INVITATION TO SUBMIT PROPOSAL
Shokan / West Shokan Local Flood Analysis
Town of Olive, Ulster County, New York

Date: January 7, 2025

Proposal Submission: Cornell Cooperative Extension Ulster County
PO Box 667
Shokan, NY 12481

Submission Date: **Tuesday, February 18, 2025, by 4:30 pm**

Contact Persons: Project Management:
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It is the responder's responsibility to read the RFP specifications below.

Purpose:
The purpose of this Request for Proposals (RFP) is to secure a qualified firm to conduct Local Flood Analyses (LFA) for two communities in the Town of Olive, Ulster County: 1) The Hamlet of Shokan located on State Route 28; and 2) Portions of the Hamlet of West Shokan located on County Route 42/Watson Hollow Road. The projects will be funded through a grant to the Town of Olive coordinated by Cornell Cooperative Extension of Ulster County (CCEUC) on behalf of the Ashokan Watershed Stream Management Program (AWSMP). Members of the Olive Flood Advisory Committee (FAC) organized by the Town Board will direct the flood analysis process. The LFA projects will be carried out in two phases. Phase I is an engineering analysis and Phase II is a feasibility analysis that ends in creation of a final report.

This RFP is posted online at: https://ashokanstreams.org/projects-and-funding/

Project Timeline and Estimated Selection Schedule:

- Submit proposal questions to laz5@cornell.edu by January 15, 2025.
- Question answers will be posted online at projects-funding link above by January 17, 2025.
- Full proposals are due **Tuesday, February 18, 2025, by 4:30 pm**.
- Applicants will be notified of award after March 11, 2025.
- Anticipated project start date on or after April 1, 2025.
- Anticipated project completion and final report by March 2026.

RFP Submittal: Please submit three (3) paper copies and one (1) electronic copy of the proposal to CCEUC, Attn: Leslie Zucker, PO Box 667, Shokan, NY 12481 and laz5@cornell.edu. If submitted in person, proposals must be received no later than 4:30 p.m. on Tuesday, February 18, 2025, at the Ashokan Watershed Stream Management Program Office, 3130 Route 28, Shokan, NY 12481.

Evaluation Criteria:
Proposals will be evaluated and scored for appropriateness of methods, project timeline, reasonableness of budget, applicant qualifications, and partnerships and coordination with stakeholders. The town requires proof of expertise in industry standard hydrologic and hydraulic modeling methods for engineering and design of stream and floodplain projects. The Town of Olive reserves the right to reject all proposals that are non-responsive, vague, or non-conforming.

Minimum Qualifications Requirements:
Proposers must demonstrate they meet the following minimum qualifications:

1. Vendor should employ a fluvial geomorphologist with demonstrated experience in assessing and diagnosing stream channel and floodplain conditions in mountain river settings.
2. Vendor should have demonstrated experience with flood modeling and best management practices to reduce flood inundation and erosion hazards. For LFA study, experience related to both riverine and stormwater-related flooding is required.
3. Vendor should have demonstrated experience communicating technical investigation results to a non-technical audience.

Contract Requirements:
Funding for this project is provided by the New York City Department of Environmental Protection through a grant that is locally administered by CCEUC for the Ashokan Watershed Stream Management Program. Before responding to this solicitation, carefully review information on Insurance Requirements, Intellectual Property, and Subcontractor Approval policies, online at:
https://ashokanstreams.org/projects-and-funding/smip-project-insurance-requirements/
https://ashokanstreams.org/projects-and-funding/copyrights-and-access-to-information/
https://ashokanstreams.org/projects-and-funding/subcontractor-approval-policy/

Proposal Content & Format: The proposal should be organized in sections containing the following information:

- **Description of Company**: Provide the address of the main office(s) (for legal purposes) and the address of the office(s) that will manage the project.
- **Qualifications and Experience:** Provide the history of the company, describe professional qualifications, prior experience and prior reports from similar projects, demonstrated capabilities, including demonstrated ability to work effectively with other service and system providers (e.g., municipal government).
- **Personnel:** Identify personnel who will conduct the project and their qualifications relevant to the project. Submittals must identify a project manager, who would be responsible for the day-to-day management of project tasks and would be the primary point of contact between your company and the town FAC.
- **Proposed Plan:** In a narrative format, describe in detail how the project will be structured, explaining how each of the requirements of the Scope of Work and other tasks will be accomplished. Include any other additional services, enhancements and/or options that will be

provided to the town. Explain what steps will be necessary to implement services. Describe what information will be provided to the town FAC and on what timeline. Describe the plan to work with the town FAC. Include any additional services or information seen beneficial to this project that the town should consider.

- **Project Cost:** State the full cost of undertaking the proposed services. Include a detailed, itemized cost statement that estimates costs associated with each task and total hours and calendar time associated with each task. Include detail showing total personnel costs associated with each task and other fees that are anticipated, such as travel, printing and materials costs, etc.

Project Descriptions:

The Town of Olive completed Local Flood Analyses for the hamlets of Boiceville and West Shokan in 2017 (main report, appendix a, appendix b) and has implemented most of the top-recommended flood mitigation actions. The town now seeks to complete a Local Flood Analysis (LFA) for the hamlet of Shokan. Additionally, the town will study areas within the hamlet of West Shokan not previously studied or insufficiently studied during the 2017 analysis.

This LFA will proceed under revised LFA Program Rules issued October 25, 2024. The Town Flood Advisory Committee and its technical advisors have identified key conditions and considerations related to flooding within the hamlet study areas that are described below. Hamlet study area boundaries are provided in **Attachment A – Study Area Maps**.

