Moderate Flood |
| 19.2 | 949.9 | 61037 | |
| 19.7 | 950.4 | 64521 | |
| 20.0 | 950.7 | 66753 | Major Flood |
| 21.3 | 952.0 | 76487 | |
| 21.8 | 952.5 | 80543 | |
| 23.6 | 954.3 | 98494 | |
| 24.9 | 955.6 | 116058 | |
| 25.4 | 956.2 | 131681 | |
| 25.6 | 956.3 | 137312 | |
| 25.8 | 956.5 | 143144 | |
| 26.1 | 956.8 | 156364 | |
| 26.3 | 957.0 | 167072 | |
| 26.7 | 957.5 | 190438 | Agnes 1972 |


Chemung River FIM-Frequency Curve Correlation-Low Flows
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Peak Flow (cfs)
1000
100
10
1
0.1
Percent Probability Storm
Chemung-Chemung
Chemung-Elmira
Chemung-Corning
Tioga-Erwins
Cohocton-Campbell


Chemung River FIM-Frequency Curve Correlation-High Flows
250000
240000
230000
220000
210000
200000
190000
180000
170000
160000
150000
140000
130000
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
1
0.1
0.01
0.001
0.0001
0.00001
0.000001
Percent Probability Storm
Peak Flow (cfs)
Agnes Flow
Chemung-Chemung
Chemung-Elmira
Chemung-Corning
Tioga-Erwins
Cohocton-Campbell

## KNOWN STORMS SUMMARY OF DISCHARGES

| River | Flow Point | Location | HEC-RAS XS | Drainage Area (mi2) | Known Storms | | | | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Oct. 20, 2011 | Jan. 24, 1999 | Jan. 31, 2013 | Jan. 25, 2010 | Feb. 06, 2008 | Mar. 15, 2007 | Jan. 19, 1996 | Eloise (1972) | Agnes (1972) | |
| Tioga | TR2 | At USGS 01526500-Tioga River near Erwins, NY | 21915 (262735) | 1377.0 | 10200 | 14600 | 18200 | 22200 | 24400 | 26400 | 45600 | 95000 | 190000 | From Gage Data |
| Tioga | TR1 | At confluence with Cohocton River | 14316 (255136) | 1380.0 | 10222 | 14632 | 18240 | 22248 | 24453 | 26458 | 45699 | 95207 | 190414 | Translated from USGS 01526500 |
| Cohocton | COH2 | Upstream of confluence of Hodgmans Creek | 9736 | 597.0 | 4014 | 8396 | 5805 | 8561 | 11673 | 11813 | 23245 | 28834 | 40647 | Translated from USGS 1529500 |
| Cohocton | COH1 | At confluence with Tioga River | 6721 | 604.0 | 4061 | 8495 | 5873 | 8662 | 11810 | 11951 | 23517 | 29172 | 41123 | Translated from USGS 1529500 |
| Chemung | CR25 | Upstream of the confluence of Cutler Creek | 240670 | 1984.0 | 16220 | 22352 | 25023 | 32045 | 34814 | 39858 | 60331 | 125607 | 225500 | Translated from USGS 1529950 |
| Chemung | CR24 | At USGS 01529950-Chemung River at Corning, NY | 238871 | 2006.0 | 16400 | 22600 | 25300 | 32400 | 35200 | 40300 | 61000 | 127000 | 228000 | From Gage Data |
| Chemung | CR23 | Downstream of confluence of Post Creek | 226645 | 2040.0 | 16465 | 22426 | 25540 | 32771 | 35374 | 40801 | 63179 | 117846 | 229526 | Translation Corning-Elmira |
| Chemung | CR22 | Downstream of confluence of Whiskey Creek | 215176 | 2070.0 | 16523 | 22272 | 25751 | 33097 | 35528 | 41244 | 65103 | 109769 | 230872 | Translation Corning-Elmira |
| Chemung | CR21 | At South Corning Road | 209927 | 2070.0 | 16523 | 22272 | 25751 | 33097 | 35528 | 41244 | 65103 | 109769 | 230872 | Translation Corning-Elmira |
| Chemung | CR20 | Downstream of confluence of Sing Sing Creek | 177737 | 2130.0 | 16638 | 21964 | 26174 | 33751 | 35836 | 42128 | 68949 | 93615 | 233564 | Translation Corning-Elmira |
| Chemung | CR19 | Downstream of confluence of Herdy Creek | 160698 | 2140.0 | 16658 | 21913 | 26245 | 33860 | 35887 | 42276 | 69590 | 90923 | 234013 | Translation Corning-Elmira |
| Chemung | CR18 | At South Main Street | 155157 | 2160.0 | 16700 | 21800 | 26400 | 34100 | 36000 | 42600 | 71000 | 85000 | 235000 | From Gage Data |
| Chemung | CR17 | Downstream of confluence of Newtown Creek | 134708 | 2240.0 | 17040 | 23478 | 27511 | 36163 | 38177 | 45026 | 72542 | 94070 | 224570 | Translation Elmira-Chemung |
| Chemung | CR15 | Downstream of confluence of Seeley Creek | 116990 | 2390.0 | 17694 | 26705 | 29648 | 40131 | 42363 | 49692 | 75507 | 111512 | 204512 | Translation Elmira-Chemung |
| Chemung | CR14 | At Lowman Crossover Road | 100186 | 2450.0 | 17956 | 27995 | 30502 | 41719 | 44037 | 51558 | 76693 | 118488 | 196488 | Translation Elmira-Chemung |
| Chemung | CR13 | At U.S. Route 86 | 92671 | 2500.0 | 18174 | 29071 | 31215 | 43041 | 45433 | 53113 | 77681 | 124302 | 189802 | Translation Elmira-Chemung |
| Chemung | CR12 | At USGS 01531000-Chemung River at Chemung, NY | 74057 | 2506.0 | 18200 | 29200 | 31300 | 43200 | 45600 | 53300 | 77800 | 125000 | 189000 | From Gage Data |
| Chemung | CR11 | 0.1 miles upstream of the confluence of Orcutt Creek | 61960 | 2507.2 | 18208 | 29213 | 31314 | 43220 | 45621 | 53324 | 77836 | 125057 | 189087 | Translated from USGS 01531000 |
| Chemung | CR9 | Immediately north of the State boundary | 57159 | 2518.7 | 18293 | 29348 | 31459 | 43420 | 45832 | 53571 | 78196 | 125635 | 189961 | Translated from USGS 01531000 |
| Chemung | CR8 | Immediately upstream of the confluence of Dry Creek | 45626 | 2565.7 | 18633 | 29895 | 32045 | 44229 | 46686 | 54569 | 79653 | 127977 | 193501 | Translated from USGS 01531000 |
| Chemung | CR5 | Immediatley upstream of the confluence of Tutelow Creek | 19868 | 2570.4 | 18667 | 29950 | 32104 | 44309 | 46771 | 54669 | 79798 | 128210 | 193854 | Translated from USGS 01531000 |
| Chemung | CR4 | 1.3 miles upstream of the confluence of Murray Creek | 12928 | 2577.5 | 18719 | 30033 | 32193 | 44432 | 46900 | 54820 | 80019 | 128564 | 194389 | Translated from USGS 01531000 |
| Chemung | CR1 | At confluence with Susquehanna River | 3083 | 2594.1 | 18839 | 30226 | 32400 | 44718 | 47202 | 55173 | 80534 | 129392 | 195641 | Translated from USGS 01531000 |

## FREQUENCY STORMS SUMMARY OF DISCHARGES

| River | Flow Point | Location | HEC-RAS XS | Drainage Area (mi2) | Frequency Storms | | | | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Q2 | Q5 | Q10 | Q25 | Q50 | Q100 | Q200 | Q500 | Q1000 | |
| Tioga | TR2 | At USGS 01526500-Tioga River near Erwins, NY | 21915 (262735) | 1377.0 | 20900 | 26900 | 30800 | 35500 | 39000 | 42500 | 46000 | 50600 | 56000 | From Gage Data |
| Tioga | TR1 | At confluence with Cohocton River | 14316 (255136) | 1380.0 | 20946 | 26959 | 30867 | 35577 | 39085 | 42593 | 46100 | 50710 | 56122 | Translated from USGS 01526500 |
| Cohocton | COH2 | Upstream of confluence of Hodgmans Creek | 9736 | 597.0 | 9069 | 14226 | 18545 | 24769 | 30358 | 36455 | 43441 | 54111 | 64146 | Translated from USGS 1529500 |
| Cohocton | COH1 | At confluence with Tioga River | 6721 | 604.0 | 9176 | 14393 | 18763 | 25060 | 30714 | 36883 | 43951 | 54746 | 64898 | Translated from USGS 1529500 |
| Chemung | CR25 | Upstream of the confluence of Cutler Creek | 240670 | 1984.0 | 29374 | 38078 | 43320 | 49551 | 54001 | 58254 | 62309 | 67551 | 73188 | Translated from USGS 1529950 |
| Chemung | CR24 | At USGS 01529950-Chemung River at Corning, NY | 238871 | 2006.0 | 29700 | 38500 | 43800 | 50100 | 54600 | 58900 | 63000 | 68300 | 74000 | From Gage Data |
| Chemung | CR23 | Downstream of confluence of Post Creek | 226645 | 2040.0 | 30332 | 39415 | 45086 | 51974 | 56997 | 61908 | 66727 | 73073 | 79667 | Translation Corning-Elmira |
| Chemung | CR22 | Downstream of confluence of Whiskey Creek | 215176 | 2070.0 | 30890 | 40223 | 46221 | 53628 | 59113 | 64562 | 70015 | 77285 | 84667 | Translation Corning-Elmira |
| Chemung | CR21 | At South Corning Road | 209927 | 2070.0 | 30890 | 40223 | 46221 | 53628 | 59113 | 64562 | 70015 | 77285 | 84667 | Translation Corning-Elmira |
| Chemung | CR20 | Downstream of confluence of Sing Sing Creek | 177737 | 2130.0 | 32005 | 41838 | 48490 | 56936 | 63344 | 69869 | 76592 | 85708 | 94667 | Translation Corning-Elmira |
| Chemung | CR19 | Downstream of confluence of Herdy Creek | 160698 | 2140.0 | 32191 | 42108 | 48868 | 57487 | 64049 | 70754 | 77688 | 87112 | 96333 | Translation Corning-Elmira |
| Chemung | CR18 | At South Main Street | 155157 | 2160.0 | 32600 | 42700 | 49700 | 58700 | 65600 | 72700 | 80100 | 90200 | 100000 | From Gage Data |
| Chemung | CR17 | Downstream of confluence of Newtown Creek | 134708 | 2240.0 | 33870 | 44605 | 52013 | 61512 | 68774 | 76237 | 83955 | 94463 | 104535 | Translation Elmira-Chemung |
| Chemung | CR15 | Downstream of confluence of Seeley Creek | 116990 | 2390.0 | 36312 | 48267 | 56460 | 66919 | 74879 | 83040 | 91367 | 102660 | 113256 | Translation Elmira-Chemung |
| Chemung | CR14 | At Lowman Crossover Road | 100186 | 2450.0 | 37288 | 49733 | 58240 | 69081 | 77321 | 85760 | 94333 | 105940 | 116744 | Translation Elmira-Chemung |
| Chemung | CR13 | At U.S. Route 86 | 92671 | 2500.0 | 38102 | 50953 | 59722 | 70884 | 79356 | 88028 | 96803 | 108672 | 119651 | Translation Elmira-Chemung |
| Chemung | CR12 | At USGS 01531000-Chemung River at Chemung, NY | 74057 | 2506.0 | 38200 | 51100 | 59900 | 71100 | 79600 | 88300 | 97100 | 109000 | 120000 | From Gage Data |
| Chemung | CR11 | 0.1 miles upstream of the confluence of Orcutt Creek | 61960 | 2507.2 | 38218 | 51123 | 59927 | 71133 | 79637 | 88341 | 97145 | 109050 | 120055 | Translated from USGS 01531000 |
| Chemung | CR9 | Immediately north of the State boundary | 57159 | 2518.7 | 38394 | 51360 | 60205 | 71461 | 80005 | 88749 | 97594 | 109554 | 120610 | Translated from USGS 01531000 |
| Chemung | CR8 | Immediately upstream of the confluence of Dry Creek | 45626 | 2565.7 | 39110 | 52317 | 61327 | 72793 | 81496 | 90403 | 99412 | 111596 | 122858 | Translated from USGS 01531000 |
| Chemung | CR5 | Immediatley upstream of the confluence of Tutelow Creek | 19868 | 2570.4 | 39181 | 52412 | 61438 | 72926 | 81644 | 90568 | 99594 | 111799 | 123082 | Translated from USGS 01531000 |
| Chemung | CR4 | 1.3 miles upstream of the confluence of Murray Creek | 12928 | 2577.5 | 39400 | 52705 | 61781 | 73333 | 82100 | 91073 | 100150 | 112424 | 123769 | Translated from USGS 01531000 |
| Chemung | CR1 | At confluence with Susquehanna River | 3083 | 2594.1 | 39542 | 52895 | 62005 | 73598 | 82397 | 91402 | 100512 | 112830 | 124216 | Translated from USGS 01531000 |

