

LOCAL FLOOD ANALYSIS FOR THE HAMLET OF ANDES



This document was prepared for the Hamlet of Andes under the supervision of the Andes Flood Advisory Committee with funding provided by Delaware County Soil and Water Conservation District's Stream Management Program through contract with New York City Department of Environmental Protection

**Prepared by:
Barton & Loguidice, D.P.C.
Syracuse, New York**

February 2018

**Barton
& Loguidice, D.P.C.**

Engineers • Environmental Scientists • Planners • Landscape Architects

LOCAL FLOOD ANALYSIS

FOR THE

HAMLET OF ANDES

Prepared by: Barton & Loguidice, D.P.C.
443 Electronics Parkway
Liverpool, New York 13088

Preparers: Shaun P. McAdams
Wendell R. Buckman, P.E.
Christopher J Norton, E.I.T.

Issue Date: February 2018

LOCAL FLOOD ANALYSIS
FOR THE
HAMLET OF ANDES
TABLE OF CONTENTS

I.	Statement of Purpose and Scope	1
II.	Site Description	2
III.	Methods	6
III.A.	Approach.....	6
III.A.1	Hydrology	7
III.A.2	Duplicate Hydraulic Model.....	8
III.B.	Public Outreach	9
IV.	Flood Mitigation.....	11
IV.A.	General.....	11
IV.B.	Areas of Interest	13
IV.B.1	Detention Pond Upstream of Hamlet	13
IV.B.2	Managed Farm Practices Upstream of Hamlet	16
IV.B.3	Floodplain Conveyance through Andes- Tremper Kill	18
IV.B.4	Increase Span of Bridges	23
IV.B.5	Debris Influence at Bridges	24
IV.B.6	Aggradation/Degradation.....	25
IV.B.7	Basement Flooding.....	26
IV.B.8	Liddle Brook Dam Enhancement	27
IV.B.9	Retaining Wall Relocation & Construction	28

IV.B.10	Comprehensive Flood Mitigation	31
V.	Benefit-Cost Analysis.....	33
V.B.1	Floodplain Conveyance through Andes – Tremper Kill.....	33
V.B.2	Retaining Wall Relocations & Construction	34
VI.	Additional Recommendations.....	35
VII.	Summary of Findings	37

TABLES

Table 1.	Peak Discharges	7
Table 2.	25-year Storm.....	23

FIGURES

Figure 1.	Tremperkill Watershed Map.....	4
Figure 2.	Project Area Map	5
Figure 3.	Proposed location for detention pond and flood retention structure.....	14
Figure 4.	Inundation Area during a 50 year event - Existing conditions	15
Figure 5.	Inundation Area during 50 year event – Proposed conditions (Detention Pond)	15
Figure 6.	Inundation Area during a 50 year event - Existing Conditions	17
Figure 7.	Inundation Area during a 50 year event – Proposed Conditions (Managed Farm Practices)	17
Figure 8.	Diagram displaying locations of the continuous floodplain throughout Andes. The red line is the river’s center line and the blue lines are the extents of the proposed floodplain.....	19
Figure 9.	Inundation Area during a 50 year event - Existing Conditions	20
Figure 10.	Inundation Area during a 50 year event - Proposed Conditions (Continuous Floodplain).....	20
Figure 11.	Inundation Area during a 50 year event for 288 Main St. to 506 Main St. – Existing Conditions.....	21

FIGURES - Continued

Figure 12. Inundation Area during a 50 year event for 288 Main St. to 506 Main St. – Proposed Conditions (Continuous Floodplain).....	21
Figure 13. Inundation Area during a 50 year event for 33 Main St. to 103 Main St. – Existing Conditions.....	22
Figure 14. Inundation Area during a 50 year event for 33 Main St. to 103 Main St. – Proposed Conditions (Continuous Floodplain).....	22
Figure 15. Areas being considered for enhanced streambank protection.	25
Figure 16. Inundation Area for the school retaining wall during a 50 year event for the proposed widened conditions for Liddle Brook.	29
Figure 17. Inundation Area for the school retaining wall during a 50 year event for existing conditions.	29
Figure 18. Inundation Area for the school retaining wall during a 50 year event for the existing widened conditions.	30
Figure 19. Inundation Area for the school retaining wall during a 50-year event for the proposed widened conditions.	30
Figure 20. Inundation Area during a 50 year event through the hamlet for the existing conditions.	32
Figure 21. Inundation Area during 50 year event through the hamlet for the Hybrid Alternative.....	32

APPENDICES

Appendix A	Property Impact Summary Table
Appendix B	HEC-RAS Results
Appendix C	Benefit-Cost Analysis Summary
Appendix D	Catskill Watershed Corporation – Funding Summary

I. Statement of Purpose and Scope

Purpose and Scope

The Hamlet of Andes, situated along the banks of the Tremper Kill, Gladstone Hollow and Liddle Brook stream systems, has experienced severe flooding in recent years. This has led to a heightened awareness of the damage that can occur from flooding. Residents, businesses, and other stakeholders desire to build community resilience and protect community assets from future flood damage. A hydraulic analysis of the main population areas of Andes was progressed to identify locally supported actions that would reduce damages. Qualifying and eligible projects would then be funded through FEMA or other area programs. As with Stream Management Planning in the New York City watershed region since 1997, this effort is funded through local County Soil & Water Conservation Districts by NYC Department of Environmental Protection. A Flood Advisory Committee (FAC) comprised of residents, local officials and technical staff representing these funding / supporting agencies was created to administer the Local Flood Hazard Mitigation Analysis (LFA).

The purpose of this LFA document is to provide a detailed assessment of the flooding characteristics in the Hamlet of Andes. This LFA document describes the existing flood hazards within the focus area, identifies existing infrastructure elements in the community that are at risk for flood damage, recognizes potential alternatives aimed at reducing flood impacts, and describes an implementation plan for prioritized alternatives. The study area of the analysis extends from the Hyzer Hill Road crossing of the Tremper Kill downstream through the Hamlet of Andes, ending at the Cabin Hill Road (County Route 2) crossing of the Tremper Kill just south of the Andes Central School and junction with Liddle Brook. The study area also includes the area adjacent to the lower 1.6 miles of Liddle Brook, measured upstream from the confluence with the Tremper Kill. Limits of the study area are shown in FIGURE 2. In particular, this LFA emphasizes hazards, risks and potential mitigation options directly affecting road networks, utilities, emergency services and residential / commercial properties within populated portions of the hamlet along Tremper Kill and Liddle Brook.

Development of the LFA is based on an initial flood study completed by FEMA, and is supported by additional field-derived data reflecting current river- and floodplain conditions. This document includes a review of available information pertinent to the hydrologic and hydraulic functions of the Tremper Kill, Gladstone Hollow and Liddle Brook as well as engineering analysis required to assess the flooding characteristics within the focus area. In addition, reach specific stream stability restoration goals from the Andes Flood Commission have been included in the Appendices, as well as General Recommendations for best practices when managing the stream for flood hazard mitigation.

Following a review of existing information and discussions with the flood commission, it was determined that direct flood damage to above-ground structures within the focus area generally has been minimal. However, temporary flooding of basements is of particular concern to those residents and business owners situated within the project area.

II. Site Description

County: Delaware County

Village/Town: Hamlet of Andes

USGS Quadrangle Map: Andes

River/stream: Tremper Kill, Gladstone Hollow and Liddle Brook

Stream Classification: C with (T) Standards (Liddle Brook)
C with (TS) Standards (Tremper Kill)
C with (TS) Standards (Gladstone Hollow)

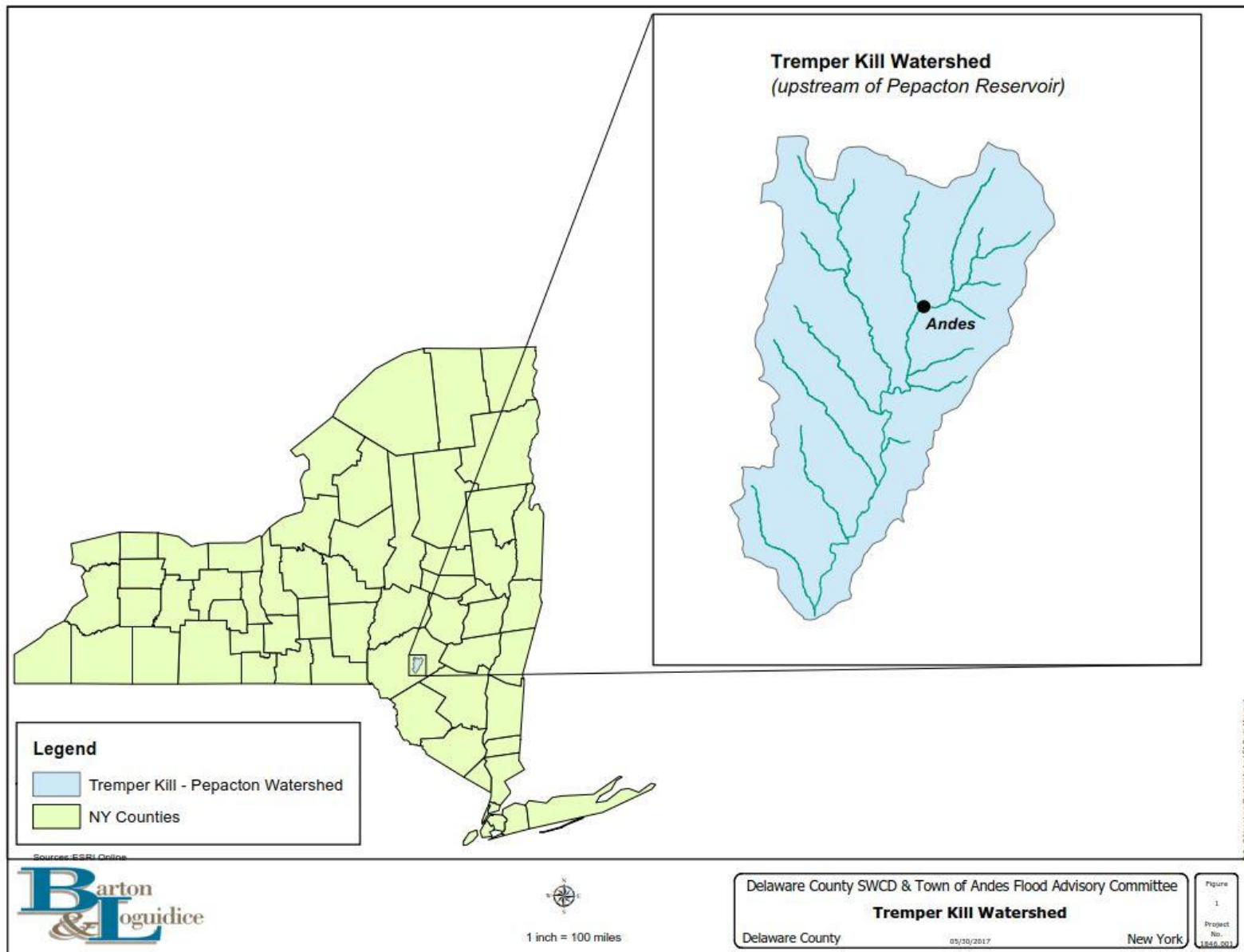
Focus Area Length: 4.5 miles
(1.25 miles along Main Street, 1.45 miles along Glad Stone Hollow Road, 1.6 miles along Delaware Ave)