A third project component is to evaluate and develop stormwater management recommendations for a Stormwater Study Area immediately adjacent to the Shokan LFA Study Area, identified on the Hamlet of Shokan map in **Attachment A**. The proposed Shokan stormwater analysis is not an LFA project but included here because of potential contributions to the Shokan LFA Study Area and public interest in stormwater flooding solutions.

Project 1 - Shokan LFA

The Shokan LFA Study Area that is approximately 0.17 sq. miles (110 acres). A branch of Butternut Creek runs through the Study Area fed by flows off the southern slope of Ticetonyk Mountain and runs south for approximately 3.0 miles from the outlet of a small pond to the Ashokan Reservoir. The Butternut Creek watershed is steep and mostly forested with only a small percentage of impervious cover.

Butternut Creek is an ungauged stream, and a FEMA Flood Insurance Study (FIS) has not been performed for the watercourse. A hydrologic analysis was performed for Butternut Creek by the town's hired consultant in 2021 to design two stream crossings over Butternut Creek that are located within the Shokan LFA Study Area. See **Attachment A** for crossing locations. While these crossing sites should be considered for recommendation in the Shokan LFA due to flood reduction benefits, a full Phase II LFA feasibility analysis for the crossings will not be necessary.

For the crossing project described above, the town's consultant carried out geomorphic field investigation that included cross-sections along reference reaches and at the crossing locations. The consultant estimated bankfull measurements and discharges. A two-dimensional hydraulic model was developed at crossing locations using Hydrologic Engineering Center River Analysis System (HEC-RAS) software. The model covers a total area of 18.7 acres including both crossings and 2,300 linear feet of channel and surrounding floodplain. Modeling begins upstream of the Red Maple Road crossing where Butternut Creek splits into two channels and ends 450 feet downstream of the Bostock Road crossing

where the stream parallels State Route 28. Crossing project information will be made available to the LFA consultant.

The **Appendix A** LFA Study Area map for Shokan indicates the location of past flooding issues and concerns identified by the Town FAC. Specific flood concerns identified within the Shokan study area include, but are not limited to:

- Flooding at hydraulically constricted culverts on Bostock Road and Red Maple Road (discussed above).
- Flooding along a low-lying area where Black Alder Road meets Red Maple Road, affecting road and homes.

Project 1 work should be advanced alongside work for Projects 2 and 3 to create efficiency. The Shokan LFA and West Shokan LFA findings may be presented together in the same reports, such as memoranda and final report documents that identify in title and organization that separate LFAs for Shokan and West Shokan are contained within. The Shokan LFA (Project 1) and West Shokan LFA (Project 2) may be scoped, budgeted, and invoiced as one combined effort.

Project 2 - West Shokan LFA

The West Shokan LFA Study Area that is approximately 0.25 sq. miles (160 acres). The Bushkill stream begins on Mombaccus Mountain and drains rugged and steep terrain above the study area.

A LFA study was originally conducted for the Hamlet of West Shokan from 2016-2017. The 2017 LFA Study Area extended approximately 1.2 miles upstream of the Bushkill-Ashokan Reservoir confluence to the Bushkill confluence with Maltby Hollow Brook. On Dry Brook the study area extended approximately 0.7 miles upstream of the Bushkill confluence.

The 2017 LFA included development of Terrace and Floodplain Terrain (TAFT) maps covering the West Shokan study area and about 1,800’ upstream of the study area on the Bushkill. The maps clearly identify a flat, wide valley that begins above the Maltby Hollow and Bushkill confluence with an average channel slope of 2% over an alluvial fan.

The 2017 LFA identified five flooding hazards within a proposed Bushkill Mitigation Area. Subsequently, a $1.475M project was implemented with funding provided through the NY Rising Community Reconstruction Program in February 2022. The project modified the Bushkill stream channel and banks to mitigate the identified flooding hazards. Several culvert enlargement projects on Burgher Road over Dry Brook and a bridge enlargement on Watson Hollow Road over Maltby Hollow Brook were also implemented with funding provided by the Ashokan Watershed Stream Management Program and the Catskill Watershed Corporation. The 2017 LFA also recommended mitigation measures to protect structures, such as elevations, wet/dry floodproofing, property improvements, and relocation of the most flood-vulnerable properties.

The focus of this new analysis will be on hamlet areas not fully considered during the 2017 study. These areas include the lower reaches of Maltby Hollow Brook, an upstream portion of Bushkill above the confluence with Maltby Hollow, and a cluster of structures near Lang Road affected by small tributaries that drain into the Ashokan Reservoir (see LFA Study Area map in **Appendix A**). The TAFT maps indicated an area of high daily water surface elevations east of the town offices along Lang Road.

No additional work within the original 2017 LFA Study Area (mapped in **Appendix A**) is requested or should be scoped except for 1) a recommendation to complete Letters of Map Revision (LOMRs) following completion of mitigation projects; and 2) possible updates to listings of floodprone properties.

Specific flood concerns identified within the current West Shokan LFA Study Area include, but are not limited to:

- Shallow groundwater and riverine flooding contributions to flooding and repetitive loss in the Lang Road area.
- Flooding affecting a repetitive loss area bordering Moonhaw Road.
- Flooding affecting Watson Hollow Road and adjacent properties on the Bushkill. A cluster of structures located on the Bushkill at the upstream extent of the LFA Study Area may be affected by an ungauged tributary to the Bushkill. This area should be evaluated for flood risk potential caused by combined tributary and Bushkill flows.