**FIM SUMMARY OF DISCHARGES**

| River | Flow Point | Location | HEC-RAS XS | Drainage Area (mi2) | FIM Profile | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | |
| Tioga River | TR2 | At USGS 01526500-Tioga River near Erwins, NY | 262735 | 1377.0 | 11599 | 12906 | 16203 | 17506 | 20511 | 23212 | 24006 | 26028 | 29041 | 32214 | 32522 | 35500 | 39813 | 40400 | 43238 | 44847 | 47044 | 52006 | 52662 | 59476 | 61037 | 64521 | 66753 | 76487 | 80543 | 98494 | 116058 | 131681 | 137312 | 143144 | 156364 | 167072 | 190438 | From Gage Data |
| Tioga River | TR1 | At confluence with Cohocton River | 255136 | 1380.0 | 11624 | 12934 | 16238 | 17544 | 20556 | 23263 | 24058 | 26084 | 29104 | 32284 | 32593 | 35577 | 39900 | 40488 | 43332 | 44945 | 47147 | 52119 | 52777 | 59605 | 61170 | 64661 | 66898 | 76653 | 80719 | 98708 | 116311 | 131968 | 137611 | 143456 | 156705 | 167436 | 190853 | Translated from USGS 01526500 |
| Chemung River | CR25 | Upstream of the confluence of Cutler Creek | 240670 | 1984.0 | 17804 | 18814 | 23627 | 24746 | 28727 | 32482 | 33460 | 36938 | 40842 | 45129 | 45463 | 49567 | 54975 | 57891 | 59428 | 61185 | 63872 | 68809 | 70074 | 77153 | 79180 | 83789 | 87101 | 95944 | 101452 | 121743 | 142527 | 159241 | 166390 | 172579 | 185960 | 199345 | 225453 | Translated from USGS 1529950 |
| Chemung River | CR24 | At USGS 01529950-Chemung River at Corning, NY | 238871 | 2006.0 | 18001 | 19023 | 23889 | 25020 | 29046 | 32842 | 33831 | 37347 | 41295 | 45630 | 45967 | 50117 | 55585 | 58533 | 60087 | 61863 | 64581 | 69572 | 70851 | 78009 | 80058 | 84718 | 88067 | 97008 | 102577 | 123093 | 144107 | 161007 | 168235 | 174493 | 188022 | 201556 | 227953 | From Gage Data |
| Chemung River | CR23 | Downstream of confluence of Post Creek | 226645 | 2040.0 | 18547 | 19567 | 24398 | 25592 | 29629 | 33648 | 34540 | 38194 | 42430 | 47090 | 47500 | 51985 | 58035 | 60702 | 63133 | 65205 | 68596 | 74569 | 75897 | 83564 | 85603 | 90010 | 93239 | 102019 | 107573 | 127432 | 147898 | 164492 | 171344 | 177437 | 190415 | 203832 | 229489 | Translation Corning-Elmira |
| Chemung River | CR22 | Downstream of confluence of Whiskey Creek | 215176 | 2070.0 | 19029 | 20047 | 24848 | 26096 | 30144 | 34359 | 35166 | 38942 | 43431 | 48378 | 48854 | 53633 | 60197 | 62616 | 65820 | 68153 | 72139 | 78978 | 80348 | 88467 | 90496 | 94680 | 97803 | 106441 | 111981 | 131260 | 151243 | 167568 | 174087 | 180034 | 192526 | 205841 | 230844 | Translation Corning-Elmira |
| Chemung River | CR21 | At South Corning Road | 209927 | 2070.0 | 19029 | 20047 | 24848 | 26096 | 30144 | 34359 | 35166 | 38942 | 43431 | 48378 | 48854 | 53633 | 60197 | 62616 | 65820 | 68153 | 72139 | 78978 | 80348 | 88467 | 90496 | 94680 | 97803 | 106441 | 111981 | 131260 | 151243 | 167568 | 174087 | 180034 | 192526 | 205841 | 230844 | Translation Corning-Elmira |
| Chemung River | CR20 | Downstream of confluence of Sing Sing Creek | 177737 | 2130.0 | 19992 | 21007 | 25746 | 27105 | 31174 | 35782 | 36418 | 40437 | 45434 | 50955 | 51560 | 56930 | 64520 | 66444 | 71194 | 74050 | 79226 | 87797 | 89252 | 98271 | 100281 | 104019 | 106932 | 115284 | 120798 | 138917 | 157932 | 173719 | 179574 | 185229 | 196748 | 209858 | 233554 | Translation Corning-Elmira |
| Chemung River | CR19 | Downstream of confluence of Herdy Creek | 160698 | 2140.0 | 20152 | 21167 | 25896 | 27273 | 31345 | 36019 | 36626 | 40686 | 45768 | 51384 | 52011 | 57479 | 65241 | 67082 | 72090 | 75032 | 80407 | 89266 | 90735 | 99905 | 101912 | 105576 | 108453 | 116758 | 122267 | 140193 | 159047 | 174745 | 180488 | 186095 | 197452 | 210527 | 234006 | Translation Corning-Elmira |
| Chemung River | CR18 | At South Main Street | 155157 | 2160.0 | 20505 | 21519 | 26226 | 27643 | 31723 | 36540 | 37085 | 41234 | 46502 | 52329 | 53004 | 58688 | 66826 | 68486 | 74060 | 77195 | 83005 | 92500 | 94000 | 103500 | 105500 | 109000 | 111800 | 120000 | 125500 | 143000 | 161500 | 177000 | 182500 | 188000 | 199000 | 212000 | 235000 | From Gage Data |
| Chemung River | CR17 | Downstream of confluence of Newtown Creek | 134708 | 2240.0 | 21639 | 22661 | 27442 | 28865 | 32935 | 37991 | 38661 | 43040 | 48619 | 54792 | 55498 | 61506 | 69910 | 71780 | 77638 | 80971 | 86809 | 96826 | 98557 | 107805 | 109480 | 112733 | 115371 | 122726 | 127490 | 143507 | 160246 | 174233 | 179216 | 184305 | 194344 | 205934 | 224627 | Translation Elmira-Chemung |
| Chemung River | CR15 | Downstream of confluence of Seeley Creek | 116990 | 2390.0 | 23819 | 24858 | 29781 | 31214 | 35266 | 40782 | 41693 | 46512 | 52688 | 59530 | 60296 | 66926 | 75842 | 78113 | 84519 | 88235 | 94124 | 105144 | 107319 | 116083 | 117135 | 119912 | 122237 | 127968 | 131316 | 144482 | 157836 | 168912 | 172902 | 177198 | 185391 | 194268 | 204679 | Translation Elmira-Chemung |
| Chemung River | CR14 | At Lowman Crossover Road | 100186 | 2450.0 | 24692 | 25737 | 30717 | 32154 | 36199 | 41898 | 42906 | 47901 | 54316 | 61425 | 62214 | 69094 | 78215 | 80646 | 87271 | 91140 | 97050 | 108472 | 110824 | 119394 | 120197 | 122784 | 124984 | 130065 | 132846 | 144872 | 156872 | 166783 | 170376 | 174355 | 181810 | 189602 | 196700 | Translation Elmira-Chemung |
| Chemung River | CR13 | At U.S. Route 86 | 92671 | 2500.0 | 25418 | 26469 | 31497 | 32937 | 36976 | 42828 | 43916 | 49058 | 55673 | 63004 | 63814 | 70900 | 80192 | 82757 | 89565 | 93561 | 99488 | 111245 | 113745 | 122154 | 122749 | 125177 | 127273 | 131813 | 134122 | 145197 | 156068 | 165010 | 168271 | 171986 | 178825 | 185713 | 190050 | Translation Elmira-Chemung |
| Chemung River | CR12 | At USGS 01531000-Chemung River at Chemung, NY | 74057 | 2506.0 | 25506 | 26557 | 31590 | 33031 | 37069 | 42940 | 44038 | 49197 | 55836 | 63194 | 64006 | 71117 | 80429 | 83011 | 89840 | 93851 | 99781 | 111578 | 114096 | 122485 | 123055 | 125464 | 127547 | 132023 | 134275 | 145236 | 155972 | 164797 | 168018 | 171702 | 178467 | 185246 | 189253 | From Gage Data |
| Chemung River | CR11 | 0.1 miles upstream of the confluence of Orcutt Creek | 61960 | 2507.2 | 25517 | 26569 | 31605 | 33046 | 37086 | 42960 | 44058 | 49220 | 55861 | 63223 | 64035 | 71150 | 80466 | 83049 | 89881 | 93894 | 99826 | 111629 | 114148 | 122541 | 123111 | 125521 | 127606 | 132083 | 134336 | 145302 | 156043 | 164872 | 168095 | 171781 | 178549 | 185331 | 189339 | Translated from USGS 01531000 |
| Chemung River | CR9 | Immediately north of the State boundary | 57159 | 2518.7 | 25635 | 26692 | 31751 | 33199 | 37258 | 43158 | 44262 | 49447 | 56120 | 63515 | 64331 | 71479 | 80838 | 83433 | 90297 | 94329 | 100288 | 112145 | 114676 | 123108 | 123680 | 126101 | 128196 | 132694 | 134957 | 145974 | 156764 | 165635 | 168873 | 172575 | 179374 | 186188 | 190215 | Translated from USGS 01531000 |
| Chemung River | CR8 | Immediately upstream of the confluence of Dry Creek | 45626 | 2565.7 | 26113 | 27189 | 32343 | 33817 | 37952 | 43962 | 45086 | 50369 | 57165 | 64699 | 65530 | 72811 | 82345 | 84988 | 91979 | 96086 | 102157 | 114235 | 116813 | 125402 | 125985 | 128452 | 130585 | 135167 | 137472 | 148695 | 159686 | 168721 | 172020 | 175791 | 182717 | 189658 | 193760 | Translated from USGS 01531000 |
| Chemung River | CR5 | Immediatley upstream of the confluence of Tutelow Creek | 19868 | 2570.4 | 26161 | 27239 | 32402 | 33879 | 38021 | 44043 | 45169 | 50461 | 57270 | 64817 | 65649 | 72944 | 82495 | 85143 | 92147 | 96262 | 102343 | 114443 | 117026 | 125631 | 126215 | 128686 | 130823 | 135413 | 137723 | 148966 | 159977 | 169029 | 172333 | 176112 | 183050 | 190004 | 194113 | Translated from USGS 01531000 |
| Chemung River | CR4 | 1.3 miles upstream of the confluence of Murray Creek | 12928 | 2577.5 | 26233 | 27314 | 32491 | 33973 | 38126 | 44164 | 45294 | 50600 | 57428 | 64996 | 65831 | 73145 | 82723 | 85378 | 92402 | 96528 | 102626 | 114759 | 117349 | 125978 | 126564 | 129041 | 131184 | 135787 | 138104 | 149377 | 160419 | 169496 | 172810 | 176598 | 183556 | 190529 | 194649 | Translated from USGS 01531000 |
| Chemung River | CR1 | At confluence with Susquehanna River | 3083 | 2594.1 | 26402 | 27490 | 32700 | 34191 | 38372 | 44449 | 45585 | 50926 | 57798 | 65414 | 66254 | 73616 | 83255 | 85927 | 92996 | 97149 | 103287 | 115498 | 118105 | 126788 | 127379 | 129872 | 132029 | 136661 | 138992 | 150339 | 161452 | 170587 | 173922 | 177735 | 184738 | 191755 | 195902 | Translated from USGS 01531000 |