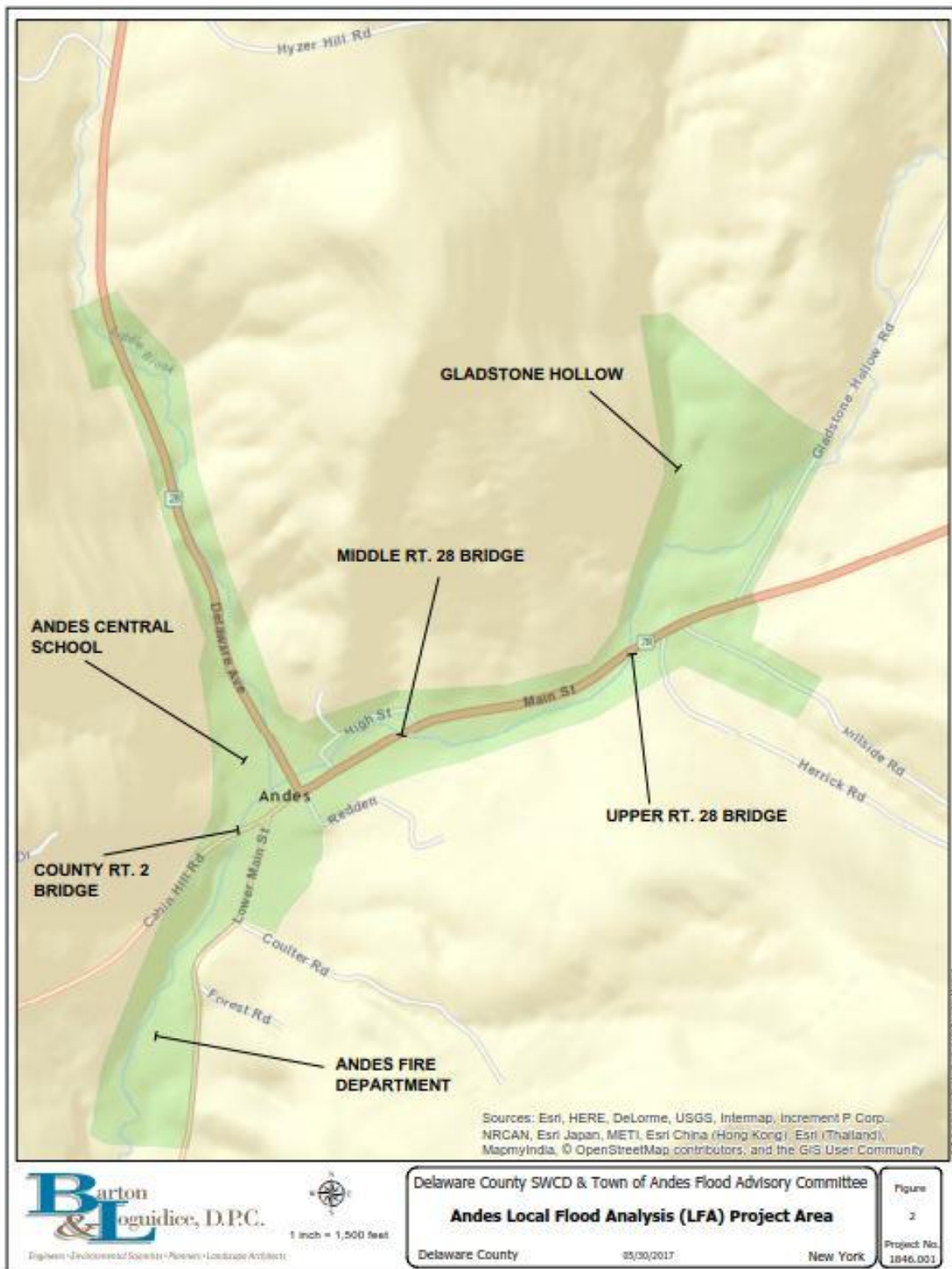
Drainage area: The drainage area at the downstream limits of the study area is approximately 10.2 square miles.

Gages: There is only one gaging station in proximity to the study area, USGS 01415000, and it is located approximately 6 miles south of the Route 2 Crossing of the Tremper Kill. The period of records at the gage station is 1937- present.

There is a weather station in Andes hosted through the NYS Mesonet program through the University of Albany.

<http://www.nysmesonet.org/mesonow#?stid=ANDE>





III. Methods

III.A. Approach

An evaluation of flooding in the Tremper Kill watershed was developed from available information, data collected from field reconnaissance, and engineering computations. The basis for the evaluation was FEMA's hydraulic model developed in 2013 to update previous Flood Insurance Studies (FISs). FEMA's Effective Hydraulic Model was performed in the US Army Corps of Engineers' HEC-RAS software. Barton & Loguidice D.P.C. (B&L) reviewed and modified the FEMA Effective Model in order to capture the existing flood regime of the Liddle Brook and the Tremper Kill and their tributaries within the defined project area. This adapted model is referred to as the "Duplicate Model."

Using this refined model informed by existing FEMA modeling and corrected by inputs from field data and observations of the stream/floodplain network, B&L modeled a range of flood flows (10-, 25-, 50-, 100-, and 500-year flood events) within the project area. The outputs of these model runs graphically document flood profiles, identifying water surface (flood) elevations and lateral flood extents (inundation widths) within the project area corresponding to each flood flow. Using Geographic Information Systems (GIS), topographic mapping (supported by LiDAR-derived contour data) and aerial imagery overlays to depict inundation zones, at-risk structural elements (including residential properties, infrastructure elements, etc.) were identified for each flood stage modeled. Defining the inundation limits and affected infrastructure elements corresponding to each modeled flood stage provides the fundamental basis for identifying mitigation alternatives based upon prioritized assessment of the severity and extent of impacts associated with each modeled flood event.

III.A.1 Hydrology

The hydrology for the existing FEMA models was developed utilizing current information from the gage station located on the Tremper Kill. The total drainage area at the downstream limits of the project area is approximately 10.2 square miles. There is one gaging station in proximity to the study area(USGS 01415000)located on the Tremper Kill approximately 6 miles south of the Hamlet of Andes. Consequently, flows further upstream of this gage were estimated using weighted averages of transferred gage flows (based upon prevailing drainage area) and regional regression flows. Flows closer to the gage were estimated only using regional regression flows.

FEMA utilized a Log Pearson Type III statistical evaluation of historic flood elevations recorded at the Tremper Kill gage station to determine the peak discharges for the 10, 25, 50, 100, & 500 year flood events. Results of this evaluation were reviewed by B&L to confirm that the corresponding discharge values determined by FEMA are consistent with actual, current flood conditions. The flows were calibrated to reflect points in the Duplicate Model.

Table 1 - Peak Discharges (cfs)					
Location	Recurrence Interval (years)				
	10	25	50	100	500
Tremper Kill upstream of Gladstone Hollow	255	346	424	505	711
Tremper Kill downstream of confluence with Gladstone Hollow	448	539	614	696	912
Tremper Kill downstream of confluence with Herrick Hollow	516	633	730	836	1111
Tremper Kill upstream of confluence Liddle Brook	540	720	834	956	1282
Tremper Kill downstream of confluence with Liddle Brook	894	1140	1344	1566	2112
Tremper Kill Near Andes, NY (USGS Gage No. 01415000)	2869	3845	4695	5623	8011

III.A.2 Duplicate Hydraulic Model

The hydraulic assessment is used to evaluate and predict water elevations, identify flood prone areas, and evaluate mitigation strategies to minimize future flood damage and protect water quality. FEMA developed an updated hydraulic analysis for the Tremper Kill Watershed in 2013.

The detailed HEC-RAS model developed by FEMA for the Tremper Kill and Liddle Brook does not extend to the upstream limits of the LFA study area. An approximate FEMA model extended from the detailed model past the limits of the study area. The approximate study was used and enhanced with additional field survey data to extend the detailed HEC-RAS model upstream to the study area limits. In addition to the cross sections in the FEMA model (surveyed in 2013), an additional eight cross sections were surveyed through the upper reaches of the Tremper Kill and Gladstone Hollow to provide the most complete and up-to-date model possible. A detailed evaluation of the duplicate hydraulic model was completed to verify channel and floodplain geometry throughout the length of the modeled stream network, and to identify and to investigate initial areas of interest such as constrictions, obstructions and areas of ineffective flow (i.e. ponding or detention of flood waters) predicted by the model. As a means of validating the accuracy of the model, feedback was solicited from the community during our initial public meeting to determine if the flood profile, elevations and extent (inundation zone) predicted by the model for the January 1996 flood were consistent with conditions actually observed through the hamlet during that event. This provided us with a real-world calibration of the model. The end result was our existing conditions “Duplicate Effective Model” that was used to compare potential mitigation alternatives across a range of flood flows.

III.B. Public Outreach

A series of public presentations were held to gain input and share information with the community members during the process of conducting the analysis. The meetings were structured as follows:

- *Meeting #1* (June 2016) – This meeting was used to inform the community of the LFA process. We also utilized this meeting to verify the existing HEC-RAS model. To do this we showed the residents the inundation developed by Irene in our model and compared it to what the public actually experienced during the storm.
- *Meeting #2*(October 2016) – We presented our alternative modeling to the public and the results of modeling and used the opportunity further educate on the functionality of the model and its benefits as a tool for planning. River process, river stability, and sediment transport concepts were also presented, as well as the distinction between natural stream channel design and traditional dredging.
- *Meeting #3* (September 2017) – This meeting was used to further present modeling of potential mitigation alternatives and the results of the Benefit/Cost Analysis (BCA). An overview of funding options and the limitations of the BCA was provided.
- *Town Board Meeting* – Once accepted by the Andes Town Board, the Local Flood Analysis will serve to make the Town eligible for future funding opportunities available within the NYC watershed region.
- *Stream Walks*
 - § March 4, 2016 – An initial walk-through of the Hamlet was performed by B&L with members of the Advisory Committee, DCSWCD, and NYCDEP. This provided an opportunity to discuss problem areas and brainstorm potential solutions.
 - § May 10, 2016 – The upper Gladstone Creek area was identified during the March site walk-through as an area of importance. B&L along with members of the Advisory Committee, DCSWCD and NYCDEP walked the Gladstone Creek Corridor to evaluate the presence and potential for additional wetland storage above the Hamlet.

§ July 6, 2017 – A walkthrough of the Andes Central School Property with members of the Flood Advisory Committee and residents was performed to discuss the particulars of potential floodplain expansion specific to the school property as well as other locations in the Hamlet.

IV. Flood Mitigation

IV.A. General

As shown through the modeling and historic events, the studied project reach (Tremper Kill and Liddle Brook in the Andes Area) is susceptible to flooding during large storm events. Alternatives for mitigation alternatives are characterized under the following categories:

- **Property Protection:** These types of alternatives include measures that either provide structural measures to protect existing buildings, residences, and infrastructure elements from flood impacts, such as flood levees, diversions, floodwalls, etc., or to remove them from the flood inundation zone through raising building elevations, relocation, or abandonment of properties.
- **Flood Damage Protection and Planning:** These types of alternatives include stream and/or floodplain modifications intended to reduce flood elevations. These approaches are *oftentimes, but not entirely*, most applicable in areas where sufficient lateral area adjacent to the active channel and floodplain are available to implement such measures. In addition to reduction in flood risk and associated hazards, these alternatives, including such measures as floodplain reconnection, installation and protection of streamside buffers, and natural channel restoration, provide a wide range of additional benefits to the community. Benefits include improved aesthetics, recreational opportunities, water quality, and elevated property values. When compared to more structurally-engineered alternatives, these modifications provide greater flood mitigation benefits to the system as a whole by reducing flood velocities, reducing bank erosion and mass failures, and minimizing changes in channel form upstream and downstream by balancing the sediment transport regime. Funding sources such as Catskill Watershed Corporation (CWC) are available to support flood mitigation projects that incorporate approaches such as natural channel and/or floodplain restoration.

- **Natural Resource Protection:** These types of alternatives do not directly address flood stages or direct flood impacts, but instead address elements that frequently contribute to or exacerbate flood elevations. They include: debris management; bed-load, large woody debris; bank stabilization; and landslide remediation. These approaches can also include out-of-channel projects intended to restore the natural hydrologic regime through increasing groundwater infiltration, stormwater detention and storage, and reducing flood surges associated with excessive overland runoff.
- **Structural Projects:** These types of alternatives provide structural protection to critical infrastructure elements, such as utilities, bridges, roadway embankments, and culverts. Because of the localized nature of many of these types of projects, these approaches are best implemented in conjunction with one or more additional mitigation alternative approaches, such as replacing, retrofitting, or re-sizing bridges and culverts, etc.
- **Emergency Response and Services:** These types of alternatives do not directly address flood impacts, per se, but establish adequate response measures from Emergency Services agencies to provide affected residents with safety, shelter, and adequate supplies to offset the impacts to health, personal safety, and impacts to quality of life that result from flood events.
- **Community Pollution Prevention:** These types of alternatives identify and secure, either through structural, relocation, or other means, elements within the community that pose potential pollution and/or toxic risks to people, property, and the environment when inundated during a flood.

The alternatives evaluated by the hydraulic model below largely focus on structural and flood damage protection through projects that reduce flood elevations and subsequent impacts to structures and roadways. The alternatives evaluated are presented starting upstream and working downstream through the project area but in no order of importance or priority.

Given the degree to which development of the valley has led to widespread encroachment and confinement of stream channels and floodplains through much of the study area, it has become evident through the development of this LFA that implementation of individual mitigation alternatives frequently meet with only a modicum of corresponding flood/flood hazard reduction. On their own merit, most of the mitigation alternatives presented in this section offer only minor reduction of flood risks. However, when combined as part of a more comprehensive and multi-faceted flood mitigation plan, the cumulative benefit of multiple measures implemented over time can provide a more profound benefit to the community by way of limiting the hazards associated with future flood events.