A USGS stream gauge is located on the Bushkill below the Maltby Hollow confluence in West Shokan (01363382). A FEMA Flood Insurance Study is available for the Bush Kill and Maltby Hollow Brook; a FIS is not available for small Ashokan Reservoir tributaries in the Lang Road area. The Ashokan Watershed Stream Management (AWSMP) completed a Stream Feature Inventory of the Bushkill in 2012 and published the Bush Kill Stream Management Plan in 2015. In addition, the Maltby Hollow Brook was studied in 2015 to identify treatment options for channel erosion that may be impacting flooding downstream. In 2017, the AWSMP completed a multi-objective assessment and inventory of public road-stream crossings in the Ashokan Reservoir watershed to determine geomorphic compatibility, structural condition, return interval flow capacity, and aquatic organism passage potential. The AWSMP is assisting the Town of Olive with completion of LFA studies and will make these study findings available.

Project 2 work should be advanced alongside work for Project 1 and Project 3 to create efficiency. The Shokan LFA and West Shokan LFA may be presented in the same memoranda and final report documents that identify in title and organization that separate LFAs for Shokan and West Shokan are contained within. **The Shokan LFA (Project 1) and West Shokan LFA (Project 2) should be scoped, budgeted, and invoiced as one combined effort**.

Project 3 – Shokan Stormwater Management Analysis

Some flooding issues in the western portion of Shokan appear related to concentrated sheet flows (flows that are not channelized) off Ticetonyk Mountain that pool in low-lying areas. The town seeks stormwater management solutions that create a public benefit within a Shokan Stormwater Analysis Study Area of approximately 0.8 sq. miles (50 acres). Additional solutions may be recommended for private landowner implementation. The proposer should be prepared to provide education on the distinction between stormwater and fluvial flooding, and stormwater management to residents during LFA public meetings, the FAC and Town Board.

Specific stormwater flooding concerns for the Shokan Stormwater Study Area include:

- Flooding on Black Road and Laurel Lane related to flows concentrated in a road ditch with no relief culverts and at least one undersized and misaligned culvert, with probable link to flooding in area of the Olive Town Justice Court (50 Bostock Road).
- Flooding at the corner of Laurel Lane and Dogwood Drive.

- Road and property flooding on Black Road and Dogwood Drive.

For Project 3, elements of the LFA Scope of Work (below) should be adapted and applied as necessary. The Shokan Stormwater Management Analysis must be reported in stand-alone memoranda and final report document that is separate from the LFA study reports developed for Projects 1 and 2.

Project 3 work should be advanced alongside Projects 1 and 2 and presented and coordinated at the same public and FAC meetings scheduled for LFAs for the sake of efficiency. However, **Project 3 must be presented as a separate project in the proposal's detailed budget** and must be invoiced separately from Projects 1 and 2. Project 3 may be integrated into the proposal's scope presentation if methods for the stormwater analysis are sufficiently identified and included (e.g., in separate paragraphs or sections).

Scope of Work and Deliverables:

PHASE I – FLOOD ENGINEERING ANALYSIS

In Phase I, the Town of Olive and its consultant will better understand the nature of flooding, what significant factors exacerbate flooding, consider options for reducing losses, model potential projects to mitigate flooding, document community opinions about these options, and decide whether to proceed to Phase 2 for a subset of actions that stand out as potentially effective and feasible based on Phase 1 results.

Task 1 – Project Management, Coordination, and Meetings

1.1 Project Management - Throughout the course of the project, the consultant will coordinate tasks; perform project-related managerial tasks; maintain project records, technical data, drawings, and reports; maintain financial records; and coordinate with the Town Board and/or their appointed designees.

1.2 Project Initiation – The Town of Olive has established a Flood Advisory Committee (FAC) to assist in the LFA process. The FAC includes town officials and invited agency representatives from Ulster County Soil and Water Conservation District, Cornell Cooperative Extension, Ulster County's Dept. of Environment; and the NYCDEP, Catskill Watershed Corporation, and other agencies with interests in flood-prone areas. The consultant will meet and collaborate with the FAC and Town Board. The consultant will engage and communicate with project stakeholders in support of the overall process, which will include explaining the engineering analysis to be undertaken and its results. The consultant will solicit input from project stakeholders relative to the identification of flooding threats and potential mitigation strategies to be included as part of the analysis, as well as prioritizing recommendations based upon the results of the analysis. Where possible the process should be integrated with similar or on-going efforts, such as updates to the Ulster County Multi-Jurisdictional All Hazard Mitigation Plan.

1.3 Educational Materials - As requested by the FAC, the consultant will prepare general and technical educational materials, as well as participate and contribute to ongoing education and outreach efforts regarding LFA. Educational materials related to stormwater management, in addition to floodplain management and flood mitigation may be needed for this project.

1.4 Public Meetings - Prepare for and attend a minimum of up to **three** (3) public information meetings. The first meeting will provide an introduction and general overview of the scope of the Local Flood

Analysis to the public and Town Board and will gather information from property owners about historic flooding and property damage in the hamlet study areas. Meeting two will be a follow-up to present preliminary results and invite participants to provide input on mitigation alternatives in the study areas. Meeting three will present the final project analysis and results to the public and Town Board before town adoption, or acceptance of the final LFA plan. In-person public meetings will be held at the Town Meeting Hall in Shokan.

1.5 Planning Meetings - Prepare for and attend (at the option of the Town Board) a minimum of **eight** (8) FAC meetings. Four (4) of the FAC meetings should be attended in-person, while four may be attended online. FAC meetings can only be attended or billed for up to 1-2 key consultant staff. An initial fact-finding meeting may include a field tour attended by flood committee members. Subsequent committee meetings should cover presentation of initial findings and possible mitigation solutions, iterations of findings at key decision points, and benefit-cost analysis results and final mitigation recommendations. The committee may also request attendance at meetings to review draft LFA reports.