# APPENDIX B


Calibration Results

## CALIBRATION TO HISTORICAL STORMS

| River | HEC-RAS XS | Storm | Discharge (cfs) | Flood Elevation (ft. NAVD88) | | Difference (ft.) | Notes |
|---|---|---|---|---|---|---|---|
| | | | | Computed | Observed | | |
| Tioga | 16274 USGS 01526500 | 10/20/2011 | 10200 | 938.4 | 938.7 | -0.3 | |
| Tioga | 16274 USGS 01526500 | 1/24/1999 | 14600 | 940.4 | 940.3 | 0.1 | |
| Tioga | 16274 USGS 01526500 | 1/31/2013 | 18200 | 941.5 | 941.4 | 0.1 | |
| Tioga | 16274 USGS 01526500 | 1/25/2010 | 22200 | 942.5 | 942.5 | 0 | |
| Tioga | 16274 USGS 01526500 | 2/6/2008 | 24400 | 943.1 | 943.1 | 0 | |
| Tioga | 16274 USGS 01526500 | 3/15/2007 | 26400 | 943.7 | 943.6 | 0.1 | |
| Tioga | 16274 USGS 01526500 | 1/19/1996 | 45600 | 948.1 | 947.7 | 0.4 | |
| Tioga | 16274 USGS 01526500 | Eloise1975 | 95000 | 953.1 | 954.3 | -1.2 | |
| Tioga | 16274 USGS 01526500 | Agnes1972 | 190000 | 953.6 | 957.5 | -3.9 | |
| Tioga | 8655 | Agnes1972 | 190414 | 952.8 | 952.8 | 0 | |
| Tioga | 3401 | Agnes1972 | 190414 | 951.3 | 950.3 | 1 | |
| Cohocton | 8375 | Agnes1972 | 40647 | 953.4 | 953.5 | -0.1 | |
| Cohocton | 5095 | Agnes1972 | 41123 | 950 | 951.5 | -1.5 | |
| Cohocton | 3667 | Agnes1972 | 41123 | 949.6 | 951.1 | -1.5 | |
| Cohocton | 3013 | Agnes1972 | 41123 | 949.6 | 950 | -0.4 | |
| Cohocton | 904 | Agnes1972 | 41123 | 949.2 | 949.8 | -0.6 | |
| Chemung | 240178 | Agnes1972 | 225500 | 946.6 | 949.5 | -2.9 | Impacted by levee overflow |
| Chemung | 236970 | Agnes1972 | 228000 | 942 | 944.2 | -2.2 | Impacted by levee overflow |
| Chemung | 231921 USGS 01529950 | 10/20/2011 | 16400 | 919.9 | 920.2 | -0.3 | |
| Chemung | 231921 USGS 01529950 | 1/24/1999 | 22600 | 921.4 | 921.4 | 0 | |
| Chemung | 231921 USGS 01529950 | 1/31/2013 | 25300 | 921.8 | 921.8 | 0 | |
| Chemung | 231921 USGS 01529950 | 1/25/2010 | 32400 | 923.1 | 922.9 | 0.2 | |
| Chemung | 231921 USGS 01529950 | 2/6/2008 | 35200 | 923.7 | 923.3 | 0.4 | |
| Chemung | 231921 USGS 01529950 | 3/15/2007 | 40300 | 924.2 | 924 | 0.2 | |
| Chemung | 231921 USGS 01529950 | 1/19/1996 | 61000 | 926.9 | 925.4 | 1.5 | |
| Chemung | 231921 USGS 01529950 | Eloise1975 | 127000 | 932.5 | 932 | 0.5 | |
| Chemung | 231921 USGS 01529950 | Agnes1972 | 228000 | 937.8 | 940.2 | -2.4 | Impacted by levee overflow |
| Chemung | 230224 | Agnes1972 | 227993.3 | 938.4 | 937.3 | 1.1 | Impacted by levee overflow |
| Chemung | 229284 | Agnes1972 | 223979.5 | 938.2 | 931.7 | 6.5 | Impacted by levee overflow |
| Chemung | 226644 | Agnes1972 | 214805.5 | 933.4 | 928.9 | 4.5 | Impacted by levee overflow |
| Chemung | 225721 | Agnes1972 | 214600.6 | 933.9 | 928.5 | 5.4 | Impacted by levee overflow |

## CALIBRATION TO HISTORICAL STORMS

| River | HEC-RAS XS | Storm | Discharge (cfs) | Flood Elevation (ft. NAVD88) | | Difference (ft.) | Notes |
|---|---|---|---|---|---|---|---|
| | | | | Computed | Observed | | |
| Chemung | 194987 | Agnes1972 | 230872 | 904.5 | 904.1 | 0.4 | Impacted by levee overflow |
| Chemung | 160405 | Agnes1972 | 234013 | 884.4 | 882.4 | 2 | Impacted by levee overflow |
| Chemung | 146074 | Agnes1972 | 235000 | 873.3 | 867.3 | 6 | Impacted by levee overflow |
| Chemung | 144148 | Agnes1972 | 235000 | 871.8 | 866.2 | 5.6 | Impacted by levee overflow |
| Chemung | 142570 | Agnes1972 | 235000 | 871.3 | 861.4 | 9.9 | Impacted by levee overflow |
| Chemung | 140557 | Agnes1972 | 235000 | 868.8 | 860.3 | 8.5 | Impacted by levee overflow |
| Chemung | 140230 USGS 01530332 | 10/20/2011 | 16700 | 840.4 | 840.4 | 0 | |
| Chemung | 140230 USGS 01530332 | 1/24/1999 | 21800 | 841.8 | 842.8 | -1 | |
| Chemung | 140230 USGS 01530332 | 1/31/2013 | 26400 | 842.8 | 842.8 | 0 | |
| Chemung | 140230 USGS 01530332 | 1/25/2010 | 34100 | 844.4 | 844.4 | 0 | |
| Chemung | 140230 USGS 01530332 | 2/6/2008 | 36000 | 845 | 845 | 0 | |
| Chemung | 140230 USGS 01530332 | 3/15/2007 | 42600 | 846.2 | 846.2 | 0 | |
| Chemung | 140230 USGS 01530332 | 1/19/1996 | 71000 | 851.4 | 851.6 | -0.2 | |
| Chemung | 140230 USGS 01530332 | Eloise1975 | 85000 | 853 | 852.9 | 0.1 | |
| Chemung | 140230 USGS 01530332 | Agnes1972 | 235000 | 867.4 | 858.4 | 9 | Impacted by levee overflow |
| Chemung | 139870 | Agnes1972 | 235000 | 868.3 | 859 | 9.3 | Impacted by levee overflow |
| Chemung | 138450 | Agnes1972 | 235000 | 861.4 | 858.4 | 3 | Impacted by levee overflow |
| Chemung | 137862 | Agnes1972 | 235000 | 860.2 | 857.7 | 2.5 | Impacted by levee overflow |
| Chemung | 126507 | Agnes1972 | 224570 | 848.3 | 846.3 | 2 | Impacted by levee overflow |
| Chemung | 120035 | Agnes1972 | 224570 | 843.4 | 842.3 | 1.1 | |
| Chemung | 112179 | Agnes1972 | 204512 | 836.7 | 836.7 | 0 | |
| Chemung | 100186 | Agnes1972 | 196488 | 831.1 | 831 | 0.1 | |
| Chemung | 99324 | Agnes1972 | 196488 | 830.4 | 830.4 | 0 | |
| Chemung | 93989 | Agnes1972 | 196488 | 828.3 | 827.2 | 1.1 | |
| Chemung | 88596 | Agnes1972 | 189802 | 824.3 | 824.7 | -0.4 | |
| Chemung | 83842 | Agnes1972 | 189802 | 822.4 | 821.8 | 0.6 | |
| Chemung | 65533 USGS 01531000 | 10/20/2011 | 18200 | 788.2 | 788.1 | 0.1 | |
| Chemung | 65533 USGS 01531000 | 1/24/1999 | 29200 | 790.6 | 790.6 | 0 | |
| Chemung | 65533 USGS 01531000 | 1/31/2013 | 31300 | 791.1 | 791 | 0.1 | |
| Chemung | 65533 USGS 01531000 | 1/25/2010 | 43200 | 793.4 | 793.1 | 0.3 | |
| Chemung | 65533 USGS 01531000 | 2/6/2008 | 45600 | 793.8 | 793.5 | 0.3 | |

## CALIBRATION TO HISTORICAL STORMS

| River | HEC-RAS XS | Storm | Discharge (cfs) | Flood Elevation (ft. NAVD88) | | Difference (ft.) | Notes |
|---|---|---|---|---|---|---|---|
| | | | | Computed | Observed | | |
| Chemung | 65533 USGS 01531000 | 3/15/2007 | 53300 | 795.1 | 794.7 | 0.4 | |
| Chemung | 65533 USGS 01531000 | 1/19/1996 | 77800 | 798.2 | 797.8 | 0.4 | |
| Chemung | 65533 USGS 01531000 | Eloise1975 | 125000 | 802.5 | 802.2 | 0.3 | |
| Chemung | 65533 USGS 01531000 | Agnes1972 | 189000 | 809.9 | 809.7 | 0.2 | |
| Chemung | 15263 | Eloise1975 | 128210 | 766.5 | 769 | -2.5 | Impacted by backwater |
| Chemung | 12928 | Eloise1975 | 128564 | 764.9 | 764.9 | 0 | Impacted by backwater |

## CALIBRATION TO FREQUENCY STORMS

| River | HEC-RAS XS | Storm | Discharge (cfs) | Flood Elevation (ft. NAVD88) | | Difference (ft.) | Notes |
|---|---|---|---|---|---|---|---|
| | | | | Computed | Observed | | |
| Tioga | 257094 USGS 01526500 | Q2 | 20900 | 942.2 | 942.1 | 0.1 | |
| Tioga | 257094 USGS 01526500 | Q5 | 26900 | 943.8 | 943.7 | 0.1 | |
| Tioga | 257094 USGS 01526500 | Q10 | 30800 | 944.9 | 944.6 | 0.3 | |
| Tioga | 257094 USGS 01526500 | Q25 | 35500 | 946 | 945.7 | 0.3 | |
| Tioga | 257094 USGS 01526500 | Q50 | 39000 | 946.8 | 946.4 | 0.4 | |
| Tioga | 257094 USGS 01526500 | Q100 | 42500 | 947.4 | 947.1 | 0.3 | |
| Tioga | 257094 USGS 01526500 | Q200 | 46000 | 948 | 947.7 | 0.3 | |
| Tioga | 257094 USGS 01526500 | Q500 | 50600 | 948.7 | 948.4 | 0.3 | |
| Tioga | 257094 USGS 01526500 | Q1000 | 56000 | 949.5 | 949.2 | 0.3 | |
| | | | | | | | |
| Chemung | 231921 USGS 01529950 | Q2 | 29700 | 922.6 | 922.5 | 0.1 | |
| Chemung | 231921 USGS 01529950 | Q5 | 38500 | 924 | 923.7 | 0.3 | |
| Chemung | 231921 USGS 01529950 | Q10 | 43800 | 924.8 | 924.4 | 0.4 | |
| Chemung | 231921 USGS 01529950 | Q25 | 50100 | 925.3 | 925.1 | 0.2 | |
| Chemung | 231921 USGS 01529950 | Q50 | 54600 | 925.9 | 925.6 | 0.3 | |
| Chemung | 231921 USGS 01529950 | Q100 | 58900 | 926.6 | 926.1 | 0.5 | |
| Chemung | 231921 USGS 01529950 | Q200 | 63000 | 927.1 | 926.5 | 0.6 | |
| Chemung | 231921 USGS 01529950 | Q500 | 68300 | 927.7 | 927 | 0.7 | |
| Chemung | 231921 USGS 01529950 | Q1000 | 74000 | 928.3 | 927.6 | 0.7 | |
| | | | | | | | |
| Chemung | 140230 USGS 01530332 | Q2 | 32600 | 844.1 | 844.1 | 0 | |
| Chemung | 140230 USGS 01530332 | Q5 | 42700 | 846.2 | 846.2 | 0 | |
| Chemung | 140230 USGS 01530332 | Q10 | 49700 | 847.5 | 847.5 | 0 | |
| Chemung | 140230 USGS 01530332 | Q25 | 58700 | 849.3 | 849 | 0.3 | |
| Chemung | 140230 USGS 01530332 | Q50 | 65600 | 850.7 | 850.2 | 0.5 | |
| Chemung | 140230 USGS 01530332 | Q100 | 72700 | 851.7 | 851.4 | 0.3 | |
| Chemung | 140230 USGS 01530332 | Q200 | 80100 | 852.5 | 852.5 | 0 | |
| Chemung | 140230 USGS 01530332 | Q500 | 90200 | 853.2 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | Q1000 | 100000 | 853.6 | | | No rating at this flow |
| | | | | | | | |
| Chemung | 65533 USGS 01531000 | Q2 | 38200 | 792.5 | 792.3 | 0.2 | |

## CALIBRATION TO FREQUENCY STORMS

| River | HEC-RAS XS | Storm | Discharge (cfs) | Flood Elevation (ft. NAVD88) | | Difference (ft.) | Notes |
|---|---|---|---|---|---|---|---|
| | | | | Computed | Observed | | |
| Chemung | 65533 USGS 01531000 | Q5 | 51100 | 794.7 | 794.4 | 0.3 | |
| Chemung | 65533 USGS 01531000 | Q10 | 59900 | 796 | 795.7 | 0.3 | |
| Chemung | 65533 USGS 01531000 | Q25 | 71100 | 797.4 | 797 | 0.4 | |
| Chemung | 65533 USGS 01531000 | Q50 | 79600 | 798.3 | 798 | 0.3 | |
| Chemung | 65533 USGS 01531000 | Q100 | 88300 | 799.2 | 798.9 | 0.3 | |
| Chemung | 65533 USGS 01531000 | Q200 | 97100 | 800 | 799.8 | 0.2 | |
| Chemung | 65533 USGS 01531000 | Q500 | 109000 | 801 | 800.9 | 0.1 | |
| Chemung | 65533 USGS 01531000 | Q1000 | 120000 | 802 | 801.8 | 0.2 | |