IV.B. Areas of Interest

IV.B.1 Detention Pond Upstream of Hamlet

The junction between Gladstone Hollow and Tremper Kill is approximately $\frac{1}{4}$ of a mile upstream of the Tremper Kill's first crossing of Route 28 in Andes. During large storm events the wetland areas in the vicinity of this junction are engaged in attenuating some flow from the storm. It is thought that a detention pond could be developed in the area surrounding the junction in order to attenuate more flow from reaching the hamlet. The detention pond would be developed in the farm fields north east of the junction between the two rivers. It would require a minimum storage of 25 acre-feet of water in order to be effective, however the more the pond can attenuate the greater the degree of flood reduction downstream through the Hamlet. To evaluate necessary design standards for such a measure, a detention pond was modeled on Gladstone Hollow assuming that a peak discharge that would never exceed the 2-yr storm. This design storm was modeled for the detention pond because there is no inundation through the Hamlet from the 2-yr storm. This would require an engineered flood retention structure (i.e. structural dam) to accomplish. The retention structure would span across the Tremper Kill channel just south of the confluence with Gladstone Hollow (see Figure 1), effectively impounding both streams during high water events. A flood retention structure would not be covered under the LFA, but the concept of retaining flow was shown to have merit. Further 'softer' approaches will be pursued.

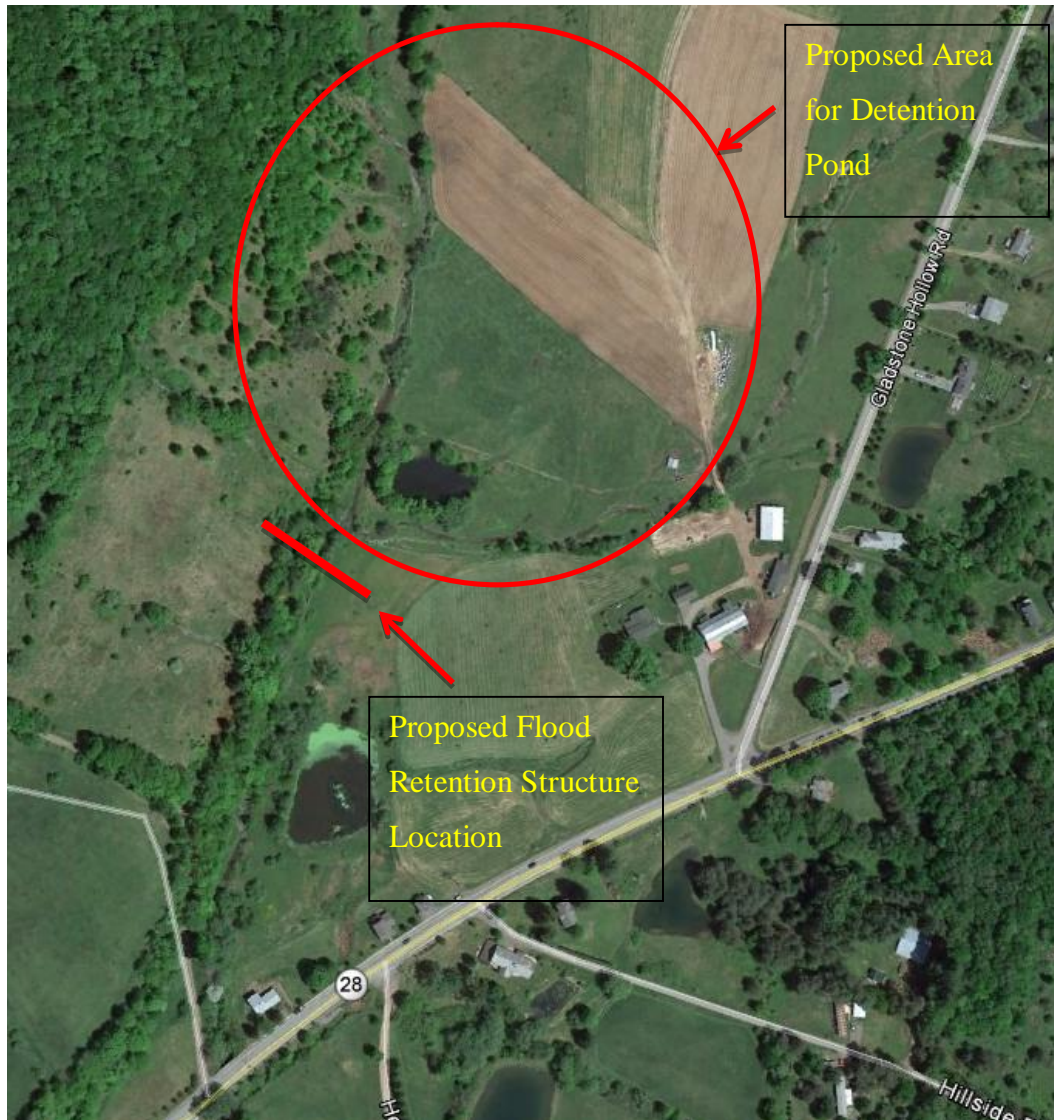


Figure 3. Proposed location for detention pond and flood retention structure.

Results:

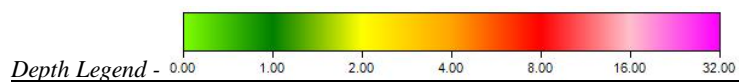
- n Developing an upstream detention pond reduces inundation area and depth through the Hamlet downstream (see figure 4 & 5)
- n Preliminary modeling of a retention structure and detention pond was based upon general assumption of design dimensions. A more detailed design will be needed to evaluate accurate results and benefits
- n By effectively “cutting off” the upper headwaters of the watershed, the detention pond decreases the drainage area of the Tremper Kill contributing flood flows through the Hamlet of Andes by approximately 3.25 square miles (57%)
- n Costs associated with design, permitting, construction and long-term inspection and maintenance of a retention structure / detention pond cannot be funded through the LFA program.



Figure 4. Inundation Area during a 50 year event - Existing conditions



Figure 5. Inundation Area during 50 year event – Proposed conditions (Detention Pond)



IV.B.2 Managed Farm Practices Upstream of Hamlet

Agricultural areas along Gladstone Hollow were evaluated to identify opportunities to reduce runoff volumes and increase time of concentration (i.e. rate of discharge to the receiving stream network) through implementation of improved management practices. Evaluation of flood mitigation benefits that could potentially be gained through improved management of farm fields considered both the acreage of agricultural lands available as well as the reductions in curve number that would result from implementation of best management practices (BMPs). Utilizing overhead imagery within the drainage basin, we estimated farm land comprised approximately 277 acres (or 34%) of the Gladstone Hollow drainage basin. The curve number for row crops is 89-91 and the curve number for terraced and contoured fields is 80-81. Corresponding runoff reductions associated with implementation of BMPs would translate to an estimated 30-190 cfs, depending on the magnitude of the storm event. The resulting reduction in flow through the Hamlet is 5-12% depending on the recurrence interval of the storm. This approach would not single-handedly solve all flooding-related issues in its own right, but would help reduce peak flow. If coupled with other flood mitigation measures within the study area, improved agricultural management practices would be a beneficial component to a broader, comprehensive approach to reducing flood elevations, inundation zones and corresponding flood hazards through the study area.

Results:

- n **Managing crops has a 5-12% reduction in runoff to the upper portions of Tremper Kill and Gladstone Hollow, reflective of the prevailing storm intensity.**
- n **Peak flows are decreased but inundation areas and depths are not reduced.**

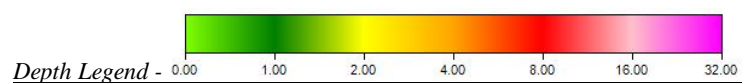
Based on the flood commission's walk of the upper Tremper Kill, the existing wetlands in the Upper portions of the Tremper Kill and Gladstone Hollow should be preserved. These wetlands provide areas of detention and infiltration that benefit the Hamlet downstream. The removal or destruction of these wetlands would increase runoff and consequently peak flows and associated flooding.



Figure 6. Inundation Area during a 50 year event - Existing Conditions



Figure 7. Inundation Area during a 50 year event – Proposed Conditions (Managed Farm Practices)



IV.B.3 Floodplain Conveyance through Andes- Tremper Kill

Development of properties within the Hamlet along the banks of the Tremper Kill has resulted in widespread encroachment of the stream channel and adjacent floodplains. In an effort to relieve the confined condition of the river and corresponding increased floodwater elevations and velocities, the addition of a floodplain bench was investigated for the purpose of improving conveyance capacity through the study area. The width of the bench was determined by utilizing overhead imagery to identify potential opportunities for floodplain reconnection and/or widening. Using the imagery we were able to identify garages and sheds, as well as residential structures. At this conceptual stage, we determined available floodplain widths through the Hamlet by assuming that relocating garages and sheds is acceptable, but displacement of houses and businesses is not. From this we utilized a 20-40' wide floodplain starting near the old Town Hall site. Opportunities for floodplain expansion alternate between one or both sides of the stream as it passes through the Hamlet. Modeling of the proposed floodplain bench alternative indicates a reduction in flood elevations ranging from 0 feet to -3.5 feet for the 50 year storm, depending on location within the Hamlet. Inundation maps shown below show that both the river and floodplain are engaged during the 50 year storm and improving conveyance and pulling inundation limits away from properties throughout the Hamlet. One area of significant reduction is south of Route 28 between the properties 288 Main Street and 506 Main Street. Another of which showed a significant reduction in flooding was to the north of route 28 between the properties of 33 Main Street and 103 Main Street.



Figure 8. Diagram displaying locations of the continuous floodplain throughout Andes. The red line is the river's center line and the blue lines are the extents of the proposed floodplain.

Results:

- n **If utilizing the maximum available floodplain width through the Hamlet, inundation areas are notably reduced at the 50-yr storm.**
- n **When utilizing the maximum available floodplain width, flood elevations are decreased 0-3.5 feet during the 50 year storm**
- n **Maximizing floodplain width and extent along the Tremper Kill will result in a significant decrease in flood elevations through developed portions of the Hamlet of Andes**
- n **Flood plain width can be maximized with only the need to relocate sheds and garages, but not houses or businesses.**

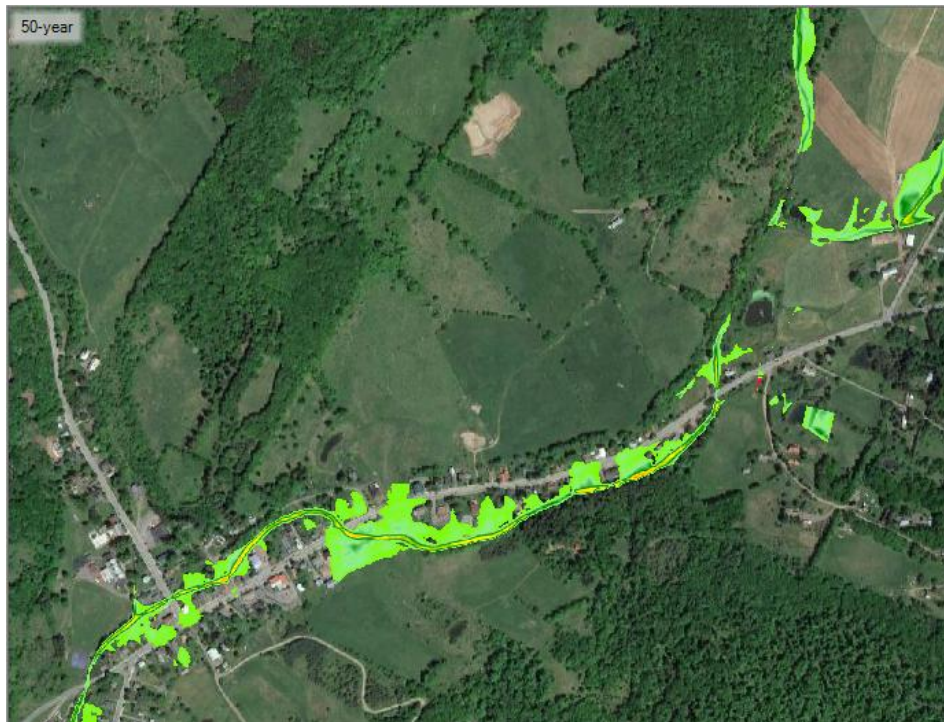


Figure 9. Inundation Area during a 50 year event - Existing Conditions



Figure 10. Inundation Area during a 50 year event - Proposed Conditions (Continuous Floodplain)

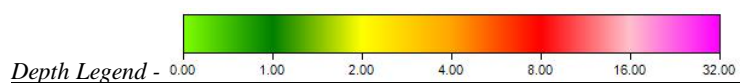




Figure 11. Inundation Area during a 50 year event for 288 Main St. to 506 Main St. – Existing Conditions



Figure 12. Inundation Area during a 50 year event for 288 Main St. to 506 Main St. – Proposed Conditions (Continuous Floodplain)

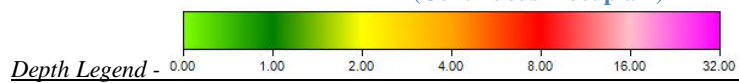
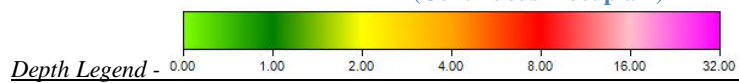