1.5.1 Project Reports - Throughout the project duration, coordinate with the Town Board, and/or their designees, to provide written and verbal project updates and technical information.

1.5.2 Outreach Materials – Provide handouts and slide presentations to the flood advisory committee and at public meetings.

1.5.3 Educational Support - Provide additional educational support activities and materials as determined by the Town Board, and/or their designees,

Task 1 Deliverables

- Preparation for and attendance at 3 public meetings
- Preparation for and attendance at 8 flood committee meetings (4 in person, 4 remote)
- Meeting minutes
- Periodic project updates to the client
- Educational support materials
- Complete set of all records including any digital copies of any model files, maps, datasets, FEMA BCA toolkit files, GIS map layouts, survey records, AutoCAD files produced for this project.
- Prepare a record of time spent on each task in an invoicing format consistent with the LFA grant funding agreement.

Task 2 –Data Collection and Field Verification

Two primary areas of investigation are anticipated under Task 2. First, an investigation of flooding and related hazards on roads and at road-stream crossings. The second priority of investigation is flooding affecting residential and commercial structures in the hamlets. The consultant will conduct field investigations to support development and prioritization of likely mitigation measures such as property protection, floodproofing and elevation, and potential buyout and relocation.

2.1 Data Gathering - Gather, compile, and review existing available mapping and aerial photography of the river channel and floodplain as well as information regarding potentially flood-prone structures, infrastructure, and water quality threats located along the river corridor and within the floodplain. The following information will be provided by the Ulster County Soil & Water Conservation District for use in the analysis:

a. Available construction drawings of bridge crossings and structures; and associated hydraulics models for bridges, where available.

b. Available aerial photogrammetry (DOQQs), topographic mapping, LiDAR based DEMs (1m horizontal resolution).

c. 2013 Preliminary and 2016 Final FEMA Flood Insurance Study for the Ashokan Watershed including both the Hydrology and Hydraulics study reports, Digital Flood Insurance Rate Maps (DFIRMs) and depth grids, and associated surveys and HEC-RAS models.

d. Reports of flooding that have been compiled and documented by the local Town, county or federal government (i.e., Damage Survey Reports).

e. Water quality reports that have been compiled and documented by the local community, the county, or NYCDEP.

f. Prior reports and analyses that may be available.

g. The community's flood mitigation plans (including the county-wide all-hazard mitigation plan, other multi-jurisdiction plans, a community annex, or a single-jurisdiction plan if applicable).

h. Bush Kill Stream Management Plan; and

i. Stream Feature Inventory Geodatabase, in ESRI ArcGIS formats.

The following data, mapping, reports, and information will be sought by the consultant:

a. Request from NYCDEP a revised land use/land cover layer developed from aerial imagery.
b. Repetitive Loss Area Analysis and any other relevant datasets developed by the Town of Hunter.

2.2 List of Resource Material - Compile a list of resource material from Task 2.1 and submit an electronic copy of same. Periodically update the list as it is expanded.

2.3 Field Assessment - Conduct a visual assessment of the river channel and floodplain in the project area. The assessment will include identification of low-lying structures, stream bank and channel conditions, and vegetation along the stream corridor. Photo-document channel reaches. Identify significant storm drainage discharge points into the stream and locations of known or suspected inadequate road drainage conveyance.

2.4 Watershed Survey - Perform a "windshield survey" to observe the watershed and site conditions.

2.5 Identify Sources of Water Quality Impairment - Identify potential sources of water quality impairment within the Study Area that could result from flood discharges, such as residential, commercial and transportation-related hazardous contaminants, roadway contaminants, streambank and bed erosion, fuel tanks, and other sources as appropriate to the project area. Document any known historic impacts to water quality that resulted from flooding.

2.6 Survey Structures - To facilitate the Benefit Cost Analysis, carry out a field survey of structures located within the FEMA 500-year flood zone (or estimated 500-yr flood zone developed for this

study) within the Study Area. Note the following features and verify against parcel data contained in the Ulster County Parcel Viewer https://ulstercountyny.gov/maps/parcel-viewer/.

- Is the structure commercial or residential?
- If the structure is commercial, is it a retail establishment, a warehouse, or vacant?
- Does the structure have a basement, crawlspace, or slab foundation?
- What is the number of stories?
- Is the structure split level?
- What is the elevation of the first floor in relation to the lowest adjacent grade? Map structures on the base flood depth grid to illustrate the range of first-floor elevation findings relative to flood depth.

2.7 Technical Memorandum - Prepare a technical memorandum summarizing data, mapping, and information obtained in Tasks 2.1 through 2.6. Identify any constraints and/or deficiencies in the existing database, including known changes in the system that have occurred following data collection. Evaluate the vulnerability of the system under study to potentially undergo rapid changes.

Task 2 Deliverables

- List of resource materials gathered
- Technical memorandum of existing conditions.

Task 3 – Hydraulic Modeling Baseline

3.1 FEMA Effective Model - Obtain the most recent FEMA modeling (Effective Model) in digital format for use in evaluating possible mitigation measures. The model must be obtained either directly from FEMA or as provided by FEMA to the state, county or local community.

3.2 FEMA Duplicate Model - Import the FEMA model into HEC-RAS software to develop a "FEMA Duplicate Effective Model" model[1]. This is necessary to demonstrate the reproducibility of the model results obtained by FEMA on the consultant's equipment/software. Compare output with published FEMA data and identify any discrepancies. This modeling effort will be conducted in accordance with FEMA requirements.