## CALIBRATION TO FIM PROJECT FLOWS (USGS RATING CURVES)

| River | HEC-RAS XS | Storm | Discharge (cfs) | Flood Elevation (ft. NAVD88) | | Difference (ft.) | Notes |
|---|---|---|---|---|---|---|---|
| | | | | Computed | Observed | | |
| Tioga | 257094 USGS 01526500 | FIM1 | 11599 | 939.1 | 939.2 | -0.1 | |
| Tioga | 257094 USGS 01526500 | FIM2 | 12906 | 939.7 | 939.7 | 0 | |
| Tioga | 257094 USGS 01526500 | FIM3 | 16203 | 940.9 | 940.8 | 0.1 | |
| Tioga | 257094 USGS 01526500 | FIM4 | 17506 | 941.3 | 941.2 | 0.1 | |
| Tioga | 257094 USGS 01526500 | FIM5 | 20511 | 942.1 | 942 | 0.1 | |
| Tioga | 257094 USGS 01526500 | FIM6 | 23212 | 942.9 | 942.8 | 0.1 | |
| Tioga | 257094 USGS 01526500 | FIM7 | 24006 | 943.1 | 943 | 0.1 | |
| Tioga | 257094 USGS 01526500 | FIM8 | 26028 | 943.6 | 943.5 | 0.1 | |
| Tioga | 257094 USGS 01526500 | FIM9 | 29041 | 944.4 | 944.2 | 0.2 | |
| Tioga | 257094 USGS 01526500 | FIM10 | 32214 | 945.2 | 945 | 0.2 | |
| Tioga | 257094 USGS 01526500 | FIM11 | 32522 | 945.3 | 945 | 0.3 | |
| Tioga | 257094 USGS 01526500 | FIM12 | 35500 | 946 | 945.7 | 0.3 | |
| Tioga | 257094 USGS 01526500 | FIM13 | 39813 | 947 | 946.6 | 0.4 | |
| Tioga | 257094 USGS 01526500 | FIM14 | 40400 | 947.1 | 946.7 | 0.4 | |
| Tioga | 257094 USGS 01526500 | FIM15 | 43238 | 947.6 | 947.2 | 0.4 | |
| Tioga | 257094 USGS 01526500 | FIM16 | 44847 | 947.9 | 947.5 | 0.4 | |
| Tioga | 257094 USGS 01526500 | FIM17 | 47044 | 948.2 | 947.8 | 0.4 | |
| Tioga | 257094 USGS 01526500 | FIM18 | 52006 | 948.9 | 948.6 | 0.3 | |
| Tioga | 257094 USGS 01526500 | FIM19 | 52662 | 949 | 948.7 | 0.3 | |
| Tioga | 257094 USGS 01526500 | FIM20 | 59476 | 950 | 949.7 | 0.3 | |
| Tioga | 257094 USGS 01526500 | FIM21 | 61037 | 950.2 | 949.9 | 0.3 | |
| Tioga | 257094 USGS 01526500 | FIM22 | 64521 | 950.7 | 950.4 | 0.3 | |
| Tioga | 257094 USGS 01526500 | FIM23 | 66753 | 950.9 | 950.7 | 0.2 | |
| Tioga | 257094 USGS 01526500 | FIM24 | 76487 | 952.1 | 952 | 0.1 | |
| Tioga | 257094 USGS 01526500 | FIM25 | 80543 | 952.6 | 952.5 | 0.1 | |
| Tioga | 257094 USGS 01526500 | FIM26 | 98494 | 954.4 | 954.3 | 0.1 | |
| Tioga | 257094 USGS 01526500 | FIM27 | 116058 | 955.5 | 955.6 | -0.1 | |
| Tioga | 257094 USGS 01526500 | FIM28 | 131681 | 956.2 | 956.2 | 0 | |
| Tioga | 257094 USGS 01526500 | FIM29 | 137312 | 956.4 | 956.3 | 0.1 | |
| Tioga | 257094 USGS 01526500 | FIM30 | 143144 | 957.3 | 956.5 | 0.8 | |
| Tioga | 257094 USGS 01526500 | FIM31 | 156364 | 955.8 | 956.8 | -1 | |

## CALIBRATION TO FIM PROJECT FLOWS (USGS RATING CURVES)

| River | HEC-RAS XS | Storm | Discharge (cfs) | Flood Elevation (ft. NAVD88) | | Difference (ft.) | Notes |
|---|---|---|---|---|---|---|---|
| | | | | Computed | Observed | | |
| Tioga | 257094 USGS 01526500 | FIM32 | 167072 | 956.3 | 957 | -0.7 | |
| Tioga | 257094 USGS 01526500 | FIM33 | 190438 | 957.3 | 957.5 | -0.2 | |
| | | | | | | | |
| Chemung | 231921 USGS 01529950 | FIM1 | 18001 | 920.3 | 920.5 | -0.2 | |
| Chemung | 231921 USGS 01529950 | FIM2 | 19023 | 920.6 | 920.7 | -0.1 | |
| Chemung | 231921 USGS 01529950 | FIM3 | 23889 | 921.6 | 921.6 | 0 | |
| Chemung | 231921 USGS 01529950 | FIM4 | 25020 | 921.8 | 921.8 | 0 | |
| Chemung | 231921 USGS 01529950 | FIM5 | 29046 | 922.5 | 922.4 | 0.1 | |
| Chemung | 231921 USGS 01529950 | FIM6 | 32842 | 923.2 | 923 | 0.2 | |
| Chemung | 231921 USGS 01529950 | FIM7 | 33831 | 923.4 | 923.1 | 0.3 | |
| Chemung | 231921 USGS 01529950 | FIM8 | 37347 | 923.9 | 923.6 | 0.3 | |
| Chemung | 231921 USGS 01529950 | FIM9 | 41295 | 924.4 | 924.1 | 0.3 | |
| Chemung | 231921 USGS 01529950 | FIM10 | 45630 | 925 | 924.6 | 0.4 | |
| Chemung | 231921 USGS 01529950 | FIM11 | 45967 | 925 | 924.7 | 0.3 | |
| Chemung | 231921 USGS 01529950 | FIM12 | 50117 | 925.3 | 925.1 | 0.2 | |
| Chemung | 231921 USGS 01529950 | FIM13 | 55585 | 926.1 | 925.7 | 0.4 | |
| Chemung | 231921 USGS 01529950 | FIM14 | 58533 | 926.5 | 926 | 0.5 | |
| Chemung | 231921 USGS 01529950 | FIM15 | 60087 | 926.7 | 926.2 | 0.5 | |
| Chemung | 231921 USGS 01529950 | FIM16 | 61863 | 927 | 926.4 | 0.6 | |
| Chemung | 231921 USGS 01529950 | FIM17 | 64581 | 927.3 | 926.7 | 0.6 | |
| Chemung | 231921 USGS 01529950 | FIM18 | 69572 | 927.9 | 927.1 | 0.8 | |
| Chemung | 231921 USGS 01529950 | FIM19 | 70851 | 928 | 927.3 | 0.7 | |
| Chemung | 231921 USGS 01529950 | FIM20 | 78009 | 928.7 | 927.9 | 0.8 | |
| Chemung | 231921 USGS 01529950 | FIM21 | 80058 | 928.9 | 928.1 | 0.8 | |
| Chemung | 231921 USGS 01529950 | FIM22 | 84718 | 929.3 | 928.5 | 0.8 | |
| Chemung | 231921 USGS 01529950 | FIM23 | 88067 | 929.6 | 928.8 | 0.8 | |
| Chemung | 231921 USGS 01529950 | FIM24 | 97008 | 930.3 | 929.5 | 0.8 | |
| Chemung | 231921 USGS 01529950 | FIM25 | 102577 | 930.8 | 929.9 | 0.9 | |
| Chemung | 231921 USGS 01529950 | FIM26 | 123093 | 932.3 | 931.7 | 0.6 | |
| Chemung | 231921 USGS 01529950 | FIM27 | 144107 | 933.8 | 933.4 | 0.4 | |
| Chemung | 231921 USGS 01529950 | FIM28 | 161007 | 934.9 | 934.9 | 0 | |

## CALIBRATION TO FIM PROJECT FLOWS (USGS RATING CURVES)

| River | HEC-RAS XS | Storm | Discharge (cfs) | Flood Elevation (ft. NAVD88) | | Difference (ft.) | Notes |
|---|---|---|---|---|---|---|---|
| | | | | Computed | Observed | | |
| Chemung | 231921 USGS 01529950 | FIM29 | 168235 | 935.4 | 935.5 | -0.1 | |
| Chemung | 231921 USGS 01529950 | FIM30 | 174493 | 935.8 | 936 | -0.2 | |
| Chemung | 231921 USGS 01529950 | FIM31 | 188022 | 936.5 | 937.1 | -0.6 | |
| Chemung | 231921 USGS 01529950 | FIM32 | 201556 | 937.1 | 938.2 | -1.1 | Impacted by levee overflow |
| Chemung | 231921 USGS 01529950 | FIM33 | 227953 | 937.8 | 940.2 | -2.4 | Impacted by levee overflow |
| | | | | | | | |
| Chemung | 140230 USGS 01530332 | FIM1 | 20505 | 841.5 | 841.4 | 0.1 | |
| Chemung | 140230 USGS 01530332 | FIM2 | 21519 | 841.7 | 841.6 | 0.1 | |
| Chemung | 140230 USGS 01530332 | FIM3 | 26226 | 842.8 | 842.7 | 0.1 | |
| Chemung | 140230 USGS 01530332 | FIM4 | 27643 | 843.1 | 843.1 | 0 | |
| Chemung | 140230 USGS 01530332 | FIM5 | 31723 | 843.9 | 843.9 | 0 | |
| Chemung | 140230 USGS 01530332 | FIM6 | 36540 | 845.1 | 844.9 | 0.2 | |
| Chemung | 140230 USGS 01530332 | FIM7 | 37085 | 845.2 | 845.1 | 0.1 | |
| Chemung | 140230 USGS 01530332 | FIM8 | 41234 | 845.9 | 845.9 | 0 | |
| Chemung | 140230 USGS 01530332 | FIM9 | 46502 | 846.9 | 846.9 | 0 | |
| Chemung | 140230 USGS 01530332 | FIM10 | 52329 | 848 | 847.9 | 0.1 | |
| Chemung | 140230 USGS 01530332 | FIM11 | 53004 | 848.1 | 848.1 | 0 | |
| Chemung | 140230 USGS 01530332 | FIM12 | 58688 | 849.3 | 849 | 0.3 | |
| Chemung | 140230 USGS 01530332 | FIM13 | 66826 | 850.9 | 850.4 | 0.5 | |
| Chemung | 140230 USGS 01530332 | FIM14 | 68486 | 851.1 | 850.7 | 0.4 | |
| Chemung | 140230 USGS 01530332 | FIM15 | 74060 | 851.9 | 851.6 | 0.3 | |
| Chemung | 140230 USGS 01530332 | FIM16 | 77195 | 852.2 | 852.1 | 0.1 | |
| Chemung | 140230 USGS 01530332 | FIM17 | 83005 | 852.7 | 852.9 | -0.2 | |
| Chemung | 140230 USGS 01530332 | FIM18 | 92500 | 853.3 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM19 | 94000 | 853.4 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM20 | 103500 | 853.7 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM21 | 105500 | 853.8 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM22 | 109000 | 853.9 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM23 | 111800 | 854 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM24 | 120000 | 854.2 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM25 | 125500 | 854.4 | | | No rating at this flow |

## CALIBRATION TO FIM PROJECT FLOWS (USGS RATING CURVES)

| River | HEC-RAS XS | Storm | Discharge (cfs) | Flood Elevation (ft. NAVD88) | | Difference (ft.) | Notes |
|---|---|---|---|---|---|---|---|
| | | | | Computed | Observed | | |
| Chemung | 140230 USGS 01530332 | FIM26 | 143000 | 856.4 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM27 | 161137.4 | 858.3 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM28 | 170303.2 | 859.3 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM29 | 172753.8 | 859.6 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM30 | 175095.4 | 859.8 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM31 | 179016.8 | 860.2 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM32 | 212000 | 864.2 | | | No rating at this flow |
| Chemung | 140230 USGS 01530332 | FIM33 | 235000 | 867.4 | 858.4 | 9 | Impacted by levee overflow |
| | | | | | | | |
| Chemung | 65533 USGS 01531000 | FIM1 | 25506 | 789.9 | 789.8 | 0.1 | |
| Chemung | 65533 USGS 01531000 | FIM2 | 26557 | 790.1 | 790.1 | 0 | |
| Chemung | 65533 USGS 01531000 | FIM3 | 31590 | 791.1 | 791.1 | 0 | |
| Chemung | 65533 USGS 01531000 | FIM4 | 33031 | 791.4 | 791.4 | 0 | |
| Chemung | 65533 USGS 01531000 | FIM5 | 37069 | 792.2 | 792.1 | 0.1 | |
| Chemung | 65533 USGS 01531000 | FIM6 | 42940 | 793.4 | 793.1 | 0.3 | |
| Chemung | 65533 USGS 01531000 | FIM7 | 44038 | 793.6 | 793.3 | 0.3 | |
| Chemung | 65533 USGS 01531000 | FIM8 | 49197 | 794.4 | 794.1 | 0.3 | |
| Chemung | 65533 USGS 01531000 | FIM9 | 55836 | 795.4 | 795.1 | 0.3 | |
| Chemung | 65533 USGS 01531000 | FIM10 | 63194 | 796.4 | 796.1 | 0.3 | |
| Chemung | 65533 USGS 01531000 | FIM11 | 64006 | 796.6 | 796.2 | 0.4 | |
| Chemung | 65533 USGS 01531000 | FIM12 | 71117 | 797.4 | 797 | 0.4 | |
| Chemung | 65533 USGS 01531000 | FIM13 | 80429 | 798.4 | 798.1 | 0.3 | |
| Chemung | 65533 USGS 01531000 | FIM14 | 83011 | 798.7 | 798.4 | 0.3 | |
| Chemung | 65533 USGS 01531000 | FIM15 | 89840 | 799.3 | 799.1 | 0.2 | |
| Chemung | 65533 USGS 01531000 | FIM16 | 93851 | 799.7 | 799.5 | 0.2 | |
| Chemung | 65533 USGS 01531000 | FIM17 | 99781 | 800.2 | 800.1 | 0.1 | |
| Chemung | 65533 USGS 01531000 | FIM18 | 111578 | 801.3 | 801.1 | 0.2 | |
| Chemung | 65533 USGS 01531000 | FIM19 | 114096 | 801.5 | 801.3 | 0.2 | |
| Chemung | 65533 USGS 01531000 | FIM20 | 122485 | 802.2 | 802 | 0.2 | |
| Chemung | 65533 USGS 01531000 | FIM21 | 123055 | 802.3 | 802.1 | 0.2 | |
| Chemung | 65533 USGS 01531000 | FIM22 | 125464 | 802.5 | 802.3 | 0.2 | |