Figure 13. Inundation Area during a 50 year event for 33 Main St. to 103 Main St. – Existing Conditions



Figure 14. Inundation Area during a 50 year event for 33 Main St. to 103 Main St. – Proposed Conditions (Continuous Floodplain)



IV.B.4 Increase Span of Bridges

In order to evaluate which bridges had influence on backwater and consequent flooding, the span each of the bridges in the Hamlet of Andes were individually increased by 10' to determine the impact. Below is a summary of the impacts in Table 2:

Table 2 (25-Year Storm)			
Bridge Description	River	Existing Backwater	Proposed Backwater
Route 28 Bridge over Tremper Kill, North of Herrick Hollow Junction	Tremper Kill	1657.63	1657.37
Pedestrian Bridge South of Route 28, Behind 506 Main Street	Tremper Kill	1646.47	1646.47
Pedestrian Bridge South of Route 28, Behind 470 Main Street	Tremper Kill	1642.44	1641.35
Pedestrian Bridge South of Route 28, to the West of 242 Main Street	Tremper Kill	1621.97	1621.93
Route 28 Bridge over Tremper Kill, South of 193 Main Street	Tremper Kill	1621.26	1620.19
Pedestrian Bridge North of Route 28, Behind 65 Main Street	Tremper Kill	1606.93	1606.23
Route 28 Bridge over Tremper Kill, East of 39 Delaware Ave	Tremper Kill	1600.96	1600.49
Route 2 bridge Over Tremper Kill, West of 415 Depot St.	Tremper kill	1592.28	1591.93
Route 28 over Liddle Brooke, East of 115 Delaware Ave.	Liddle Brook	1612.14	1610.65
Pedestrian Bridge over Liddle Brooke, East of Andes Central School	Liddle Brook	1606.10	1605.09
Parking Lot Bridge over Liddle Brook, South of Andes Central School	Liddle Brook	1599.71	1598.41

Results:

- n **Increasing the span of bridges on Tremper Kill by 10' had nominal impact on backwater elevations, and does not result in a notable reduction in overall flood elevations or inundation zones.**
- n **Tremper Kill's Bridges are adequately sized**
- n **Increasing the span of bridges on Liddle Brook saw decrease in backwater between 1-1.5 feet**
- n **Increasing any Bridge Span on Liddle Brook would reduce roadway flooding on 28**

IV.B.5 Debris Influence at Bridges

Information gathered and conditions observed during walkthroughs of the study area identified several opportunities for debris (both in the way of trees and flood debris from streamside properties) to become lodged at bridges through the Hamlet. Feedback from the FAC and the general public to date have expressed concerns about the influence of debris in flooding through the Hamlet, and the discrepancies between the duplicate effective model and conditions observed by residents during the 2006 flood seem to indicate that debris obstructions may have had a significant role in driving the impacts associated with that event.

Areas being considered for enhanced streambank protection / stabilization on the Tremper Kill include:

- *Left bank immediately downstream of Herrick Hollow* - reconstruct/reconfigure grade control structure(s), left bank vanes and floodplain bench with right bank grading to relieve channel entrenchment.
- *Left bank upstream of NBDC property* – construct floodplain bench along left toe of bank, grade right floodplain to reduce entrenchment, utilize instream vanes to reduce bank erosion and bed degradation/maintain feature spacing.
- *Right bank downstream of Middle Rt. 28 Bridge* – utilize vanes to support creation of vegetated floodplain bench along outside (right bank) meander bend.
- *Both banks from above High St / pedestrian bridge downstream to ACS property* – enhance instream grade (bed) control to reduce channel downcutting and undermining of stacked stone walls.

On Liddle Brook:

- *Left bank approx. 300 feet upstream of Rt. 28 Bridge* – toe protection and grade control to prevent undermining of large trees along left bank through reach, severely entrenched and in close proximity to garages along right bank (one of which spans partway over the creek); recommend relocating garage away from streambank.
- *Both banks through the ACS property* - enhance instream grade (bed) control to reduce channel downcutting and undermining of stacked stone walls



Figure 15. Areas being considered for enhanced streambank protection

IV.B.6 Aggradation/Degradation

Overall, sediment transport-related issues do not appear to be substantial contributors to the extent and severity of flooding through the study area. Principal sources of sediment appear to be from streambank erosion in the areas of Tremper Kill listed above for streambank stabilization, and from bed scour through those portions of the Tremper Kill and Liddle Brook bound within stacked stone walls. While the fate of sediment generated from these locations is not a direct contributor or influence on flooding in the study area *per se*, the processes of bank erosion and bed scour promote inputs of woody debris and undermining / failure of existing bank revetments (namely the stacked stone walls through the Hamlet and on the Andes Central School property), both of which represent tangible flood-related hazards in the Hamlet.

The measures being developed for recommendation addressing bank erosion and bed scour listed above are also intended to address sediment-related flood hazards through the study area.

IV.B.7 Basement Flooding

In recent history, direct flood damage to above-ground structures within the focus area generally has been minimal. However, temporary flooding of basements is of particular concern to those residents and business owners situated within the project area.

Many households throughout the hamlet of Andes are currently required to purchase flood insurance under the National Flood Insurance Program (NFIP). Households that are required to purchase flood insurance under NFIP are those houses located within a flood zone designated as an A zone by FEMA, and houses where the lowest floor, which includes basement or crawlspace, is below the flood elevation for the 100 year storm. Many households in Andes fall within a flood zone designated as an A zone by FEMA and have experienced basement flooding. Many of the foundations in Andes consist of field stone foundations. These basements have historically flooded without structural damage. The residents of Andes generally understand this phenomenon and don't locate anything of value in their basement. To most home owners, this is viewed as a manageable risk. The households located within the A zone are listed in Appendix A. In order for these households listed in Appendix A to no longer pay the NFIP flood insurance, an option would be to fill in their basement or crawl space. If a household with a basement floor or crawl space has a first floor that is above the 100 year flood elevation, then filling in the basement floor or crawl space would designate the first floor as the lowest floor used for determining whether the household requires flood insurance. Therefore, if that household fills in its basement and completes an elevation certificate, it may no longer be required to purchase flood insurance under the NFIP program.

A shorter list of properties were identified that may have their first floor below the BFE. A formal survey was not completed, but a screening of depth of water in the model compared to the height to the first floor above adjacent ground was conducted. The adjacent ground elevations were based on LiDAR flown in April of 2009. These properties are candidates to have an Elevation Survey completed to determine the first floor elevations in relation to the BFE. If it is determined that the first floors are below the BFE, these properties may be eligible for funding to elevate their structures to remove them from the flood risk. These properties are:

Potential Impact from 100-Year Flood (BFE)

267 Lower Main Street
72 Main Street
85 Main Street
193 Main Street
200 Main Street
221 Main Street
270 Main Street
388 Main Street
396 Main Street
27 Delaware Avenue
39 Delaware Avenue
22 Delaware Avenue

IV.B.8 Liddle Brook Dam Enhancement

At the upstream limits of the study area along Liddle Brook is a small detention pond constructed by a property owner for their farm. On the south side of the pond is a 180 foot long by 3 foot tall earthen embankment. An alternative where this dam would be enhanced in order to impound more water and decrease flow rate in the Liddle Brook was evaluated. For this alternative, the embankments of the pond would be increased to 6 feet in elevation for 174 feet of the existing embankment length, leaving a 6 foot wide spillway at the embankment's current elevation. This alternative was modeled through Hydro Cad and was found to minimally lower the flow rate into the Liddle Brook by 14 cfs or 2% for the 100-yr storm. While the model reflects modest gains by improving this system, retaining this feature is important. Removal of this wetland or any other wetland in the drainage area would result in an increase in peak discharges. It is recommended that assistance be provided to landowners encouraging them to participate in available programs to protect and enhance existing wetlands.

IV.B.9 Retaining Wall Relocation & Construction

The downstream portion of the Liddle Brook travels along the front of Andes Central School. Currently the retaining wall on either side of the brook has sections that are failing and need to be replaced. An alternative where this retaining wall was relocated in order to allow for larger flows to travel through this area while decreasing flooding was evaluated. In the model, the walls on each side of the brook were relocated up to a distance of 30 feet east and west of its current location depending on limits due to structure locations, in order to widen the flood channel and allow for development of floodplain benches within the bounds of the rock walls. The two bridges that span Liddle Brook in front of the school would each need to be reconstructed with larger openings in order to widen the channel and relocate the retaining walls. Relocating the retaining walls and increasing the opening of the bridges to allow for greater flood conveyance significantly decreases width of the inundation immediately in front of the school and over Route 28 further downstream. Perhaps more importantly, widening of the channel in front of the School would reduce flood depth, flood velocity and corresponding propensity for streambed scour, which is a significant contributor to the risk of imminent failure of the existing stacked rock revetments along the streambanks. A significant reduction of the inundation can be seen immediately in front of Andes Central School, in the backyard of 40 Delaware Ave, and over Route 28 in front of the properties of 415 and 417 Main Street. The inundation limits of the 50-year storm are shown for the existing conditions and proposed alternative in Figures 16 and 17.

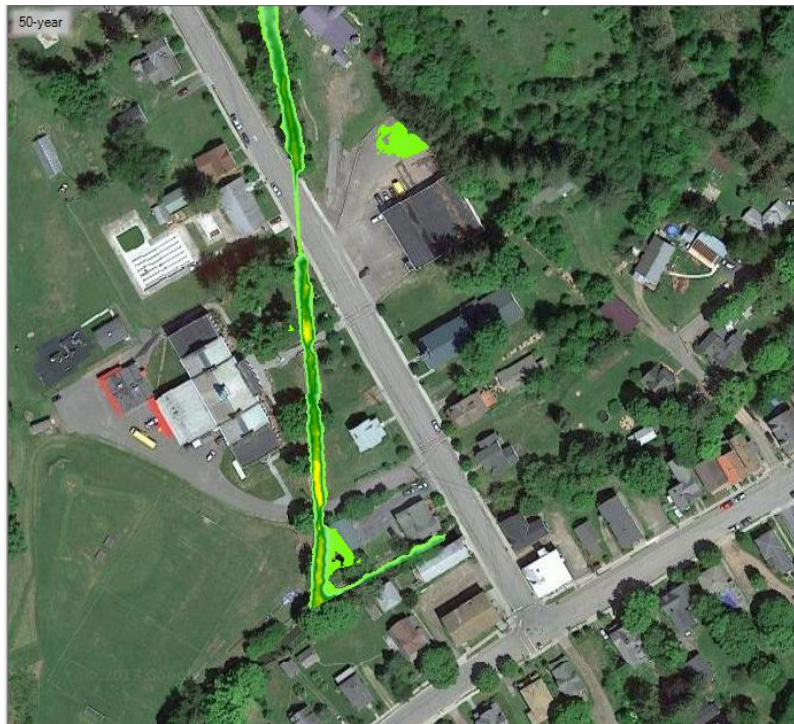


Figure 16. Inundation Area for the school retaining wall during a 50 year event for existing conditions for Liddle Brook.



Figure 17. Inundation Area for the school retaining wall during a 50 year event for the proposed widened conditions.

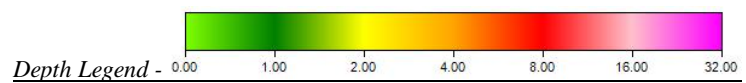
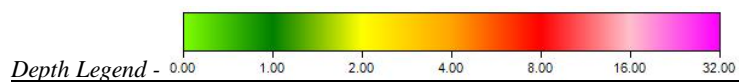




Figure 18. Inundation Area for the school retaining wall during a 50 year event for existing conditions.



Figure 19. Inundation Area for the school retaining wall during a 50 year event for the proposed widened conditions.



To promote the concept of enhancing floodplain connectivity and conveyance through Andes, a section of Liddle Brook and Tremper Kill approximately 600 feet long (extending from the southern ACS entrance road downstream to the County Route 2 Bridge) has been discussed as a possible location of a potential demonstration project. Aspects of this potential project, still at the conceptual stages of consideration, might include reconnection of the floodplain, relocation of the upper portion of the stacked stone wall further back from the stream, and grade control to prevent further downcutting of the stream and undermining of the adjacent stone wall. At this time, ACS and other project partners are the conceptual constraints and opportunities such a project may entail.