3.3 Corrected Effective Model - Review the FEMA model cross sections, Manning's 'n' coefficients, site conditions, and expansion/contraction coefficients to ensure that the information in the Effective FEMA model and the FEMA Duplicate Effective Model accurately reflect site conditions. If warranted, prepare a "Corrected Effective Model" to modify the Duplicate Effective Model. This modeling effort will be conducted in accordance with FEMA requirements. Acquisition of additional survey or topographic information is not permitted.

3.4 Additional Survey/Modeling Assessment - Determine the need to run HEC-RAS split channel flow (or 2-D) and sediment transport modules, alternative modeling software, as conditions dictate. The need for 2D modeling is anticipated within the Detailed Study Area. If recommended, identify the need to acquire additional survey and other field data to run the models. If approved to advance, acquire needed additional data. Incorporate new survey data, as well as

[1] If HEC RAS is not used, the consultant must use another FEMA approved modeling software and provide justification why HEC RAS is not appropriate for the analysis (attach list).

known forthcoming channel modifications, including scheduled bridge replacements, using existing design data.

3.5 Existing Conditions Model - Run the model for the 2-, 10-, 25-, 50-, 100-, and 500-year flow conditions utilizing FEMA published flows. For undefined flow conditions (i.e. 2-year flow) use USGS regression analysis and compare to statistical analysis of USGS stream gage data (if available) for the specific flow to adjust flow values if needed. Calibrate model using most recent flood events of August 28, 2011, September 19, 2012, February 25, 2016, December 25, 2020, and August 22, 2021.

3.6 Additional Survey/Modeling - Develop and run the HEC-RAS split channel flow and/or sediment transport module or alternative modeling software, approved under Task 3.4, as needed, on selected reaches. Use 2-D modeling where appropriate to understand flood routing.

3.7 Floodplain Mapping - Import floodplain shape files from available GIS and FEMA data and present the existing floodplains on available LiDAR based DEM or GIS mapping of the stream channel corridor on the most recent available aerial imagery.

3.8 Floodprone Property Mapping - Identify and map flood-prone properties and infrastructure (i.e. roads, bridges, utilities, etc.).

3.9 Technical Memorandum - Prepare a technical memorandum summarizing Tasks 3.1 through 3.8.

3.10 Climate Change Scenario Summary and Mapping: Use the existing HEC-RAS model to evaluate the effect on Phase II recommended projects of potential increases in peak flows under a future climate change scenario, for a range of return intervals that are relevant to the project. Future peak flows can be estimated by multiplying design flows by a factor based on geographic region following methods outlined in the NYS Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act (August 2020) or other applicable and referenced method.

Task 3 Deliverables

- Electronic versions in HEC-RAS of all model input and output (presentation of analysis to be provided in Task 6)
- Revised digital planimetric inundation maps and depth grids depicting revised pre-project conditions
- Flood-prone property mapping
- Technical memorandum

Task 4 – Evaluate Mitigation Alternatives

4.1 Mitigation Alternatives - Working with the FAC, identify flood mitigation goals and objectives, and develop potential actions for the following categories of flood hazard mitigation:

a. Property Protection - Actions that reduce potential damage to buildings, infrastructure and other kinds of physical property (including property acquisition/relocation, elevation or flood proofing of buildings).
b. Flood Damage Prevention and Planning - Actions that lower flood elevations or prevent future losses (such as channel and floodplain modifications, floodplain reclamation, and adoption or amendment of land use regulations, building codes or flood damage prevention

regulations).

c. Natural Resource Protection - Actions that minimize hazard loss of or preserve/ restore the function of natural systems and associated ecosystem services, including water supply (such as soil stabilization measures such as bank protection and stabilization or landslide stabilization, attenuation of peak flows through detention and enhanced storage, debris management).
d. Structural Projects - Actions that use or modify structures to mitigate a hazard (such as replacement or retrofit of bridges and culverts, protection of critical utilities and infrastructure).
e. Emergency Services - Actions that mitigate risks to the provision of emergency services that protect people and property during and immediately following a flood.
f. Community Pollution Prevention - Actions at the community scale that reduce pollution during a flood event (such as securing oil and propane tanks).
g. Public Education and Information - Education efforts centered on the benefits of general best management practices to code enforcement officers, realtors, contractors, municipal officials and property owners about how to protect themselves and the community from flood disasters and associated losses.

Consult with the local hazard mitigation plan as needed to ensure consistency with the goals and potential actions listed in that plan.

4.2 Modeling of Mitigation Measures - Using the modeling from Task 3, develop, analyze and evaluate potential structural flood mitigation in an attempt to decrease or alleviate flooding and flood-related damage in populated areas using technically and economically justifiable alternatives. Such evaluation may include the following:

- Replacement or retrofits of bridges or culverts.
- Removal or relocation of structures, buildings, or channel encroachments.
- Stream channel and floodplain modifications.

Consultant should be prepared to model key road-stream crossings, including those public road crossings identified in **Attachment A**. Assess the extent to which each bridge is causing flooding or erosion and identify conceptual solutions that will lead to estimated treatment costs and feasibility analysis under Phase 2.

Considered options may include acquisition of flood-damaged or flood-threatened properties, including properties with structures after which the structures are removed and the properties are restored or allowed to revert to a natural condition to mitigate the impacts of future floods. Options to be considered also include relocation of anchor businesses, critical community facilities, residences, and non-anchor businesses as recommended by the analysis.