CALIBRATION TO FIM PROJECT FLOWS (USGS RATING CURVES)

| River | HEC-RAS XS | Storm | Discharge (cfs) | Flood Elevation (ft. NAVD88) | | Difference (ft.) | Notes |
|---|---|---|---|---|---|---|---|
| | | | | Computed | Observed | | |
| Chemung | 65533 USGS 01531000 | FIM23 | 127547 | 802.8 | 802.5 | 0.3 | |
| Chemung | 65533 USGS 01531000 | FIM24 | 132023 | 803.3 | 802.9 | 0.4 | |
| Chemung | 65533 USGS 01531000 | FIM25 | 134275 | 803.5 | 803.1 | 0.4 | |
| Chemung | 65533 USGS 01531000 | FIM26 | 145236 | 804.8 | 804.1 | 0.7 | |
| Chemung | 65533 USGS 01531000 | FIM27 | 155972 | 806.1 | 805.1 | 1 | |
| Chemung | 65533 USGS 01531000 | FIM28 | 164797.1 | 807.1 | 806.1 | 1 | |
| Chemung | 65533 USGS 01531000 | FIM29 | 168018 | 807.6 | 806.5 | 1.1 | |
| Chemung | 65533 USGS 01531000 | FIM30 | 171702 | 808 | 807.1 | 0.9 | |
| Chemung | 65533 USGS 01531000 | FIM31 | 178467 | 808.8 | 808.1 | 0.7 | |
| Chemung | 65533 USGS 01531000 | FIM32 | 185246 | 809.5 | 809.1 | 0.4 | |
| Chemung | 65533 USGS 01531000 | FIM33 | 189253 | 809.9 | 809.7 | 0.2 | |

# APPENDIX C


HEC-RAS Modeling Results

| HEC-RAS XS | River | Community | Effective FEMA Lettered XS | 100-year flood elevation (feet NAVD 88) | | Difference |
|---|---|---|---|---|---|---|
| | | | | Effective FEMA | Existing-Conditions | |
| 261123 | Tioga River | Town of Erwin | I | 952.6 | 951.3 | -1.3 |
| 257712 | Tioga River | Town of Erwin | H | 950.4 | 948.1 | -2.3 |
| 255136 | Tioga River | Town of Erwin | G | 949.0 | 945.8 | -3.2 |
| 252672 | Tioga River | Town of Erwin | F | 945.6 | 943.1 | -2.5 |
| 250319 | Tioga River | Town of Erwin | E | 943.0 | 941.9 | -1.1 |
| 247652 | Tioga River | Town of Erwin | D | 940.4 | 938.9 | -1.5 |
| 245931 | Tioga River | Town of Erwin | C | 938.5 | 936.6 | -1.9 |
| 243053 | Tioga River | Town of Erwin | B | 935.7 | 933.1 | -2.6 |
| 238871 | Chemung River | Town of Corning | N | 932.8 | 930.5 | -2.3 |
| 236970 | Chemung River | City of Corning | Q | 931.3 | 929.6 | -1.7 |
| 235863 | Chemung River | City of Corning | P | 931.2 | 929.1 | -2.1 |
| 234652 | Chemung River | City of Corning | O | 930.8 | 927.6 | -3.2 |
| 233362 | Chemung River | City of Corning | N | 930.0 | 927.1 | -2.9 |
| 233083 | Chemung River | City of Corning | M | 929.5 | 927.0 | -2.5 |
| 232884 | Chemung River | City of Corning | L | 929.4 | 926.7 | -2.7 |
| 232344 | Chemung River | City of Corning | K | 929.1 | 926.7 | -2.4 |
| 231546 | Chemung River | City of Corning | I | 928.4 | 926.5 | -1.9 |
| 230964 | Chemung River | City of Corning | H | 928.1 | 926.4 | -1.7 |
| 230789 | Chemung River | City of Corning | G | 928.0 | 926.4 | -1.6 |
| 228107 | Chemung River | City of Corning | F | 925.4 | 925.4 | 0.0 |
| 227174 | Chemung River | City of Corning | E | 923.1 | 920.1 | -3.0 |
| 226644 | Chemung River | City of Corning | D | 922.8 | 921.0 | -1.8 |
| 225074 | Chemung River | City of Corning | C | 922.0 | 919.6 | -2.4 |
| 222894 | Chemung River | City of Corning | B | 920.5 | 918.2 | -2.3 |
| 222242 | Chemung River | City of Corning, Town of Corning | A, K | 920.4 | 916.8 | -3.6 |
| 220078 | Chemung River | Town of Corning | J | 919.0 | 916.3 | -2.7 |
| 219020 | Chemung River | Town of Corning | I | 917.7 | 914.8 | -2.9 |
| 218299 | Chemung River | Town of Corning | H | 917.7 | 913.8 | -3.9 |
| 216686 | Chemung River | Town of Corning | G | 917.4 | 912.8 | -4.6 |
| 212544 | Chemung River | Town of Corning | F | 913.4 | 908.6 | -4.8 |
| 208143 | Chemung River | Town of Corning | E | 908.8 | 905.5 | -3.3 |
| 204658 | Chemung River | Town of Corning | D | 906.5 | 902.7 | -3.8 |
| 203141 | Chemung River | Town of Corning | C | 904.4 | 899.6 | -4.8 |
| 201492 | Chemung River | Town of Corning | B | 900.7 | 897.7 | -3.0 |
| 199391 | Chemung River | Town of Corning | A | 898.3 | 897.6 | -0.7 |
| 194826 | Chemung River | Big Flats | T | 894.1 | 891.4 | -2.7 |
| 193046 | Chemung River | Big Flats | S | 892.7 | 889.3 | -3.4 |
| 191060 | Chemung River | Big Flats | R | 891.5 | 888.3 | -3.2 |
| 189634 | Chemung River | Big Flats | Q | 890.1 | 887.5 | -2.6 |
| 188512 | Chemung River | Big Flats | P | 888.9 | 887.1 | -1.8 |
| 185583 | Chemung River | Big Flats | O | 886.7 | 885.4 | -1.3 |
| 183769 | Chemung River | Big Flats | N | 885.4 | 884.5 | -0.9 |
| 182036 | Chemung River | Big Flats | M | 883.5 | 883.4 | -0.1 |
| 180366 | Chemung River | Big Flats | L | 882.6 | 883.1 | 0.5 |
| 179056 | Chemung River | Big Flats | K | 882.0 | 882.2 | 0.2 |
| 177737 | Chemung River | Big Flats | J | 881.0 | 882.0 | 1.0 |
| 176217 | Chemung River | Big Flats | I | 879.8 | 880.9 | 1.1 |
| 173966 | Chemung River | Big Flats | H | 877.8 | 876.6 | -1.2 |
| 171371 | Chemung River | Big Flats | G | 876.5 | 876.1 | -0.4 |
| 169622 | Chemung River | Big Flats | F | 875.8 | 875.3 | -0.5 |
| 168642 | Chemung River | Big Flats | E | 875.1 | 874.9 | -0.2 |
| 166718 | Chemung River | Big Flats | D | 873.9 | 874.1 | 0.2 |
| 163964 | Chemung River | Big Flats | C | 871.0 | 870.0 | -1.0 |
| 162198 | Chemung River | Big Flats | B | 870.4 | 868.9 | -1.5 |
| 160180 | Chemung River | Big Flats | A | 869.0 | 866.7 | -2.3 |
| 157893 | Chemung River | Town of Elmira | M | 868.6 | 866.2 | -2.4 |
| 154806 | Chemung River | Town of Elmira | L | 866.4 | 863.6 | -2.8 |
| 150889 | Chemung River | Town of Elmira | K | 862.6 | 860.6 | -2.0 |
| 148771 | Chemung River | Town of Elmira | J | 858.7 | 858.1 | -0.6 |
| 146659 | Chemung River | City of Elmira | S | 857.5 | 857.5 | 0.0 |
| 144563 | Chemung River | City of Elmira | R | 855.2 | 855.8 | 0.6 |

| HEC-RAS XS | River | Community | Effective FEMA Lettered XS | 100-year flood elevation (feet NAVD 88) | | Difference |
|---|---|---|---|---|---|---|
| | | | | Effective FEMA | Existing-Conditions | |
| 144148 | Chemung River | City of Elmira | Q | 855.2 | 855.7 | 0.5 |
| 144003 | Chemung River | City of Elmira | P | 855.2 | 855.5 | 0.3 |
| 142907 | Chemung River | City of Elmira | O | 855.0 | 854.8 | -0.2 |
| 142702 | Chemung River | City of Elmira | N | 854.2 | 854.9 | 0.7 |
| 142570 | Chemung River | City of Elmira | M | 854.2 | 854.7 | 0.5 |
| 141928 | Chemung River | City of Elmira | L | 853.9 | 854.1 | 0.2 |
| 141400 | Chemung River | City of Elmira | K | 853.7 | 853.6 | -0.1 |
| 141054 | Chemung River | City of Elmira | J | 853.4 | 853.4 | 0.0 |
| 140889 | Chemung River | City of Elmira | I | 853.2 | 853.3 | 0.1 |
| 139870 | Chemung River | City of Elmira | H | 852.3 | 851.5 | -0.8 |
| 139777 | Chemung River | City of Elmira | G | 851.9 | 851.3 | -0.6 |
| 139208 | Chemung River | City of Elmira | F | 851.2 | 850.7 | -0.5 |
| 139061 | Chemung River | City of Elmira | E | 851.2 | 850.5 | -0.7 |
| 137588 | Chemung River | City of Elmira | D | 849.6 | 849.1 | -0.5 |
| 135345 | Chemung River | City of Elmira | C | 848.5 | 847.6 | -0.9 |
| 133571 | Chemung River | City of Elmira | B | 847.8 | 846.7 | -1.1 |
| 132890 | Chemung River | City of Elmira | A | 846.7 | 845.7 | -1.0 |
| 128045 | Chemung River | Town of Elmira | G | 841.9 | 843.2 | 1.3 |
| 127330 | Chemung River | Town of Elmira | F | 841.7 | 842.9 | 1.2 |
| 126507 | Chemung River | Town of Elmira | E | 840.6 | 842.6 | 2.0 |
| 124543 | Chemung River | Town of Elmira | D | 839.5 | 841.5 | 2.0 |
| 122443 | Chemung River | Town of Elmira | C | 837.2 | 838.2 | 1.0 |
| 120035 | Chemung River | Town of Elmira, Town of Ashland | B, H | 837.3 | 836.4 | -0.9 |
| 115238 | Chemung River | Town of Elmira, Town of Ashland | A, G | 835.3 | 833.5 | -1.8 |
| 112179 | Chemung River | Town of Ashland | F | 831.8 | 829.7 | -2.1 |
| 108972 | Chemung River | Town of Ashland | E | 828.7 | 828.2 | -0.5 |
| 105837 | Chemung River | Town of Ashland | D | 827.8 | 826.6 | -1.2 |
| 104122 | Chemung River | Town of Ashland | C | 826.5 | 825.8 | -0.7 |
| 99765 | Chemung River | Town of Ashland | B | 824.6 | 823.0 | -1.6 |
| 95404 | Chemung River | Town of Ashland, Town of Chemung | A, R | 821.1 | 820.5 | -0.6 |
| 91242 | Chemung River | Town of Chemung | Q | 818.0 | 815.4 | -2.6 |
| 89976 | Chemung River | Town of Chemung | P | 818.0 | 815.7 | -2.3 |
| 87843 | Chemung River | Town of Chemung | O | 817.4 | 814.8 | -2.6 |
| 83842 | Chemung River | Town of Chemung | N | 814.6 | 811.3 | -3.3 |
| 81011 | Chemung River | Town of Chemung | M | 812.6 | 810.5 | -2.1 |
| 76408 | Chemung River | Town of Chemung | L | 810.6 | 807.6 | -3.0 |
| 71260 | Chemung River | Town of Chemung | K | 805.3 | 803.7 | -1.6 |
| 70456 | Chemung River | Town of Chemung | J | 802.4 | 802.8 | 0.4 |
| 63755 | Chemung River | Town of Chemung | H | 799.5 | 797.5 | -2.0 |
| 60558 | Chemung River | Bradford County | AK | 797.4 | 793.7 | -3.7 |
| 59800 | Chemung River | Bradford County | AJ | 797.1 | 794.0 | -3.1 |
| 58458 | Chemung River | Bradford County | AI | 796.1 | 792.5 | -3.6 |
| 57159 | Chemung River | Bradford County | AH | 795.2 | 791.2 | -4.0 |
| 55988 | Chemung River | Bradford County | AG | 794.8 | 790.4 | -4.4 |
| 54894 | Chemung River | Bradford County | AF | 794.0 | 789.4 | -4.6 |
| 53855 | Chemung River | Bradford County | AE | 792.7 | 788.7 | -4.0 |
| 52895 | Chemung River | Bradford County | AD | 791.4 | 787.7 | -3.7 |
| 50262 | Chemung River | Town of Chemung | G | 790.5 | 786.7 | -3.8 |
| 47411 | Chemung River | Town of Chemung | F | 786.4 | 784.7 | -1.7 |
| 45626 | Chemung River | Town of Chemung | E | 784.6 | 783.5 | -1.1 |
| 41807 | Chemung River | Town of Chemung | D | 782.0 | 781.0 | -1.0 |
| 39196 | Chemung River | Town of Chemung | C | 780.7 | 779.5 | -1.2 |
| 37564 | Chemung River | Town of Chemung | B | 779.5 | 779.5 | 0.0 |
| 36551 | Chemung River | Town of Chemung | A | 778.1 | 777.5 | -0.6 |
| 34622 | Chemung River | Bradford County | AA | 777.2 | 775.8 | -1.4 |
| 33080 | Chemung River | Bradford County | Z | 776.9 | 775.2 | -1.7 |
| 32120 | Chemung River | Bradford County | Y | 776.6 | 774.6 | -2.0 |
| 31438 | Chemung River | Bradford County | X | 775.7 | 774.2 | -1.5 |
| 29097 | Chemung River | Bradford County | W | 772.2 | 769.8 | -2.4 |
| 27986 | Chemung River | Bradford County | V | 771.5 | 769.1 | -2.4 |
| 27121 | Chemung River | Bradford County | U | 771.1 | 768.0 | -3.1 |