IV.B.10 Comprehensive Flood Mitigation

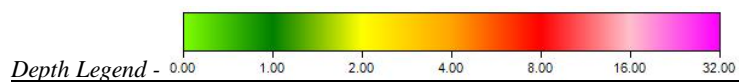
As discussed at the outset, each alternative presented above proves to diminish a small amount of flooding through the Hamlet of Andes through various methods. In an effort to diminish all of the inundation of Main Street through the center of Andes, a combination of the different alternatives discussed above was evaluated. The combination of alternatives includes managed farm practices upstream of the hamlet, removing debris and sediment from the Route 28 Bridge over the Tremper Kill, relocation of the retaining wall along the school fields, enlarging the opening of the Delaware Ave. Bridge over the Tremper Kill, and construction of a flood plain to the south of the Tremper Kill behind the property of 274 Main Street. The combination of these alternatives showed a significant reduction in the inundation levels of through the hamlet for the 50-year storm. This alternative could also be completed in phases throughout the oncoming years, allowing the Town to construct each phase in a timely and cost effective manner. The inundations limits of this alternative can be compared to the inundation limits of existing conditions in Figure 20 and Figure 21.



Figure 20. Inundation Area during a 50 year event through the hamlet for existing conditions.



Figure 21. Inundation Area during a 50 year event through the hamlet for the Hybrid Alternative.



V. Benefit-Cost Analysis

A benefit-cost analysis (BCA) was completed on two of the proposed projects mentioned above. The remaining projects offered minimal benefits, therefore a BCA would not provide a favorable assessment. For the two projects progressed, a project cost was developed and compared to the benefits of the project. The benefits include maintenance of emergency facilities, reduction in flooding at residences, property damage, and loss of life. The two Alternatives are summarized below.

- Benefit-Cost Analysis (BCA) – BCA is the method by which the future benefits for a mitigation project are estimated and compared to its cost. The end result is a Benefit-Cost Ratio (BCR)
- Benefit-Cost Ratio (BCR) – The BCR is a numerical expression of the cost effectiveness of a project. A project is considered cost effective when the BCR is 1.0 or greater.

V.B.1 Floodplain Conveyance through Andes- Tremper Kill

The floodplain conveyance project provides benefits primarily related to access through Andes during a flood event. Adding the additional conveyance prevents water from overtopping the banks and flooding the road cutting off access. Preventing flooding of the road benefits access for emergency services and maintains traffic/evacuation routes for the residents of Andes. The BCR for this project is 0.12.

Summary

Total Project Cost	\$720,000
Service Life	75 years
Total Benefits	\$86,229
BCR	0.12

V.B.2 Retaining Wall Relocation & Construction

A benefit-cost analysis was performed on the first phase of the retaining wall relocation project on the Andes Central School property. This phase would include the stretch of Tremper kill from the County Bridge on Depot Street, along the tennis courts and terminate at the school driveway bridge. This segment would be designed to accommodate further work throughout the rest of the school property on Liddle Brook, but would be designed independently at this point. The project would include a floodplain bench along the school side of the river for this reach, increasing conveyance and reducing flood elevations. This would prevent water from getting into the Route 28 intersection and cutting off access and emergency services. In addition, the flooding would be reduced at the houses on the opposite of the river through this stretch. The sewer line would be relocated farther from the river, preventing the undermining and failure risk currently associated with the line. Failure of the sewer line would force closure of the school, and impact the businesses on Depot Street. Due to the impacts to the school property, the tennis courts would be relocated on the school property and the soccer field adjusted. The intent is to maintain the assets the school currently has, although their location will be shifted on the property to accommodate the floodplain. The benefits of this project include: stabilizing the retaining wall that is undermined, protecting the sewer line which serves the school and two business, and maintaining emergency services and resident access.

Summary

Total Project Cost	\$858,000
Service Life	75 years
Total Benefits	\$540,086
BCR	0.63

VI. Additional Recommendations

These recommendations are provided to the Andes Flood Advisory Committee for further consideration. Potential funding sources for eligible projects is summarized in Appendix D.

- Developing an early warning system through a reverse 911 system or similar could be investigated to provide more advanced notice to residents in the event of a flood.
- Fuel tanks throughout the Towns can be elevated above flood stage and anchored to prevent movement or spilling during a flood.
- The advanced warning system suggested for areas of the road system that flood could be pursued for other areas to warn motorists of locally flooded road conditions.
- Investigate the development a Town-wide database of storm damage that could be updated after every storm. This would provide useful data when determining which future projects to pursue; and help in gathering data for grant applications that require Benefit Cost Ratios. The database should include actual, verified Base Flood and First Floor elevations at each residence to accompany damage values.
- Implement a program to fund stabilization materials (rock of various sizes, sections of corrugated culvert) to be used for roadway protection during emergency response immediately following a flood.
- Further survey First Floor Elevations of homes in the SFHA to guide decisions on potentially elevation structures that can benefit from this flood mitigation practice.
- Implement stream gage stations on the Tremperkill and Liddle Brook in the vicinity of Andes or weather stations within the watershed. This information would provide better real time data to emergency services during a flood event. Opportunities for public involvement and outreach / education include ACS participation in installing and monitoring these stations. These activities can be supported by funding grants through the Delaware County Stream Program.
- Provide educational outreach to residents of the community. The DCSWCD, NYCDEP, and CWC all provide outreach programs available to the community.

- Provide training to Code Enforcement Officers on Flood mitigation and prevention. DCSWCD provides funding assistance for Code Enforcement officers to become Certified Floodplain Managers.
- The Delaware County Department of Emergency Services is responsible for maintaining and updating a County-wide “*Comprehensive Emergency Management Plan*”. A review of the existing version of the comprehensive plan should be completed to identify activities and projects presented in this LFA report that warrant updating or inclusion in the comprehensive plan. Consistency of the proposed mitigation measures identified in this LFA report with objectives already stated in the comprehensive plan may assist in prioritization of projects or additional sources of support and funding.
- A review of local ordinances should be conducted to identify opportunities for improved local resiliency and mitigation of flood-related hazards. As an NFIP community, the Town is obligated to comply with the minimal NFIP requirements listed by FEMA. An ordinance review provides opportunity for these minimum standards to potentially be expanded to improve the degree of flood hazard mitigation in Andes.
- Encourage and support efforts by local landowners to protect and enhance wetlands throughout the headwaters of the drainage basin. Preservation of the existing wetlands is necessary to prevent exacerbating flooding. Improvements to a single wetland may offer only modest benefits, but modest benefits to wetlands throughout the drainage area will provide more appreciable benefits.
- Assess annually or after major storm events for potential stream hazards in the hamlet such as streambank failures, danger tree, threatened structures, debris at bridges, utilities, etc. Coordinate with DCSWCD, NYSDOT, and County Highway Department to determine responsibility and funding opportunities for addressing identified concerns.

VII. Summary of Findings

The LFA process provides Andes and the residents throughout the project area with a valuable tool to make informed decisions within the watershed moving forward. This document is a useful tool that will continue to evolve as projects are completed or as future projects arise. The HEC-RAS model developed for this study is available for future use to evaluate any potential project. Several of the projects proposed in this study are large capital projects that don't produce enough benefit to offset their large capital investment, while others are smaller, localized projects where the benefit better suits the expenditure. Only inundation hazards were evaluated as part of this study; where additional flood hazards due to bank erosion have created costs to infrastructure and/or have produced significant negative water quality impacts, these more expensive projects may rise to a priority level that warrants their progression in the future. None of the projects were identified throughout this report have a BCR above 1.0. While some federal grant programs require a BCR of greater than 1.0, a BCR of less than 1.0 does not disqualify a project funded through the NYC DEP and CWC supported flood hazard mitigation programs. Other grant programs may also not rely on BCA for determining eligibility.

BCAs for the individual mitigation projects evaluated in this study could change as a result of accumulating damages from future floods, as additional knowledge of historical damages comes to light, or as the result of adjustments in the estimated cost of projects. Furthermore, where additional benefits of potential mitigation projects are identified, funding sources other than those dedicated solely to mitigation of inundation risks to public and private property may be identified that make some of these projects feasible.

In addition to the projects highlighted above, the Andes Flood Advisory Committee can pursue other forms of advance warning systems to alert residents and motorists during a flood. Fuel tanks can be secured and other sources of water pollution relocated or reinforced to prevent spills during a flood event.

Action Items:

- ***Hold regular meetings of the Flood Commission to assess and assist in new and ongoing implementation of action items.***
- ***Provide regular updates to the Town Board of progress and needs.***
- ***Promote securing of fuel tanks through CWC program***
- ***Review Town Building Codes/Floodplain Management***
- ***Identify/Prioritize sediment sources upstream***
- ***Increase documentation of damage and flood elevations during flood events***
- ***Hold educational; “How To” session on filling basements/Elevating Homes***

While not limited to this list, the homes in Appendix A were identified as potentially having the first floor elevation below the Base Flood Elevation (BFE) or having the basement flooded. These properties are therefore candidates to have an Elevation Survey completed to determine the first floor elevation in relation to the BFE.

IN CASE OF FLOOD EMERGENCY CONTACT:

Delaware County Department of Emergency Services

Phone: (607) 746-9600

Delaware County Soil and Water Conservation District

Graydon Dutcher, Stream Program Coordinator

Phone: (607) 865-7161

APPENDIX A

Property Impact Summary Table

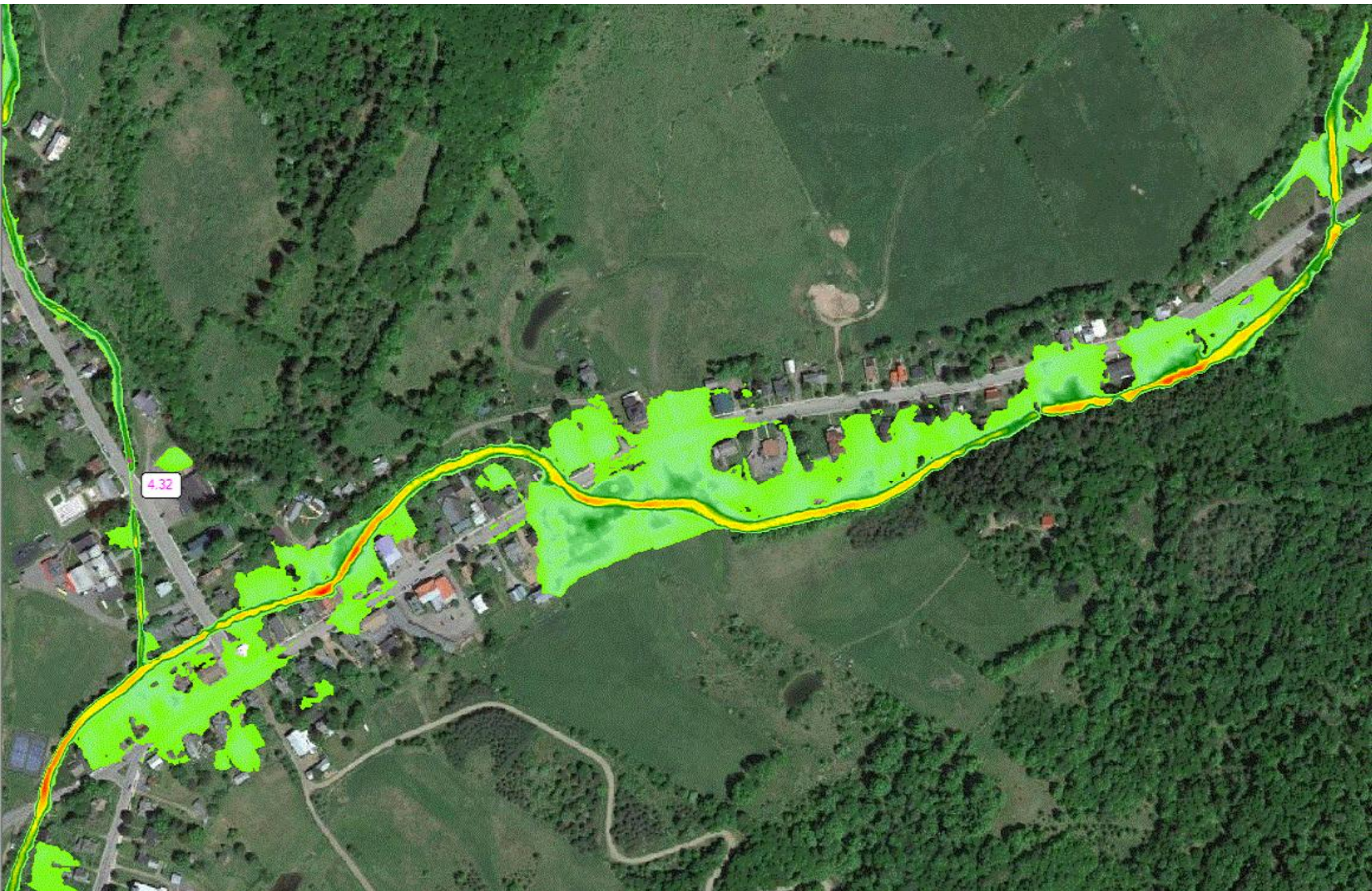
ADDRESS	PARCEL
284 Delaware Ave	238.18-1-1.1
244 Delaware Ave	259.6-4-2
214 Delaware Ave	259.6-4-3
192 Delaware Ave	259.6-4-4
85 Delaware Ave	259.6-3-10
385 Lower Main St	259.10-3-3
427 Depot St	259.10-3-2
311 Lower Main St	259.10-2-5
5 Triangle St	259.10-2-3
415 Depot St	259.10-3-1
327 Lower Main St	259.10-2-4
267 Lower Main St	259.10-2-6
356 Depot St	259.10-2-1.1
245 Lower Main St	259.10-2-1.2
County Highway 1	259.10-2-8.2
294 Depot St	259.10-1-3.2
5287 County Highway 1	259.14-1-6.1
92 Depot St	259.10-1-5
County Highway 1	259.10-2-8.3
County Highway 1	259.10-2-8.4
56 Depot St	259.10-1-7
170 Depot St	259.10-1-4
414 Lower Main St	259.10-6-16
200 Main St	259.7-3-18
396 Main St	259.7-3-12.2
388 Main St	259.7-3-12.1
378 Main St	259.7-3-13
348 Main St	259.7-3-14
410 Main St	259.7-3-11
149 Holmes Ln	259.7-3-9
420 Main St	259.7-3-10
436 Main St	259.7-3-8
470 Main St	259.7-3-7
Main St	259.7-3-6
59 Off Main St	259.7-3-3.2
528 Main St	259.7-3-4
560 Main St	259.7-3-3.3
525 Main St	259.7-1-5
506 Main St	259.7-3-5
483 Main St	259.7-1-8
Main St	259.7-1-9
255 Main St	259.7-1-18.1
221 Main St	259.7-1-20
242 Main St	259.7-3-17
288 Main St	259.7-3-15.3
270 Main St	259.7-3-16
295 Main St	259.7-1-17
319 Main St	259.7-1-16
314 Main St	259.7-3-15.2
Main St	259.7-3-15.1
188 Main St	259.10-6-36
176 Main St	259.10-6-35
161 Main St	259.10-5-8
173 Main St	259.10-5-9