4.3 Evaluate Alternative Actions - Evaluate the potential of the alternative actions, alone and in combination, to mitigate flood hazard risks at each of the flows modeled. Evaluate and summarize model output relative to each potential mitigation alternative to include changes in water surface elevations, extent of inundation, depth of flooding, and flow conditions in the floodway. A comparison shall be made between existing and proposed conditions (i.e. with and without the proposed mitigation). Assess potential alternatives individually and in combination, to evaluate collective flood reduction potential. Plot flood profiles and prepare inundation

maps for individual measures as well as those that will be achieved with combined measures.

4.4 Impact Analysis - Identify potential impacts associated with structural mitigation alternatives, including the potential for downstream impacts caused by greater flood conveyance and the effect on sediment transport.

4.5 Cost Opinions - Develop preliminary cost opinions for mitigation alternatives.

4.6 Feasibility Analysis - Complete an initial feasibility analysis of structural mitigation measures identified in tasks 4.2 and 4.3, as a first-cut determination of which measures should be evaluated in greater detail, and which are so unlikely to provide acceptable benefit/cost ratios that they don't merit more detailed analysis. Alternatives shall be evaluated based on initial estimates of tangible benefits, project goals, impacts, regulatory requirements, and costs associated with design and construction.

4.7 Evaluate Non-Structural Alternatives - For areas where flood protection through structural modifications is determined to be not feasible, non-structural measures shall be evaluated. Non-structural alternatives do not try to limit flooding but instead attempt to reduce flood damage by protecting structures in the flood prone areas. Evaluation and recommendations shall include flood proofing, relocation, and purchase of flood insurance, potentially with "increased cost of compliance" coverage.

4.8 Additional Data Needs - Identify the need for any future data collection, analysis, and design.

Task 4 Deliverables

- Electronic versions in HEC-RAS of all model input and output (presentation of analysis to be provided in Task 6)
- Technical memorandum describing analysis, including the results of any sediment transport analysis performed, mitigation alternatives, initial feasibility analysis and recommendations
- Inundation mapping

Task 5 –Flood Engineering Analysis Report

5.1 Draft Flood Engineering Analysis Report - Prepare a draft local flood mitigation plan that documents the results of Tasks 1 through 4. It is anticipated that the plan will include the information and analysis contained in the numerous technical memoranda developed in previous tasks. Specifically, the plan will include the following:

- Summary of public outreach process and results.
- Narrative and mapping to present existing conditions, including results of field assessment.
- Mapping of inundation areas and floodprone.
- Alternatives analysis, including feasibility.
- Narrative and mapping of hydraulic modeling, including a summary of model output relative to forecast reductions in flood inundation areas, depth of flooding, and water surface elevations.
- Inundation mapping and flood profiles (for all relevant existing and proposed flood conditions including the 100-year event).
- Recommended mitigation actions.

- Preliminary benefit cost analysis summarized in the main body of the document and with detail reported in an appendix using the table (one per recommendation) provided at the end of this Scope of Services.
- Implementation plan and prioritization of mitigation actions.
- Recommendations for future analysis; and
- List of reference and resource materials.

5.2 Distribute Draft Report - Provide electronic (pdf) copies of the draft plan for review by the Town Board, FAC and funding agencies.

5.2.1 Present Draft Report - Meet with the FAC to present draft findings and implementation plan and recommendations to the FAC for review, revision, and approval for certain projects to proceed to Phase 2.

5.3 Final Flood Engineering Analysis Report - Modify and revise the flood mitigation plan based on review comments and provide the final plan in paper and electronic (pdf) format.

Task 5 Deliverables
- Draft Flood Engineering Analysis Report
- Preparation and attendance at a Town Board meeting
- Final Flood Engineering Analysis Report

Phase 2–Feasibility Analysis

In Phase 2, the consultant will explore in detail the costs, benefits and feasibility of each option deemed in Phase 1 as having a flood inundation reduction or water quality benefit and as acceptable to the Town Board. Phase 2 will culminate with a plan for implementing the projects that are deemed viable.

Task 6 – Local Flood Hazard Mitigation Feasibility Analysis and Plan

6.1 Review Municipal Regulations - Working with FAC or their designees to review municipal regulations concerning zoning, subdivision of land, and flood damage prevention to verify compatibility with NFIP regulations and determine where modifications may be feasible.

6.2 Benefit Cost Ratio - Using the FEMA BCA toolkit, determine the benefit cost ratio (BCR). Where site-specific information is available (i.e. cost of response or repairs, such as damage to flooded structures and the contents of such structures; the lost functions of roads, utilities, and services; and the time and costs incurred to clean up from flooding and repair facilities and infrastructure), the damage frequency assessment module will be used. Otherwise, the flood module will be used, with default values. Purchase of a property for buyout will be considered in itself a flood hazard mitigation project.

Identify properties expected to be substantially damaged over time based on existing conditions. Develop an estimated BCR for floodproofing, elevation or buyout of all residential and commercial structures that could have damages over 50% of the value shown through flood model analysis.

Characterize sections of the Study Area with the highest threat to structures and the level of threat based on flood depths. The product may be used to prioritize structures for buyouts and elevations.

Develop a table estimating the flood reduction benefits of recommended flood mitigation options for key structures within the community at different flood return frequencies.

6.3 Potential Water Quality Benefits - Identify potential water quality benefits and give general enumeration of scale of benefits for each feasible option defined in Tasks option. The reservoir basin, its status with respect to various pollutants, and the specific pollutants mitigated will be taken into consideration. The following is an example of the enumeration:

- Number of residential structures mitigated
- Number of commercial structures mitigated
- Number of tons of sediment from erosion mitigated

6.4 Funding Sources - Identify likely funding sources for the feasible mitigation alternatives.

For projects with benefit-cost ratios at 1.0 or greater, identify funding sources for mitigation actions such as FEMA's Hazard Mitigation Assistance Grants and the Building Resilient Infrastructure Communities (BRIC) grants program, Stream Management Implementation Program, and CWC Flood Hazard Mitigation Implementation Program; and determine which programs are most appropriate based on the type of recommendation and the funding available from each program at the time of analysis.