| HEC-RAS XS | River | Community | Effective FEMA Lettered XS | 100-year flood elevation (feet NAVD 88) | | Difference |
|---|---|---|---|---|---|---|
| | | | | Effective FEMA | Existing-Conditions | |
| 26388 | Chemung River | Bradford County | T | 770.3 | 767.8 | -2.5 |
| 25349 | Chemung River | Bradford County | S | 769.7 | 767.8 | -1.9 |
| 24307 | Chemung River | Bradford County | R | 768.5 | 765.6 | -2.9 |
| 23521 | Chemung River | Bradford County | Q | 768.0 | 766.3 | -1.7 |
| 22431 | Chemung River | Bradford County | P | 767.6 | 764.7 | -2.9 |
| 21436 | Chemung River | Bradford County | O | 767.1 | 764.2 | -2.9 |
| 20700 | Chemung River | Bradford County | N | 766.7 | 763.7 | -3.0 |
| 19868 | Chemung River | Bradford County | M | 766.4 | 763.8 | -2.6 |
| 19180 | Chemung River | Bradford County | L | 766.1 | 763.5 | -2.6 |
| 18233 | Chemung River | Bradford County | K | 765.5 | 763.1 | -2.4 |
| 17215 | Chemung River | Bradford County | J | 764.6 | 761.9 | -2.7 |
| 15375 | Chemung River | Bradford County | I | 762.4 | 760.8 | -1.6 |
| 13952 | Chemung River | Bradford County | H | 760.7 | 759.2 | -1.5 |
| 13483 | Chemung River | Bradford County | G | 760.2 | 758.9 | -1.3 |
| 12332 | Chemung River | Bradford County | F | 759.1 | 757.4 | -1.7 |
| 9628 | Chemung River | Bradford County | E | 756.0 | 755.7 | -0.3 |
| 8724 | Chemung River | Bradford County | D | 754.5 | 754.4 | -0.1 |
| 7623 | Chemung River | Bradford County | C | 754.2 | 753.5 | -0.7 |
| 6864 | Chemung River | Bradford County | B | 754.2 | 752.5 | -1.7 |
| 5939 | Chemung River | Bradford County | A | 754.2 | 751.7 | -2.5 |
| 7869 | Cohocton River | Town of Erwin | B | 945.7 | 947.3 | 1.6 |
| 4148 | Cohocton River | Town or Erwin | A | 939.3 | 940.4 | 1.1 |

| Gang Mills Levee-Tioga River | | | | | |
|---|---|---|---|---|---|
| HEC-RAS XS | Levee | Bank | 100-year Flood Elevation (ft. NAVD 88) | Top of Levee Elevation (ft. NAVD88) | Freeboard (ft.) |
| 256279 | Gang Mills | Left | 946.8 | 956.0 | 9.2 |
| 255688 | Gang Mills | Left | 946.5 | 956.5 | 10.0 |
| 255136 | Gang Mills | Left | 945.8 | 955.5 | 9.7 |
| 254492 | Gang Mills | Left | 945.6 | 954.8 | 9.2 |
| 253786 | Gang Mills | Left | 945.4 | 954.6 | 9.2 |
| 252672 | Gang Mills | Left | 943.1 | 953.3 | 10.2 |
| 252177 | Gang Mills | Left | 943.4 | 952.6 | 9.2 |
| 251511 | Gang Mills | Left | 942.7 | 952.1 | 9.4 |
| 250930 | Gang Mills | Left | 942.2 | 951.6 | 9.4 |
| 250319 | Gang Mills | Left | 941.9 | 951.5 | 9.6 |
| 249900 | Gang Mills | Left | 941.3 | 951.0 | 9.7 |
| 249475 | Gang Mills | Left | 940.9 | 951.1 | 10.2 |
| 248850 | Gang Mills | Left | 940.5 | 950.2 | 9.7 |
| 248268 | Gang Mills | Left | 939.8 | 950.0 | 10.2 |
| 247652 | Gang Mills | Left | 938.9 | 949.5 | 10.5 |
| 247146 Norfolk So. RR | Gang Mills | Left | | | |
| 246933 | Gang Mills | Left | 937.7 | 949.2 | 11.5 |
| 246740 | Gang Mills | Left | 937.4 | 949.1 | 11.8 |
| 246352 | Gang Mills | Left | 936.9 | 948.9 | 12.0 |
| 245931 | Gang Mills | Left | 936.6 | 948.7 | 12.1 |
| 245437 | Gang Mills | Left | 934.8 | 948.0 | 13.3 |
| 244887 | Gang Mills | Left | 934.7 | 947.5 | 12.8 |
| 244221 | Gang Mills | Left | 934.1 | 947.3 | 13.2 |
| 243647 | Gang Mills | Left | 933.6 | 946.9 | 13.3 |
| 243053 | Gang Mills | Left | 933.1 | 947.3 | 14.2 |
| 242453 | Gang Mills | Left | 932.6 | 946.6 | 14.0 |
| 241800 | Gang Mills | Left | 932.7 | 946.9 | 14.2 |

| Corning Levee | | | | | |
|---|---|---|---|---|---|
| HEC-RAS XS | Levee | Bank | 100-year Flood Elevation (ft. NAVD 88) | Top of Levee Elevation (ft. NAVD88) | Freeboard (ft.) |
| 240670 | Corning | Left | 932.0 | 947.8 | 15.8 |
| 240178 | Corning | Left | 931.6 | 948.4 | 16.8 |
| 239749 | Corning | Left | 930.9 | 954.9 | 24.0 |
| 239312 | Corning | Left | 930.6 | 959.8 | 29.2 |
| 238871 | Corning | Left | 930.5 | 948.4 | 17.9 |
| 238354 | Corning | Left | 930.5 | 947.4 | 16.9 |
| 237944 | Corning | Left | 930.4 | 946.6 | 16.2 |
| 237566 | Corning | Left | 930.0 | 946.5 | 16.4 |
| 237258 | Corning | Left | 930.0 | 947.2 | 17.2 |
| 236970 | Corning | Left | 929.6 | 952.2 | 22.6 |
| 236521 Denison Pkwy | | | | | |
| 235863 | Corning | Left | 929.1 | 942.3 | 13.2 |
| 235523 | Corning | Left | 928.4 | 943.0 | 14.6 |
| 235520 | Corning | Left | | | |
| 235099 | Corning | Left | 928.1 | 942.6 | 14.5 |
| 234652 | Corning | Left | 927.6 | 942.4 | 14.7 |
| 234238 | Corning | Left | 927.7 | 942.0 | 14.3 |
| 233740 | Corning | Left | 927.4 | 941.7 | 14.3 |
| 233362 | Corning | Left | 927.1 | 940.6 | 13.5 |
| 233083 | Corning | Left | 927.0 | 940.4 | 13.4 |
| 232972 Bridge Street | Corning | Left | | | |
| 232884 | Corning | Left | 926.7 | 939.9 | 13.2 |
| 232629 | Corning | Left | 926.6 | 940.2 | 13.6 |
| 232344 | Corning | Left | 926.7 | 940.2 | 13.5 |
| 231921 USGS 01529950 | Corning | Left | 926.6 | 938.8 | 12.2 |
| 231546 | Corning | Left | 926.5 | 939.0 | 12.5 |
| 231216 | Corning | Left | 926.3 | 938.2 | 11.9 |
| 230964 | Corning | Left | 926.4 | 939.0 | 12.5 |
| 230889 Riverfront Trail | Corning | Left | | | |
| 230837 | Corning | Left | 926.4 | 939.8 | 13.5 |
| 230789 | Corning | Left | 926.4 | 938.7 | 12.3 |

| | | | | | |
|---|---|---|---|---|---|
| 230549 Highway 414 | Corning | Left | | | |
| 230224 | Corning | Left | 926.2 | 937.3 | 11.1 |
| 229738 | Corning | Left | 925.9 | 937.1 | 11.2 |
| 229284 | Corning | Left | 925.8 | 936.6 | 10.7 |
| 228704 | Corning | Left | 925.7 | 936.2 | 10.5 |
| 228107 | Corning | Left | 925.4 | 935.4 | 10.0 |
| 227581 | Corning | Left | 923.6 | 935.3 | 11.7 |
| 227174 | Corning | Left | 920.1 | 935.0 | 14.9 |