ADDRESS	PARCEL
193 Main St	259.6-5-5
High St	259.6-5-3
155 Main St	259.10-5-7
131 Main St	259.10-5-5
119 Main St	259.10-5-4
103 Main St	259.10-5-3
85 Main St	259.10-5-2
75 Main St	259.10-5-1
34 High St	259.6-5-1
61 Main St	259.10-4-8
65 Main St	259.10-4-9
32 Main St	259.10-6-24
55 Main St	259.10-4-7
49 Main St	259.10-4-6
37 High St	259.6-4-10
21 Main St	259.10-4-3
Main St	259.10-4-5
7 Main St	259.10-4-1
16 Main St	259.10-6-23
454 Lower Main St	259.10-6-19
446 Lower Main St	259.10-6-18
Lower Main St	259.10-6-20
432 Lower Main St	259.10-6-17
11 Delaware Ave	259.10-3-7
395 Lower Main St	259.10-3-4
427 Lower Main St	259.10-3-6
27 Delaware Ave	259.10-3-8
411 Lower Main St	259.10-3-5
39 Delaware Ave	259.6-3-9
61 Delaware Ave	259.6-3-8
22 Delaware Ave	259.10-4-2
40 Delaware Ave	259.6-4-9
33 Main St	259.10-4-4
88 Delaware Ave	259.6-4-6
182 Delaware Ave	259.6-4-5
High St	259.6-4-11
148 High St	259.6-5-4
537 Main St	259.7-1-4
580 Main St	259.7-3-3.1
665 Main St	259.7-2-2
715 Main St	259.7-2-1
104 Herrick Rd	259.7-3-2
85 Herrick Rd	259.8-2-10
Gladstone Holw	238.-1-15.1

APPENDIX B

HEC-RAS Results

Existing 100-Year Inundation Map - Tremper Kill & Liddle Brook



Existing Results - Tremper Kill & Liddle Brook

HEC-RAS Plan: EXC TK +LB Locations: User Defined

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk middle	Reach-1	41995	10-year	654.00	1649.40	1659.02		1659.10	0.000391	2.42	379.45	72.82	0.14
Tk middle	Reach-1	41995	25-year	879.00	1649.40	1659.93		1660.04	0.000475	2.85	445.61	73.57	0.16
Tk middle	Reach-1	41995	50-year	1070.00	1649.40	1660.63		1660.76	0.000533	3.16	497.23	74.15	0.17
Tk middle	Reach-1	41995	100-year	1270.00	1649.40	1661.29		1661.44	0.000587	3.45	546.63	74.70	0.18
Tk middle	Reach-1	41995	500-year	1780.00	1649.40	1662.12		1662.36	0.000867	4.41	608.78	75.38	0.23
Tk middle	Reach-1	41497	10-year	654.00	1642.25	1659.05		1659.06	0.000017	0.62	1594.38	147.89	0.03
Tk middle	Reach-1	41497	25-year	879.00	1642.25	1659.97		1659.97	0.000024	0.77	1730.04	149.23	0.04
Tk middle	Reach-1	41497	50-year	1070.00	1642.25	1660.67		1660.68	0.000030	0.88	1835.81	150.26	0.04
Tk middle	Reach-1	41497	100-year	1270.00	1642.25	1661.35		1661.36	0.000035	1.00	1937.04	151.25	0.04
Tk middle	Reach-1	41497	500-year	1780.00	1642.25	1662.21		1662.22	0.000057	1.31	2067.77	152.51	0.06
Tk middle	Reach-1	41367	10-year	654.00	1652.32	1658.74		1659.02	0.002861	4.28	181.14	85.63	0.34
Tk middle	Reach-1	41367	25-year	879.00	1652.32	1659.61		1659.93	0.002757	4.69	256.24	87.93	0.34
Tk middle	Reach-1	41367	50-year	1070.00	1652.32	1660.29		1660.64	0.002635	4.94	320.25	97.84	0.34
Tk middle	Reach-1	41367	100-year	1270.00	1652.32	1660.94		1661.31	0.002521	5.15	383.95	97.84	0.34
Tk middle	Reach-1	41367	500-year	1780.00	1652.32	1661.60		1662.15	0.003476	6.42	448.11	97.84	0.41
Tk middle	Reach-1	41242	10-year	654.00	1652.62	1656.67	1656.67	1658.10	0.023622	10.00	86.95	40.12	0.97
Tk middle	Reach-1	41242	25-year	879.00	1652.62	1657.34	1657.34	1659.03	0.022104	10.95	111.86	55.48	0.97
Tk middle	Reach-1	41242	50-year	1070.00	1652.62	1657.88	1657.88	1659.75	0.020889	11.59	134.04	67.88	0.96
Tk middle	Reach-1	41242	100-year	1270.00	1652.62	1658.60	1658.60	1660.48	0.017503	11.71	174.61	104.08	0.90
Tk middle	Reach-1	41242	500-year	1780.00	1652.62	1660.14	1660.14	1661.38	0.009879	10.45	459.04	213.58	0.71
Tk middle	Reach-1	41210	10-year	654.00	1652.11	1656.88	1654.91	1657.23	0.003765	4.75	137.63	60.71	0.40
Tk middle	Reach-1	41210	25-year	879.00	1652.11	1657.63	1655.43	1658.09	0.003999	5.45	161.40	68.80	0.43
Tk middle	Reach-1	41210	50-year	1070.00	1652.11	1658.23	1655.83	1658.77	0.004086	5.93	180.45	80.17	0.44
Tk middle	Reach-1	41210	100-year	1270.00	1652.11	1658.81	1656.24	1659.44	0.004151	6.38	199.04	93.69	0.45
Tk middle	Reach-1	41210	500-year	1780.00	1652.11	1660.13	1657.15	1660.98	0.004313	7.39	240.94	155.35	0.47
Tk middle	Reach-1	41170		Bridge									
Tk middle	Reach-1	41135	10-year	654.00	1651.65	1655.32	1655.11	1656.37	0.021579	8.22	79.53	62.42	0.89
Tk middle	Reach-1	41135	25-year	879.00	1651.65	1656.10	1655.67	1657.23	0.016268	8.50	103.37	95.94	0.81
Tk middle	Reach-1	41135	50-year	1070.00	1651.65	1656.74	1656.07	1657.92	0.013613	8.72	122.70	113.54	0.76
Tk middle	Reach-1	41135	100-year	1270.00	1651.65	1657.27	1656.49	1658.57	0.012710	9.15	138.81	120.44	0.75
Tk middle	Reach-1	41135	500-year	1780.00	1651.65	1658.02	1657.44	1659.91	0.015143	11.04	161.28	129.29	0.84
Tk Lower	Tk Lower	41106	10-year	722.20	1651.19	1655.19	1654.08	1655.80	0.007823	6.34	130.34	61.97	0.57
Tk Lower	Tk Lower	41106	25-year	972.80	1651.19	1656.01	1654.65	1656.73	0.007241	6.95	166.66	71.49	0.57
Tk Lower	Tk Lower	41106	50-year	1186.00	1651.19	1656.67	1655.11	1657.46	0.006751	7.33	197.73	78.19	0.56
Tk Lower	Tk Lower	41106	100-year	1410.00	1651.19	1657.21	1655.52	1658.12	0.006777	7.85	224.26	84.37	0.57
Tk Lower	Tk Lower	41106	500-year	1979.00	1651.19	1657.96	1656.57	1659.32	0.008770	9.67	261.95	93.28	0.67
Tk Lower	Tk Lower	41100	10-year	746.00	1648.76	1653.73	1653.65	1655.12	0.027200	9.44	78.99	52.27	0.96
Tk Lower	Tk Lower	41100	25-year	1000.00	1648.76	1654.35	1654.35	1656.05	0.028384	10.47	95.55	58.29	0.99
Tk Lower	Tk Lower	41100	50-year	1230.00	1648.76	1654.89	1654.89	1656.80	0.028154	11.09	110.92	62.06	1.00
Tk Lower	Tk Lower	41100	100-year	1450.00	1648.76	1655.39	1655.39	1657.45	0.027408	11.52	125.89	65.73	1.00
Tk Lower	Tk Lower	41100	500-year	2030.00	1648.76	1658.12	1656.53	1658.78	0.006157	7.33	488.10	257.06	0.51
Tk Lower	Tk Lower	41080	10-year	746.00	1649.40	1653.17	1653.17	1654.57	0.026924	9.53	81.08	31.38	0.99
Tk Lower	Tk Lower	41080	25-year	1000.00	1649.40	1653.80	1653.80	1655.46	0.024605	10.40	101.30	32.94	0.98
Tk Lower	Tk Lower	41080	50-year	1230.00	1649.40	1654.31	1654.31	1656.19	0.023384	11.11	118.36	34.20	0.98
Tk Lower	Tk Lower	41080	100-year	1450.00	1649.40	1654.75	1654.75	1656.84	0.022742	11.74	133.60	35.28	0.98
Tk Lower	Tk Lower	41080	500-year	2030.00	1649.40	1655.88	1655.88	1658.39	0.020377	12.93	175.07	38.08	0.97
Tk Lower	Tk Lower	40662	10-year	746.00	1642.25	1648.34		1648.59	0.002742	4.03	185.02	39.73	0.33
Tk Lower	Tk Lower	40662	25-year	1000.00	1642.25	1648.62		1649.02	0.004103	5.09	196.78	42.60	0.40
Tk Lower	Tk Lower	40662	50-year	1230.00	1642.25	1649.04		1649.56	0.004805	5.77	217.27	62.47	0.44
Tk Lower	Tk Lower	40662	100-year	1450.00	1642.25	1649.50		1650.10	0.005086	6.20	254.11	95.49	0.46
Tk Lower	Tk Lower	40662	500-year	2030.00	1642.25	1650.24		1651.06	0.006414	7.43	341.72	136.74	0.52
Tk Lower	Tk Lower	40428	10-year	746.00	1641.79	1645.53	1645.53	1646.96	0.029865	9.57	77.94	80.37	1.01
Tk Lower	Tk Lower	40428	25-year	1000.00	1641.79	1646.47	1646.47	1647.32	0.014991	8.06	200.15	138.13	0.75
Tk Lower	Tk Lower	40428	50-year	1230.00	1641.79	1646.81	1646.81	1647.70	0.014689	8.47	250.16	149.69	0.75
Tk Lower	Tk Lower	40428	100-year	1450.00	1641.79	1646.91	1646.91	1648.02	0.017928	9.52	266.04	158.70	0.83
Tk Lower	Tk Lower	40428	500-year	2030.00	1641.79	1647.55	1647.55	1648.72	0.017176	10.27	370.40	168.39	0.83
Tk Lower	Tk Lower	40382	10-year	746.00	1635.54	1642.78	1639.87	1643.10	0.003490	4.55	164.12	32.21	0.36
Tk Lower	Tk Lower	40382	25-year	1000.00	1635.54	1643.80	1640.50	1644.20	0.003576	5.06	197.73	34.17	0.37
Tk Lower	Tk Lower	40382	50-year	1230.00	1635.54	1644.63	1641.06	1645.09	0.003491	5.46	226.85	58.16	0.37
Tk Lower	Tk Lower	40382	100-year	1450.00	1635.54	1645.42	1641.54	1645.90	0.003206	5.63	305.27	109.64	0.36
Tk Lower	Tk Lower	40382	500-year	2030.00	1635.54	1647.01	1642.65	1647.48	0.002699	5.87	522.59	153.04	0.34
Tk Lower	Tk Lower	40336		Bridge									
Tk Lower	Tk Lower	40303	10-year	746.00	1635.51	1642.07	1639.18	1642.38	0.003397	4.52	165.15	32.37	0.35
Tk Lower	Tk Lower	40303	25-year	1000.00	1635.51	1642.89	1639.81	1643.31	0.003969	5.20	192.32	36.21	0.38
Tk Lower	Tk Lower	40303	50-year	1230.00	1635.51	1643.55	1640.34	1644.06	0.004176	5.72	215.18	90.53	0.40
Tk Lower	Tk Lower	40303	100-year	1450.00	1635.51	1644.19	1640.80	1644.72	0.003966	5.94	304.61	152.02	0.40
Tk Lower	Tk Lower	40303	500-year	2030.00	1635.51	1645.35	1641.92	1645.88	0.003625	6.30	516.28	184.56	0.39