For projects with benefit-cost ratios less than 1.0, identify relevant funding sources including, for example the, New York State's Consolidated Funding Application (CFA), which allows communities to apply for multiple funding projects (such as the Green Infrastructure Grant Program, Climate Smart Communities Smart Growth, Water Quality Improvement Program, etc.) with just one application, Stream Management Implementation Program, and CWC Flood Hazard Mitigation Implementation Program.

6.5 Implementation and Prioritization - Update the implementation plan and prioritization of mitigation actions based on 6.1-6.4.

6.6 Local Flood Hazard Mitigation Plan - In close coordination with the Town Board, and their designees, prepare a Local Flood Hazard Mitigation Plan that includes and documents the results of Tasks 6.1 through 6.5. Specifically, the plan will include the following:

- Assessment of local regulations currently in force and their adequacy relative to flood prevention and protection.
- Discussion of known historic and potential sources of water quality impairment within the Study Area.
- Mapping of inundation areas and flood-prone and flood-damaged properties.
- Assessment of available funding.
- Implementation plan and prioritization of mitigation actions.
- Recommendations for future analysis, including hydrologic assessment and/or two-dimensional hydraulic modeling; and
- List of reference and resource materials.

Task 6 Deliverables

- Six paper copies and electronic version of the final Local Flood Hazard Mitigation Plan delivered to the FAC, Town Board, and funding agencies.

POTENTIAL SUPPLEMENTAL TASKS

The following tasks may be required to supplement the initial assessment and can be added with approval from the Town Board.

P2.1 Identify and map flood-damaged properties and infrastructure (i.e. roads, bridges, utilities, etc.), including those located outside of special flood hazard areas, repetitive loss properties (RLPs), and severe repetitive loss properties.

P2.2 Working with the local floodplain administrator, characterize and categorize flood-prone and flood-damaged properties into groups based on types of damage suffered, use (i.e. residential vs. non-residential), building or structure type (basement, crawlspace, slab on grade, number of stories, etc.), types of accessory structures on the properties, and location of building utilities relative to basements and first floors. If known, determine whether damage resulted from flood inundation, avulsion, or slope failure. Develop a database of such properties by address.

P2.3 Working with Ulster County, NYSDEC, and the local floodplain administrator, and to the extent that data is available, determine which flood-prone and flood-damaged properties are insured under the National Flood Insurance Program (NFIP) and which are not insured.

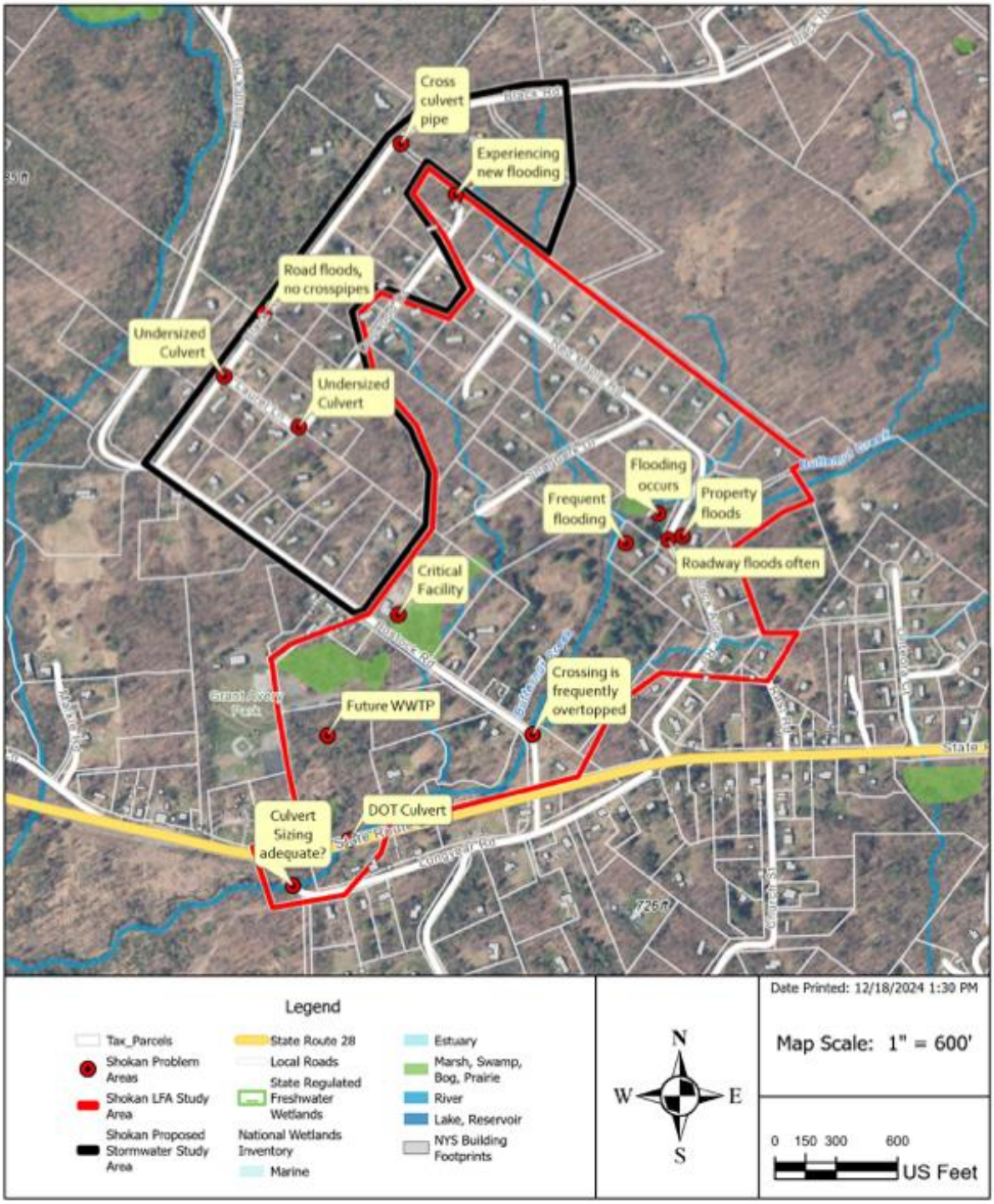
P2.4 Utilize HAZUS to evaluate cost-effectiveness.