| South Corning Levee | | | | | |
|---|---|---|---|---|---|
| HEC-RAS XS | Levee | Bank | 100-year Flood Elevation (ft. NAVD 88) | Top of Levee Elevation (ft. NAVD88) | Freeboard (ft.) |
| 235863 | South Corning | Right | 929.1 | 939.2 | 10.1 |
| 235523 | South Corning | Right | 928.4 | 944.5 | 16.1 |
| 235520 | South Corning | Right | | | |
| 235099 | South Corning | Right | 928.1 | 944.3 | 16.1 |
| 234652 | South Corning | Right | 927.6 | 944.1 | 16.5 |
| 234238 | South Corning | Right | 927.7 | 943.8 | 16.2 |
| 233740 | South Corning | Right | 927.4 | 943.1 | 15.7 |
| 233362 | South Corning | Right | 927.1 | 942.7 | 15.6 |
| 233083 | South Corning | Right | 927.0 | 940.6 | 13.6 |
| 232972 Bridge Street | South Corning | Right | | | |
| 232884 | South Corning | Right | 926.7 | 939.9 | 13.2 |
| 232629 | South Corning | Right | 926.6 | 940.9 | 14.3 |
| 232344 | South Corning | Right | 926.7 | 940.5 | 13.8 |
| 231921 USGS 01529950 | South Corning | Right | 926.6 | 941.3 | 14.7 |
| 231546 | South Corning | Right | 926.5 | 938.5 | 12.0 |
| 231216 | South Corning | Right | 926.3 | 938.4 | 12.1 |
| 230964 | South Corning | Right | 926.4 | 938.4 | 11.9 |
| 230889 Riverfront Trail | South Corning | Right | | | |
| 230837 | South Corning | Right | 926.4 | 938.4 | 12.0 |
| 230789 | South Corning | Right | 926.4 | 938.4 | 12.0 |
| 230549 Highway 414 | South Corning | Right | | | |
| 230224 | South Corning | Right | 926.2 | 936.8 | 10.6 |
| 229738 | South Corning | Right | 925.9 | 936.5 | 10.5 |
| 229284 | South Corning | Right | 925.8 | 936.6 | 10.8 |
| 228704 | South Corning | Right | 925.7 | 935.6 | 10.0 |
| 228107 | South Corning | Right | 925.4 | 935.6 | 10.2 |
| 227581 | South Corning | Right | 923.6 | 935.0 | 11.4 |
| 227174 | South Corning | Right | 920.1 | 935.4 | 15.3 |
| 226644 | South Corning | Right | 921.0 | 935.3 | 14.2 |
| 226155 | South Corning | Right | 921.0 | 934.0 | 13.0 |
| 225721 | South Corning | Right | 920.2 | 933.5 | 13.2 |
| 225074 | South Corning | Right | 919.6 | 932.8 | 13.2 |
| 224622 | South Corning | Right | 919.6 | 931.8 | 12.2 |
| 224052 | South Corning | Right | 919.1 | 930.8 | 11.7 |
| 223589 | South Corning | Right | 918.5 | 931.3 | 12.8 |
| 223265 | South Corning | Right | 918.7 | 929.9 | 11.2 |
| 222894 | South Corning | Right | 918.2 | 935.1 | 16.8 |
| 222603 Denison Pkwy | South Corning | Right | | | |
| 222242 | South Corning | Right | 916.8 | 936.2 | 19.4 |
| 221949 | South Corning | Right | 916.6 | 932.9 | 16.3 |
| 221490 | South Corning | Right | 916.7 | 929.1 | 12.4 |
| 221073 | South Corning | Right | 916.6 | 926.4 | 9.8 |
| 220698 | South Corning | Right | 916.6 | 926.0 | 9.3 |
| 220078 | South Corning | Right | 916.3 | 925.2 | 8.9 |
| 219554 | South Corning | Right | 915.1 | 924.2 | 9.1 |
| 219020 | South Corning | Right | 914.8 | 923.8 | 9.0 |
| 218299 | South Corning | Right | 913.8 | 923.3 | 9.5 |

| North Elmira Levee | | | | | |
|---|---|---|---|---|---|
| HEC-RAS XS | Levee | Bank | 100-year Flood Elevation (ft. NAVD 88) | Top of Levee Elevation (ft. NAVD88) | Freeboard (ft.) |
| 152734 | North Elmira | Left | 861.9 | 870.6 | 8.7 |

| | | | | | |
|---|---|---|---|---|---|
| 152066 | North Elmira | Left | 861.5 | 870.4 | 8.9 |
| 151423 | North Elmira | Left | 861.0 | 869.3 | 8.3 |
| 150889 | North Elmira | Left | 860.6 | 868.7 | 8.1 |
| 150158 | North Elmira | Left | 860.2 | 868.3 | 8.0 |
| 149454 | North Elmira | Left | 859.4 | 867.4 | 8.0 |
| 148771 | North Elmira | Left | 858.1 | 867.3 | 9.2 |
| 148084 | North Elmira | Left | 858.0 | 867.2 | 9.2 |
| 147455 | North Elmira | Left | 857.8 | 867.1 | 9.3 |
| 146659 | North Elmira | Left | 857.5 | 866.6 | 9.1 |
| 146074 | North Elmira | Left | 857.2 | 865.8 | 8.6 |
| 145440 | North Elmira | Left | | | |
| 145438 | North Elmira | Left | 856.4 | 864.8 | 8.4 |
| 144563 | North Elmira | Left | 855.8 | 863.9 | 8.1 |
| 144148 | North Elmira | Left | 855.7 | 864.0 | 8.3 |
| 144076 South Walnut St | North Elmira | Left | | | |
| 144003 | North Elmira | Left | 855.5 | 864.2 | 8.6 |
| 143626 | North Elmira | Left | 855.5 | 862.8 | 7.4 |
| 143264 | North Elmira | Left | 855.1 | 862.4 | 7.3 |
| 142907 | North Elmira | Left | 854.8 | 862.2 | 7.4 |
| 142702 | North Elmira | Left | 854.9 | 861.9 | 6.9 |
| 142659 Weir | North Elmira | Left | | | |
| 142570 | North Elmira | Left | 854.7 | 861.9 | 7.2 |
| 141928 | North Elmira | Left | 854.1 | 861.8 | 7.7 |
| 141705 | North Elmira | Left | 853.8 | 861.6 | 7.7 |
| 141524 | North Elmira | Left | 853.8 | 861.9 | 8.1 |
| 141456 South Main St | North Elmira | Left | | | |
| 141400 | North Elmira | Left | 853.6 | 860.6 | 6.9 |
| 141268 | North Elmira | Left | 853.5 | 860.3 | 6.8 |
| 141054 | North Elmira | Left | 853.4 | 860.2 | 6.8 |
| 140889 | North Elmira | Left | 853.3 | 860.1 | 6.8 |
| 140844 Railroad | North Elmira | Left | | | |
| 140784 | North Elmira | Left | 852.2 | 859.5 | 7.3 |
| 140734 | North Elmira | Left | 852.2 | 859.4 | 7.2 |
| 140691 | North Elmira | Left | 852.2 | 859.3 | 7.1 |
| 140629 Clemens Ct Pky | North Elmira | Left | | | |
| 140557 | North Elmira | Left | 852.0 | 859.3 | 7.3 |
| 140230 USGS 01530332 | North Elmira | Left | 851.7 | 859.0 | 7.3 |
| 139870 | North Elmira | Left | 851.5 | 857.8 | 6.3 |
| 139816 Lake Street | North Elmira | Left | | | |
| 139777 | North Elmira | Left | 851.3 | 858.2 | 7.0 |
| 139486 | North Elmira | Left | 850.9 | 857.9 | 7.0 |
| 139208 | North Elmira | Left | 850.7 | 857.8 | 7.0 |
| 139129 Madison Ave | North Elmira | Left | | | |
| 139061 | North Elmira | Left | 850.5 | 857.0 | 6.5 |
| 138796 | North Elmira | Left | 850.4 | 856.3 | 5.9 |
| 138450 | North Elmira | Left | 850.0 | 856.9 | 7.0 |
| 138183 | North Elmira | Left | 849.7 | 855.8 | 6.2 |
| 137862 | North Elmira | Left | 849.3 | 856.4 | 7.0 |
| 137588 | North Elmira | Left | 849.1 | 855.5 | 6.5 |

| South Elmira Levee | | | | | |
|---|---|---|---|---|---|
| HEC-RAS XS | Levee | Bank | 100-year Flood Elevation (ft. NAVD 88) | Top of Levee Elevation (ft. NAVD88) | Freeboard (ft.) |
| 145438 | South Elmira | Right | 856.4 | 865.2 | 8.8 |
| 144563 | South Elmira | Right | 855.8 | 863.3 | 7.4 |
| 144148 | South Elmira | Right | 855.7 | 863.2 | 7.5 |
| 144076 South Walnut St | South Elmira | Right | | | |
| 144003 | South Elmira | Right | 855.5 | 862.2 | 6.7 |
| 143626 | South Elmira | Right | 855.5 | 862.1 | 6.6 |
| 143264 | South Elmira | Right | 855.1 | 862.3 | 7.2 |
| 142907 | South Elmira | Right | 854.8 | 862.1 | 7.3 |
| 142702 | South Elmira | Right | 854.9 | 861.9 | 7.0 |
| 142659 Weir | South Elmira | Right | | | |
| 142570 | South Elmira | Right | 854.7 | 861.8 | 7.1 |

| | | | | | |
|---|---|---|---|---|---|
| 141928 | South Elmira | Right | 854.1 | 861.5 | 7.4 |
| 141705 | South Elmira | Right | 853.8 | 861.4 | 7.6 |
| 141524 | South Elmira | Right | 853.8 | 861.3 | 7.5 |
| 141456 South Main St | South Elmira | Right | | | |
| 141400 | South Elmira | Right | 853.6 | 860.1 | 6.5 |
| 141268 | South Elmira | Right | 853.5 | 860.4 | 6.9 |
| 141054 | South Elmira | Right | 853.4 | 859.9 | 6.5 |
| 140889 | South Elmira | Right | 853.3 | 860.0 | 6.7 |
| 140844 Railroad | South Elmira | Right | | | |
| 140784 | South Elmira | Right | 852.2 | 859.4 | 7.1 |
| 140734 | South Elmira | Right | 852.2 | 859.4 | 7.1 |
| 140691 | South Elmira | Right | 852.2 | 859.4 | 7.2 |
| 140629 Clemens Ct Pky | South Elmira | Right | | | |
| 140557 | South Elmira | Right | 852.0 | 860.1 | 8.1 |
| 140230 USGS 01530332 | South Elmira | Right | 851.7 | 860.1 | 8.4 |
| 139870 | South Elmira | Right | 851.5 | 858.7 | 7.2 |
| 139816 Lake Street | South Elmira | Right | | | |
| 139777 | South Elmira | Right | 851.3 | 857.0 | 5.8 |
| 139486 | South Elmira | Right | 850.9 | 858.8 | 7.9 |
| 139208 | South Elmira | Right | 850.7 | 859.3 | 8.6 |
| 139129 Madison Ave | South Elmira | Right | | | |
| 139061 | South Elmira | Right | 850.5 | 857.4 | 6.9 |
| 138796 | South Elmira | Right | 850.4 | 857.6 | 7.2 |
| 138450 | South Elmira | Right | 850.0 | 857.0 | 7.0 |
| 138183 | South Elmira | Right | 849.7 | 857.0 | 7.3 |
| 137862 | South Elmira | Right | 849.3 | 856.5 | 7.1 |
| 137588 | South Elmira | Right | 849.1 | 856.2 | 7.2 |
| 137031 | South Elmira | Right | 848.3 | 855.7 | 7.4 |
| 136444 | South Elmira | Right | 847.8 | 855.4 | 7.6 |
| 135844 | South Elmira | Right | 847.6 | 855.0 | 7.4 |
| 135345 | South Elmira | Right | 847.6 | 855.1 | 7.6 |
| 134708 | South Elmira | Right | 847.4 | 854.8 | 7.4 |
| 134118 | South Elmira | Right | 847.0 | 854.7 | 7.7 |
| 133571 | South Elmira | Right | 846.7 | 853.9 | 7.2 |
| 132890 | South Elmira | Right | 845.7 | 853.4 | 7.6 |
| 132081 | South Elmira | Right | 845.0 | 852.3 | 7.3 |
| 131370 | South Elmira | Right | 844.4 | 851.0 | 6.5 |
| 130730 | South Elmira | Right | 843.9 | 850.1 | 6.1 |
| 130047 | South Elmira | Right | 843.9 | 848.8 | 5.0 |
| 129038 | South Elmira | Right | 843.5 | 848.0 | 4.4 |
| 128045 | South Elmira | Right | 843.2 | 847.3 | 4.1 |
| 127330 | South Elmira | Right | 842.9 | 847.0 | 4.1 |
| 126507 | South Elmira | Right | 842.6 | 845.6 | 3.0 |
| 125371 | South Elmira | Right | 841.9 | 844.6 | 2.6 |
| 124543 | South Elmira | Right | 841.5 | 844.0 | 2.5 |
| 123464 | South Elmira | Right | 839.2 | 843.6 | 4.4 |
| 122443 | South Elmira | Right | 838.2 | 843.1 | 4.9 |
| 121876 | South Elmira | Right | 837.5 | 839.7 | 2.2 |

| Athens Levee | | | | | |
|---|---|---|---|---|---|
| HEC-RAS XS | Levee | Bank | 100-year Flood Elevation (ft. NAVD 88) | Top of Levee Elevation (ft. NAVD88) | Freeboard (ft.) |
| 15663 | Athens | Left | 764.1 | 770.7 | 6.6 |
| 15375 | Athens | Left | 763.5 | 770.5 | 6.9 |
| 15263 | Athens | Left | 763.5 | 771.1 | 7.5 |
| 15115 Railroad | Athens | Left | | | |
| 15003 | Athens | Left | 763.2 | 769.0 | 5.8 |
| 14419 | Athens | Left | 762.9 | 767.9 | 5.0 |
| 13952 | Athens | Left | 762.7 | 767.8 | 5.1 |
| 13483 | Athens | Left | 762.6 | 767.6 | 5.0 |
| 12928 | Athens | Left | 762.4 | 767.7 | 5.3 |