HEC-RAS Plan: EXC TK +LB Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	40237	10-year	746.00	1635.93	1641.64	1639.82	1642.08	0.004901	5.34	143.11	100.18	0.45
Tk Lower	Tk Lower	40237	25-year	1000.00	1635.93	1642.39	1640.39	1642.96	0.005175	6.09	169.77	151.03	0.47
Tk Lower	Tk Lower	40237	50-year	1230.00	1635.93	1643.02	1640.86	1643.70	0.005325	6.66	192.40	172.16	0.49
Tk Lower	Tk Lower	40237	100-year	1450.00	1635.93	1643.54	1641.29	1644.33	0.005512	7.18	211.86	174.44	0.50
Tk Lower	Tk Lower	40237	500-year	2030.00	1635.93	1645.33	1642.29	1645.57	0.001834	4.89	792.49	186.31	0.30
Tk Lower	Tk Lower	40196	10-year	746.00	1633.78	1641.67	1637.82	1641.85	0.001396	3.45	233.46	152.65	0.24
Tk Lower	Tk Lower	40196	25-year	1000.00	1633.78	1642.44	1638.40	1642.69	0.001678	4.09	268.59	162.72	0.27
Tk Lower	Tk Lower	40196	50-year	1230.00	1633.78	1643.08	1638.82	1643.39	0.001879	4.59	298.32	171.07	0.29
Tk Lower	Tk Lower	40196	100-year	1450.00	1633.78	1643.62	1639.27	1644.00	0.002062	5.03	323.89	178.13	0.31
Tk Lower	Tk Lower	40196	500-year	2030.00	1633.78	1644.85	1640.37	1645.39	0.002492	6.07	383.59	186.22	0.35
Tk Lower	Tk Lower	40151	Bridge										
Tk Lower	Tk Lower	40111	10-year	746.00	1633.65	1637.79	1637.79	1638.97	0.030055	8.70	85.71	36.13	1.00
Tk Lower	Tk Lower	40111	25-year	1000.00	1633.65	1638.30	1638.30	1639.72	0.029296	9.56	104.61	58.07	1.01
Tk Lower	Tk Lower	40111	50-year	1230.00	1633.65	1638.79	1638.79	1640.34	0.026040	10.01	124.96	88.22	0.97
Tk Lower	Tk Lower	40111	100-year	1450.00	1633.65	1639.17	1639.17	1640.87	0.024695	10.50	142.78	100.27	0.97
Tk Lower	Tk Lower	40111	500-year	2030.00	1633.65	1640.07	1640.07	1642.15	0.022799	11.67	184.26	160.75	0.96
Tk Lower	Tk Lower	40047	10-year	746.00	1631.79	1636.30	1635.19	1636.82	0.009151	5.81	128.42	41.09	0.58
Tk Lower	Tk Lower	40047	25-year	1000.00	1631.79	1636.94	1635.74	1637.58	0.009457	6.43	155.43	43.73	0.60
Tk Lower	Tk Lower	40047	50-year	1230.00	1631.79	1637.42	1636.19	1638.16	0.009294	6.92	187.58	78.36	0.61
Tk Lower	Tk Lower	40047	100-year	1450.00	1631.79	1637.82	1636.59	1638.64	0.009160	7.32	223.00	99.17	0.61
Tk Lower	Tk Lower	40047	500-year	2030.00	1631.79	1638.82	1637.68	1639.72	0.008137	7.90	330.90	141.09	0.60
Tk Lower	Tk Lower	39767	10-year	746.00	1629.09	1633.91	1632.69	1634.40	0.008132	5.64	132.39	40.06	0.55
Tk Lower	Tk Lower	39767	25-year	1000.00	1629.09	1634.74	1633.24	1635.30	0.006935	6.02	169.51	58.90	0.52
Tk Lower	Tk Lower	39767	50-year	1230.00	1629.09	1635.30	1633.68	1635.93	0.006700	6.45	210.67	82.69	0.52
Tk Lower	Tk Lower	39767	100-year	1450.00	1629.09	1635.79	1634.06	1636.47	0.006401	6.74	251.65	83.20	0.52
Tk Lower	Tk Lower	39767	500-year	2030.00	1629.09	1636.21	1635.11	1637.28	0.009229	8.52	305.65	175.84	0.63
Tk Lower	Tk Lower	39518	10-year	746.00	1626.68	1631.19	1630.34	1631.89	0.012453	6.71	111.24	35.61	0.67
Tk Lower	Tk Lower	39518	25-year	1000.00	1626.68	1631.29	1630.96	1632.47	0.020477	8.71	114.81	36.02	0.86
Tk Lower	Tk Lower	39518	50-year	1230.00	1626.68	1631.67	1631.42	1633.09	0.021632	9.57	129.10	41.12	0.90
Tk Lower	Tk Lower	39518	100-year	1450.00	1626.68	1631.96	1631.88	1633.64	0.022904	10.39	141.92	46.10	0.94
Tk Lower	Tk Lower	39518	500-year	2030.00	1626.68	1633.56	1633.56	1634.73	0.011236	9.18	294.90	168.74	0.70
Tk Lower	Tk Lower	39267	10-year	746.00	1622.32	1625.96	1625.96	1627.29	0.029010	9.24	80.70	30.24	1.00
Tk Lower	Tk Lower	39267	25-year	1000.00	1622.32	1627.00	1627.00	1627.97	0.015569	8.21	145.70	82.08	0.76
Tk Lower	Tk Lower	39267	50-year	1230.00	1622.32	1627.33	1627.33	1628.39	0.015791	8.76	173.19	82.57	0.78
Tk Lower	Tk Lower	39267	100-year	1450.00	1622.32	1627.62	1627.62	1628.76	0.015823	9.20	197.52	87.79	0.79
Tk Lower	Tk Lower	39267	500-year	2030.00	1622.32	1628.50	1628.50	1629.45	0.011856	9.03	329.19	374.61	0.70
Tk Lower	Tk Lower	38971	10-year	746.00	1617.20	1622.16	1620.62	1622.30	0.002221	3.45	309.84	311.87	0.30
Tk Lower	Tk Lower	38971	25-year	1000.00	1617.20	1622.69	1621.23	1622.84	0.002149	3.67	388.93	324.40	0.30
Tk Lower	Tk Lower	38971	50-year	1230.00	1617.20	1623.06	1621.40	1623.23	0.002243	3.95	445.11	330.48	0.31
Tk Lower	Tk Lower	38971	100-year	1450.00	1617.20	1623.95	1621.77	1624.08	0.001435	3.52	585.30	352.40	0.26
Tk Lower	Tk Lower	38971	500-year	2030.00	1617.20	1624.60	1622.23	1624.78	0.001786	4.21	692.78	368.51	0.29
Tk Lower	Tk Lower	38901	10-year	746.00	1615.56	1621.65	1619.35	1622.02	0.004225	5.15	224.58	185.94	0.39
Tk Lower	Tk Lower	38901	25-year	1000.00	1615.56	1621.97	1620.36	1622.49	0.005776	6.25	273.33	229.87	0.46
Tk Lower	Tk Lower	38901	50-year	1230.00	1615.56	1621.95	1620.96	1622.76	0.008874	7.74	270.51	228.75	0.57
Tk Lower	Tk Lower	38901	100-year	1450.00	1615.56	1623.55	1621.46	1623.87	0.003217	5.50	551.60	365.12	0.36
Tk Lower	Tk Lower	38901	500-year	2030.00	1615.56	1624.05	1622.66	1624.50	0.004414	6.74	642.01	397.21	0.43
Tk Lower	Tk Lower	38846	Bridge										
Tk Lower	Tk Lower	38818	10-year	746.00	1615.10	1620.69	1618.62	1621.00	0.004324	4.85	294.24	280.62	0.38
Tk Lower	Tk Lower	38818	25-year	1000.00	1615.10	1621.42	1619.29	1621.67	0.003390	4.71	474.14	384.58	0.35
Tk Lower	Tk Lower	38818	50-year	1230.00	1615.10	1621.54	1620.66	1621.87	0.004555	5.53	505.42	404.37	0.40
Tk Lower	Tk Lower	38818	100-year	1450.00	1615.10	1621.95	1620.94	1622.27	0.004313	5.64	630.95	477.02	0.40
Tk Lower	Tk Lower	38818	500-year	2030.00	1615.10	1622.52	1621.46	1622.88	0.004828	6.32	809.94	493.55	0.43
Tk Lower	Tk Lower	38749	10-year	746.00	1614.05	1620.49	1617.84	1620.74	0.002607	4.15	216.77	196.93	0.33
Tk Lower	Tk Lower	38749	25-year	1000.00	1614.05	1621.26	1618.51	1621.47	0.002125	4.14	371.30	326.10	0.31
Tk Lower	Tk Lower	38749	50-year	1230.00	1614.05	1621.29	1619.01	1621.60	0.003111	5.02	378.68	330.43	0.37
Tk Lower	Tk Lower	38749	100-year	1450.00	1614.05	1621.75	1619.81	1622.02	0.002637	4.88	509.79	411.30	0.35
Tk Lower	Tk Lower	38749	500-year	2030.00	1614.05	1622.30	1621.19	1622.59	0.002879	5.40	704.50	468.58	0.37
Tk Lower	Tk Lower	38683	Bridge										
Tk Lower	Tk Lower	38674	10-year	746.00	1613.24	1617.51	1616.44	1618.01	0.009064	5.68	131.38	42.84	0.57
Tk Lower	Tk Lower	38674	25-year	1000.00	1613.24	1618.30	1616.97	1618.86	0.008081	6.02	167.26	315.65	0.55
Tk Lower	Tk Lower	38674	50-year	1230.00	1613.24	1618.99	1617.37	1619.53	0.006587	6.02	263.37	476.37	0.51
Tk Lower	Tk Lower	38674	100-year	1450.00	1613.24	1619.69	1617.75	1620.09	0.004467	5.43	431.67	531.58	0.42
Tk Lower	Tk Lower	38674	500-year	2030.00	1613.24	1620.54	1619.35	1620.90	0.003941	5.58	657.97	585.99	0.40
Tk Lower	Tk Lower	38580	10-year	746.00	1610.59	1614.94	1614.94	1616.35	0.028204	9.52	78.57	28.42	0.99
Tk Lower	Tk Lower	38580	25-year	1000.00	1610.59	1615.57	1615.57	1617.26	0.026204	10.46	96.72	29.94	0.99