P2.5 Prepare information to estimate the social and economic impacts of select options identified during the analysis and planning phases. Such information might include identification of potential impacts to business community, residents, property values or the local tax base.

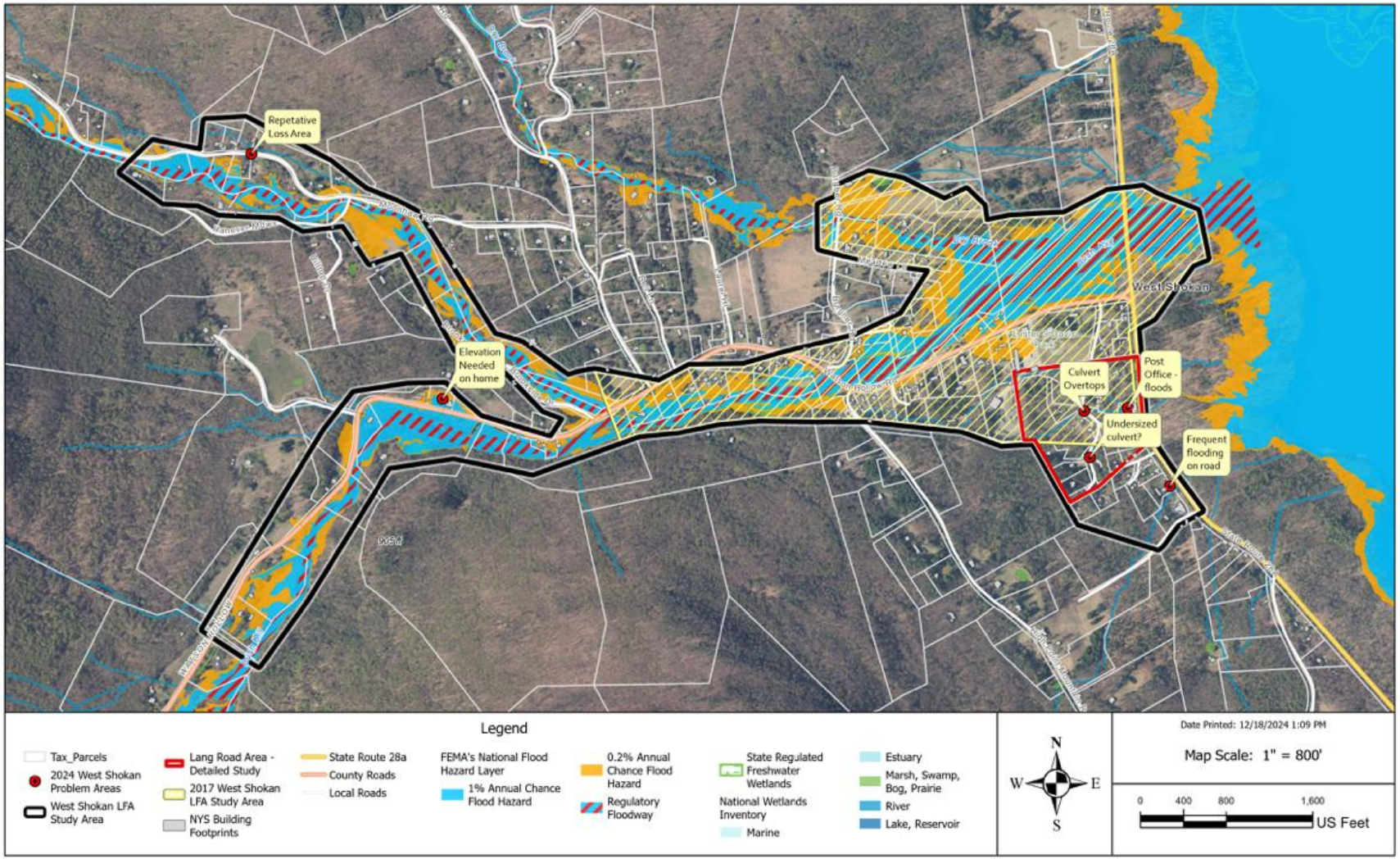
P2.6 Prepare SEQR documents to enable the municipal to adopt the plan if desired by the municipality.

Attachment A – Study Area Maps

Town of Olive - Hamlet of Shokan
Proposed Local Flood Analysis (LFA) Study Area



Town of Olive - Hamlet of West Shokan, Proposed Local Flood Analysis (LFA) Study Area



Location of Road Stream Crossing Design Projects on Bostock Road and Red Maple Road in the Hamlet of Shokan