| Gang Mills Levee-Cohocton River |
|---|

| HEC-RAS XS | Levee | Bank | 100-year Flood Elevation (ft. NAVD 88) | Top of Levee Elevation (ft. NAVD88) | Freeboard (ft.) |
|---|---|---|---|---|---|
| 4148 | Gang Mills | Right | 940.4 | 947.7 | 7.3 |
| 3667 | Gang Mills | Right | 939.6 | 947.7 | 8.1 |
| 3247 | Gang Mills | Right | 939.3 | 947.8 | 8.5 |
| 3013 | Gang Mills | Right | 939.0 | 948.0 | 9.0 |
| 2915 Hamilton St. | Gang Mills | Right | | | |
| 2853 | Gang Mills | Right | 938.3 | 947.4 | 9.1 |
| 2754 | Gang Mills | Right | 938.1 | 948.0 | 10.0 |
| 2647 | Gang Mills | Right | 937.7 | 947.4 | 9.7 |
| 2604 US Rte 86 Ramps | Gang Mills | Right | | | |
| 2555 | Gang Mills | Right | 936.7 | 947.5 | 10.8 |
| 2508 | Gang Mills | Right | 936.6 | 947.4 | 10.8 |
| 2418 US Rte 86 Ramp | Gang Mills | Right | | | |
| 2378 | Gang Mills | Right | 935.9 | 947.5 | 11.7 |
| 2303 | Gang Mills | Right | 935.9 | 947.7 | 11.8 |
| 2189 US Rte 86 Ramp | Gang Mills | Right | | | |
| 1758 | Gang Mills | Right | 935.1 | 947.5 | 12.4 |
| 1425 | Gang Mills | Right | 931.6 | 947.2 | 15.7 |
| 1081 | Gang Mills | Right | 930.5 | 947.4 | 16.9 |
| 904 | Gang Mills | Right | 930.6 | 947.9 | 17.3 |
| 834 Norfolk S RR | Gang Mills | Right | | | |
| 765 | Gang Mills | Right | 929.6 | 949.3 | 19.7 |

| Painted Post-Cohocton River | | | | | |
|---|---|---|---|---|---|
| HEC-RAS XS | Levee | Bank | 100-year Flood Elevation (ft. NAVD 88) | Top of Levee Elevation (ft. NAVD88) | Freeboard (ft.) |
| 4148 | Painted Post | Left | 940.4 | 948.0 | 7.6 |
| 3667 | Painted Post | Left | 939.6 | 954.6 | 15.0 |
| 3247 | Painted Post | Left | 939.3 | 949.0 | 9.7 |
| 3013 | Painted Post | Left | 939.0 | 948.6 | 9.6 |
| 2915 Hamilton St. | Painted Post | Left | | | |
| 2853 | Painted Post | Left | 938.3 | 948.6 | 10.3 |
| 2754 | Painted Post | Left | 938.1 | 950.5 | 12.5 |
| 2647 | Painted Post | Left | 937.7 | 950.1 | 12.3 |
| 2604 US Rte 86 Ramps | Painted Post | Left | | | |
| 2555 | Painted Post | Left | 936.7 | 947.6 | 10.8 |
| 2508 | Painted Post | Left | 936.6 | 947.6 | 10.9 |
| 2418 US Rte 86 Ramp | Painted Post | Left | | | |
| 2378 | Painted Post | Left | 935.9 | 947.6 | 11.7 |
| 2303 | Painted Post | Left | 935.9 | 947.8 | 11.9 |
| 2189 US Rte 86 Ramp | Painted Post | Left | | | |
| 1758 | Painted Post | Left | 935.1 | 947.6 | 12.5 |
| 1425 | Painted Post | Left | 931.6 | 947.9 | 16.4 |
| 1081 | Painted Post | Left | 930.5 | 948.1 | 17.6 |
| 904 | Painted Post | Left | 930.6 | 948.1 | 17.5 |
| 834 Norfolk S RR | Painted Post | Left | | | |
| 765 | Painted Post | Left | 929.6 | 947.8 | 18.1 |

# APPENDIX B

## Corresponding Stages and WSELs

## USGS 01531000-Chemung River at Chemung, New York

| | |
|---|---|
| Gage Elevation (NGVD29) | 778.63 |
| Conversion to NAVD88 (per VERTCON) | -0.55 |
| Gage Elevation (NAVD88) | 778.08 |
| Rating Used | 60.1 |

| Category | Depth (feet) | Elevation (NAVD88) |
|---|---|---|
| Action | 12 | 790.08 |
| Flood | 16 | 794.08 |
| Moderate Flood | 20 | 798.08 |
| Major Flood | 24 | 802.08 |

| | USGS Rating Curve (60.1) | | | |
|---|---|---|---|---|
| FIM Profile | Depth (feet) | Elevation (NAVD88) | Flow (cfs) | Notes |
| 1_ActionCorning | 11.8 | 789.8 | 25506 | |
| 2_ActionChemung | 12.0 | 790.1 | 26557 | Action |
| 3 | 13.0 | 791.1 | 31590 | |
| 4_ActionElmira | 13.3 | 791.4 | 33031 | |
| 5 | 14.0 | 792.1 | 37069 | |
| 6 | 15.0 | 793.1 | 42940 | |
| 7_FloodElmira | 15.2 | 793.3 | 44038 | |
| 8_FloodChemung | 16.0 | 794.1 | 49197 | Flood |
| 9 | 17.0 | 795.1 | 55836 | |
| 10 | 18.0 | 796.1 | 63194 | |
| 11_ModElmira | 18.1 | 796.2 | 64006 | |
| 12 | 19.0 | 797.0 | 71117 | |
| 13_ModChemung | 20.0 | 798.1 | 80429 | Moderate Flood |
| 14 | 20.3 | 798.4 | 83011 | |
| 15 | 21.0 | 799.1 | 89840 | |
| 16_MajElmira | 21.4 | 799.5 | 93851 | |
| 17 | 22.0 | 800.1 | 99781 | |
| 18 | 23.0 | 801.1 | 111578 | |
| 19_FloodErwin | 23.2 | 801.3 | 114096 | |
| 20_ModErwin | 23.9 | 802.0 | 122485 | |
| 21_MajChemung | 24.0 | 802.1 | 123055 | Major Flood |
| 22_FloodCorning | 24.2 | 802.3 | 125464 | |
| 23_MajErwins | 24.4 | 802.5 | 127547 | |
| 24_ModCorning | 24.8 | 802.9 | 132023 | |
| 25 | 25.0 | 803.1 | 134275 | |
| 26 | 26.0 | 804.1 | 145236 | |
| 27 | 27.0 | 805.1 | 155972 | |
| 28 | 28.0 | 806.1 | 164797 | |
| 29_MajCorning | 28.5 | 806.5 | 168018 | |
| 30 | 29.0 | 807.1 | 171702 | |
| 31 | 30.0 | 808.1 | 178467 | |
| 32 | 31.0 | 809.1 | 185246 | |
| 33_Agnes | 31.6 | 809.7 | 189253 | Agnes 1972 |

## USGS 01530332-Chemung River at Elmira, NY

| | |
|---|---|
| Gage Elevation (NGVD29) | 833.65 |
| Conversion to NAVD88 (per VERTCON) | -0.6 |
| Gage Elevation (NAVD88) | 833.05 |
| Rating Used | 8.0 |

| Category | Depth (feet) | Elevation (NAVD88) |
|---|---|---|
| Action | 10 | 843.05 |
| Flood | 12 | 845.05 |
| Moderate Flood | 15 | 848.05 |
| Major Flood | 19 | 852.05 |

| USGS Rating Curve (8.0) | | | |
|---|---|---|---|
| Depth (feet) | Elevation (NAVD88) | Flow (cfs) | Notes |
| 8.3 | 841.4 | 20505 | |
| 8.6 | 841.6 | 21519 | |
| 9.7 | 842.7 | 26226 | |
| 10.0 | 843.1 | 27643 | Action |
| 10.9 | 843.9 | 31723 | |
| 11.9 | 844.9 | 36540 | |
| 12.0 | 845.1 | 37085 | Flood |
| 12.8 | 845.9 | 41234 | |
| 13.8 | 846.9 | 46502 | |
| 14.9 | 847.9 | 52329 | |
| 15.0 | 848.1 | 53004 | Moderate Flood |
| 16.0 | 849.0 | 58688 | |
| 17.4 | 850.4 | 66826 | |
| 17.6 | 850.7 | 68486 | |
| 18.5 | 851.6 | 74060 | |
| 19.0 | 852.1 | 77195 | Major Flood |
| 19.9 | 852.9 | 83005 | |
| | | 92500 | |
| | | 94000 | |
| | | 103500 | |
| | | 105500 | |
| | | 109000 | |
| | | 111800 | |
| | | 120000 | |
| | | 125500 | |
| | | 143000 | |
| | | 161500 | |
| | | 177000 | |
| | | 182500 | |
| | | 188000 | |
| | | 199000 | |
| | | 212000 | |
| 25.3 | 858.4 | 235000 | Agnes |

## USGS 01529950-Chemung River at Corning, NY

| | |
|---|---|
| Gage Elevation (NGVD29) | 900.00 |
| Conversion to NAVD88 (per VERTCON) | -0.52 |
| Gage Elevation (NAVD88) | 899.48 |
| Rating Used | 10.0 |

| Category | Depth (feet) | Elevation (NAVD88) |
|---|---|---|
| Action | 21 | 920.48 |
| Flood | 29 | 928.48 |
| Moderate Flood | 30 | 929.48 |
| Major Flood | 36 | 935.48 |

| USGS Rating Curve (10.0) | | | |
|---|---|---|---|
| Depth (feet) | Elevation (NAVD88) | Flow (cfs) | Notes |
| 21.0 | 920.5 | 18001 | Action |
| 21.2 | 920.7 | 19023 | |
| 22.1 | 921.6 | 23889 | |
| 22.3 | 921.8 | 25020 | |
| 22.9 | 922.4 | 29046 | |
| 23.5 | 923.0 | 32842 | |
| 23.6 | 923.1 | 33831 | |
| 24.1 | 923.6 | 37347 | |
| 24.6 | 924.1 | 41295 | |
| 25.1 | 924.6 | 45630 | |
| 25.2 | 924.7 | 45967 | |
| 25.7 | 925.1 | 50117 | |
| 26.3 | 925.7 | 55585 | |
| 26.6 | 926.0 | 58533 | |
| 26.7 | 926.2 | 60087 | |
| 26.9 | 926.4 | 61863 | |
| 27.2 | 926.7 | 64581 | |
| 27.7 | 927.1 | 69572 | |
| 27.8 | 927.3 | 70851 | |
| 28.4 | 927.9 | 78009 | |
| 28.6 | 928.1 | 80058 | |
| 29.0 | 928.5 | 84718 | Flood |
| 29.3 | 928.8 | 88067 | |
| 30.0 | 929.5 | 97008 | Moderate Flood |
| 30.4 | 929.9 | 102577 | |
| 32.2 | 931.7 | 123093 | |
| 33.9 | 933.4 | 144107 | |
| 35.4 | 934.9 | 161007 | |
| 36.0 | 935.5 | 168235 | Major Flood |
| 36.5 | 936.0 | 174493 | |
| 37.6 | 937.1 | 188022 | |
| 38.7 | 938.2 | 201556 | |
| 40.7 | 940.2 | 227953 | Agnes 1972 |

## USGS 1526500-Tioga River at Erwins, NY

| | |
|---|---|
| Gage Elevation (NGVD29) | 931.24 |
| Conversion to NAVD88 (per VERTCON) | -0.52 |
| Gage Elevation (NAVD88) | 930.72 |
| Rating Used | 51.0 |

| Category | Depth (feet) | Elevation (NAVD88) |
|---|---|---|
| Action | 16 | 946.72 |
| Flood | 18 | 948.72 |
| Moderate Flood | 19 | 949.72 |
| Major Flood | 20 | 950.72 |

| USGS Rating Curve (51.0) | | | |
|---|---|---|---|
| Depth (feet) | Elevation (NAVD88) | Flow (cfs) | Notes |
| 8.5 | 939.2 | 11599 | |
| 8.9 | 939.7 | 12906 | |
| 10.0 | 940.8 | 16203 | |
| 10.4 | 941.2 | 17506 | |
| 11.3 | 942.0 | 20511 | |
| 12.0 | 942.8 | 23212 | |
| 12.2 | 943.0 | 24006 | |
| 12.8 | 943.5 | 26028 | |
| 13.5 | 944.2 | 29041 | |
| 14.2 | 945.0 | 32214 | |
| 14.3 | 945.0 | 32522 | |
| 15.0 | 945.7 | 35500 | |
| 15.9 | 946.6 | 39813 | |
| 16.0 | 946.7 | 40400 | Action |
| 16.5 | 947.2 | 43238 | |
| 16.8 | 947.5 | 44847 | |
| 17.1 | 947.8 | 47044 | |
| 17.9 | 948.6 | 52006 | |
| 18.0 | 948.7 | 52662 | Flood |
| 19.0 | 949.7 | 59476 | Moderate Flood |
| 19.2 | 949.9 | 61037 | |
| 19.7 | 950.4 | 64521 | |
| 20.0 | 950.7 | 66753 | Major Flood |
| 21.3 | 952.0 | 76487 | |
| 21.8 | 952.5 | 80543 | |
| 23.6 | 954.3 | 98494 | |
| 24.9 | 955.6 | 116058 | |
| 25.4 | 956.2 | 131681 | |
| 25.6 | 956.3 | 137312 | |
| 25.8 | 956.5 | 143144 | |
| 26.1 | 956.8 | 156364 | |
| 26.3 | 957.0 | 167072 | |
| 26.7 | 957.5 | 190438 | Agnes 1972 |