HEC-RAS Plan: EXC TK +LB Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	38580	50-year	1230.00	1610.59	1616.06	1616.06	1618.02	0.025318	11.24	111.90	83.97	0.99
Tk Lower	Tk Lower	38580	100-year	1450.00	1610.59	1616.44	1616.44	1618.69	0.025889	12.08	125.00	111.03	1.02
Tk Lower	Tk Lower	38580	500-year	2030.00	1610.59	1618.25	1618.25	1619.90	0.013068	10.82	285.15	519.16	0.77
Tk Lower	Tk Lower	38201	10-year	746.00	1603.60	1608.83	1607.14	1609.28	0.006349	5.42	137.78	35.40	0.48
Tk Lower	Tk Lower	38201	25-year	1000.00	1603.60	1609.50	1607.74	1610.09	0.006861	6.17	163.50	47.96	0.51
Tk Lower	Tk Lower	38201	50-year	1230.00	1603.60	1609.92	1608.23	1610.65	0.007668	6.92	189.85	85.99	0.55
Tk Lower	Tk Lower	38201	100-year	1450.00	1603.60	1610.25	1608.66	1611.12	0.008350	7.54	222.59	117.21	0.58
Tk Lower	Tk Lower	38201	500-year	2030.00	1603.60	1611.16	1609.79	1612.20	0.008591	8.51	336.03	198.52	0.61
Tk Lower	Tk Lower	37955	10-year	746.00	1599.53	1606.39	1604.71	1607.29	0.010116	7.80	110.06	64.56	0.56
Tk Lower	Tk Lower	37955	25-year	1000.00	1599.53	1607.11	1605.70	1608.04	0.010010	8.37	200.89	113.48	0.57
Tk Lower	Tk Lower	37955	50-year	1230.00	1599.53	1607.80	1606.44	1608.64	0.008705	8.34	291.09	138.71	0.54
Tk Lower	Tk Lower	37955	100-year	1450.00	1599.53	1608.44	1606.68	1609.15	0.007360	8.10	379.66	161.01	0.51
Tk Lower	Tk Lower	37955	500-year	2030.00	1599.53	1609.70	1608.48	1610.31	0.006072	8.12	559.09	194.92	0.47
Tk Lower	Tk Lower	37897	10-year	746.00	1599.41	1606.29	1603.23	1606.68	0.004113	5.04	153.59	55.29	0.37
Tk Lower	Tk Lower	37897	25-year	1000.00	1599.41	1606.93	1603.95	1607.44	0.004813	5.84	209.15	70.04	0.40
Tk Lower	Tk Lower	37897	50-year	1230.00	1599.41	1607.56	1604.54	1608.13	0.004990	6.32	262.84	100.04	0.42
Tk Lower	Tk Lower	37897	100-year	1450.00	1599.41	1608.16	1605.06	1608.75	0.004776	6.53	348.01	164.03	0.42
Tk Lower	Tk Lower	37897	500-year	2030.00	1599.41	1609.43	1606.77	1609.99	0.004253	6.82	566.07	181.82	0.40
Tk Lower	Tk Lower	37826		Bridge									
Tk Lower	Tk Lower	37806	10-year	746.00	1598.88	1604.31	1602.75	1604.75	0.005852	5.29	142.38	37.94	0.47
Tk Lower	Tk Lower	37806	25-year	1000.00	1598.88	1605.41	1603.27	1605.88	0.004632	5.51	194.33	67.42	0.43
Tk Lower	Tk Lower	37806	50-year	1230.00	1598.88	1606.36	1603.71	1606.81	0.003650	5.49	289.76	179.30	0.40
Tk Lower	Tk Lower	37806	100-year	1450.00	1598.88	1607.27	1604.11	1607.66	0.002762	5.26	423.43	219.50	0.35
Tk Lower	Tk Lower	37806	500-year	2030.00	1598.88	1609.58	1605.12	1609.77	0.001186	4.18	1040.23	256.53	0.24
Tk Lower	Tk Lower	37747	10-year	746.00	1597.86	1601.92	1601.92	1603.67	0.033668	10.60	70.38	20.08	1.00
Tk Lower	Tk Lower	37747	25-year	1000.00	1597.86	1602.68	1602.68	1604.80	0.034003	11.67	85.68	20.29	1.00
Tk Lower	Tk Lower	37747	50-year	1230.00	1597.86	1603.31	1603.31	1605.73	0.033726	12.49	98.49	34.46	1.00
Tk Lower	Tk Lower	37747	100-year	1450.00	1597.86	1603.89	1603.89	1606.58	0.033093	13.16	110.35	94.35	1.00
Tk Lower	Tk Lower	37747	500-year	2030.00	1597.86	1605.23	1605.23	1608.61	0.032945	14.75	138.32	232.77	1.00
Tk Lower	Tk Lower	37601	10-year	746.00	1595.08	1600.65	1598.35	1600.69	0.000655	2.12	696.70	438.68	0.17
Tk Lower	Tk Lower	37601	25-year	1000.00	1595.08	1601.12	1599.14	1601.17	0.000708	2.34	852.26	472.69	0.18
Tk Lower	Tk Lower	37601	50-year	1230.00	1595.08	1601.51	1599.38	1601.55	0.000723	2.47	984.96	482.99	0.18
Tk Lower	Tk Lower	37601	100-year	1450.00	1595.08	1601.71	1599.54	1601.77	0.000833	2.71	1059.15	502.09	0.19
Tk Lower	Tk Lower	37601	500-year	2030.00	1595.08	1601.99	1599.90	1602.04	0.000826	2.78	1476.51	517.76	0.19
Tk Lower	Tk Lower	37546	10-year	746.00	1595.00	1600.51	1598.08	1600.62	0.001509	3.12	375.27	286.55	0.24
Tk Lower	Tk Lower	37546	25-year	1000.00	1595.00	1600.96	1598.82	1601.09	0.001694	3.49	456.01	321.37	0.26
Tk Lower	Tk Lower	37546	50-year	1230.00	1595.00	1601.33	1599.44	1601.47	0.001816	3.77	522.54	335.32	0.27
Tk Lower	Tk Lower	37546	100-year	1450.00	1595.00	1601.50	1599.85	1601.67	0.002168	4.20	553.86	341.83	0.29
Tk Lower	Tk Lower	37546	500-year	2030.00	1595.00	1601.81	1600.30	1601.94	0.002021	4.18	896.50	403.02	0.29
Tk Lower	Tk Lower	37465		Bridge									
Tk Lower	Tk Lower	37428	10-year	746.00	1595.00	1597.63	1597.63	1598.64	0.030944	8.07	92.47	69.17	1.00
Tk Lower	Tk Lower	37428	25-year	1000.00	1595.00	1598.12	1598.12	1599.28	0.029115	8.65	115.64	197.15	0.99
Tk Lower	Tk Lower	37428	50-year	1230.00	1595.00	1598.50	1598.50	1599.79	0.028567	9.14	134.51	278.85	1.00
Tk Lower	Tk Lower	37428	100-year	1450.00	1595.00	1599.24	1598.83	1599.44	0.005500	4.51	521.02	431.02	0.45
Tk Lower	Tk Lower	37428	500-year	2030.00	1595.00	1600.03	1599.12	1600.15	0.002775	3.69	923.23	578.32	0.33
Tk Lower	Tk Lower	37389	10-year	746.00	1591.39	1597.52	1596.01	1597.87	0.005769	4.86	191.95	236.90	0.50
Tk Lower	Tk Lower	37389	25-year	1000.00	1591.39	1598.04	1596.69	1598.43	0.006017	5.20	272.33	368.34	0.50
Tk Lower	Tk Lower	37389	50-year	1230.00	1591.39	1598.46	1597.42	1598.85	0.005861	5.40	352.94	452.73	0.49
Tk Lower	Tk Lower	37389	100-year	1450.00	1591.39	1598.69	1597.76	1599.13	0.006397	5.81	404.05	513.15	0.51
Tk Lower	Tk Lower	37389	500-year	2030.00	1591.39	1599.40	1598.45	1599.88	0.006321	6.31	564.89	615.63	0.51
Liddle Brook	Reach-1	8289	10-year	176.00	1801.12	1806.60		1806.61	0.000042	0.57	387.63	120.08	0.04
Liddle Brook	Reach-1	8289	25-year	238.00	1801.12	1806.74		1806.75	0.000069	0.74	404.28	122.36	0.06
Liddle Brook	Reach-1	8289	50-year	291.00	1801.12	1806.84		1806.85	0.000095	0.89	416.60	127.57	0.07
Liddle Brook	Reach-1	8289	100-year	346.00	1801.12	1806.94		1806.95	0.000124	1.02	429.58	128.77	0.08
Liddle Brook	Reach-1	8289	500-year	485.00	1801.12	1807.17		1807.19	0.000204	1.35	459.58	131.00	0.10
Liddle Brook	Reach-1	8014	10-year	176.00	1795.84	1806.60	1797.88	1806.60	0.000010	0.39	876.96	171.62	0.02
Liddle Brook	Reach-1	8014	25-year	238.00	1795.84	1806.74	1798.22	1806.74	0.000017	0.51	900.18	172.70	0.03
Liddle Brook	Reach-1	8014	50-year	291.00	1795.84	1806.83	1798.47	1806.84	0.000024	0.62	916.74	173.43	0.04
Liddle Brook	Reach-1	8014	100-year	346.00	1795.84	1806.93	1798.71	1806.94	0.000033	0.72	933.76	174.15	0.04
Liddle Brook	Reach-1	8014	500-year	485.00	1795.84	1807.15	1799.40	1807.16	0.000058	0.98	972.44	175.67	0.06
Liddle Brook	Reach-1	7961		Inl Struct									
Liddle Brook	Reach-1	7913	10-year	176.00	1794.19	1796.09	1796.09	1796.91	0.030629	7.27	25.91	18.13	0.98
Liddle Brook	Reach-1	7913	25-year	238.00	1794.19	1796.46	1796.46	1797.44	0.028749	8.02	32.84	19.77	0.98
Liddle Brook	Reach-1	7913	50-year	291.00	1794.19	1796.74	1796.74	1797.86	0.027624	8.57	38.64	21.17	0.99
Liddle Brook	Reach-1	7913	100-year	346.00	1794.19	1797.05	1797.05	1798.26	0.025734	8.97	45.41	23.70	0.97
Liddle Brook	Reach-1	7913	500-year	485.00	1794.19	1797.72	1797.72	1799.14	0.022790	9.81	63.20	28.92	0.95

HEC-RAS Plan: EXC TK +LB Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Liddle Brook	Reach-1	7853	10-year	176.00	1793.28	1795.57		1795.80	0.011592	4.51	65.51	44.60	0.61
Liddle Brook	Reach-1	7853	25-year	238.00	1793.28	1795.87		1796.19	0.012982	5.33	80.53	51.75	0.66
Liddle Brook	Reach-1	7853	50-year	291.00	1793.28	1796.07		1796.46	0.013700	5.84	91.41	53.90	0.69
Liddle Brook	Reach-1	7853	100-year	346.00	1793.28	1796.27		1796.72	0.014194	6.30	102.23	55.41	0.72
Liddle Brook	Reach-1	7853	500-year	485.00	1793.28	1796.71		1797.29	0.015154	7.27	127.09	58.13	0.76
Liddle Brook	Reach-1	7783	10-year	176.00	1792.15	1793.98	1793.98	1794.49	0.032514	5.80	35.17	42.87	0.96
Liddle Brook	Reach-1	7783	25-year	238.00	1792.15	1794.21	1794.21	1794.82	0.031550	6.44	44.91	44.60	0.97
Liddle Brook	Reach-1	7783	50-year	291.00	1792.15	1794.40	1794.40	1795.08	0.029646	6.81	53.64	47.02	0.96
Liddle Brook	Reach-1	7783	100-year	346.00	1792.15	1794.57	1794.57	1795.32	0.028571	7.18	62.05	48.54	0.96
Liddle Brook	Reach-1	7783	500-year	485.00	1792.15	1794.98	1794.98	1795.88	0.026546	7.97	82.69	53.25	0.96
Liddle Brook	Reach-1	7284	10-year	176.00	1780.76	1782.68		1782.92	0.013408	4.82	83.61	89.50	0.66
Liddle Brook	Reach-1	7284	25-year	238.00	1780.76	1782.86	1782.63	1783.18	0.015969	5.64	100.72	97.28	0.73
Liddle Brook	Reach-1	7284	50-year	291.00	1780.76	1783.05		1783.39	0.015375	5.90	119.31	98.00	0.73
Liddle Brook	Reach-1	7284	100-year	346.00	1780.76	1783.22		1783.58	0.015364	6.22	135.76	98.67	0.74
Liddle Brook	Reach-1	7284	500-year	485.00	1780.76	1783.61	1783.27	1784.02	0.014875	6.83	175.13	100.12	0.75
Liddle Brook	Reach-1	6828	10-year	176.00	1770.93	1773.05	1773.05	1773.49	0.032415	6.41	58.84	69.08	0.97
Liddle Brook	Reach-1	6828	25-year	238.00	1770.93	1773.38	1773.22	1773.80	0.025063	6.51	82.25	76.21	0.89
Liddle Brook	Reach-1	6828	50-year	291.00	1770.93	1773.53	1773.44	1774.02	0.026244	7.06	94.16	78.71	0.92
Liddle Brook	Reach-1	6828	100-year	346.00	1770.93	1773.69	1773.59	1774.22	0.026242	7.47	106.93	80.26	0.93
Liddle Brook	Reach-1	6828	500-year	485.00	1770.93	1774.06	1773.82	1774.71	0.026948	8.47	137.36	88.40	0.97
Liddle Brook	Reach-1	6286	10-year	176.00	1757.34	1758.82	1758.65	1759.05	0.021462	5.16	86.10	108.99	0.80
Liddle Brook	Reach-1	6286	25-year	238.00	1757.34	1758.93	1758.80	1759.27	0.028683	6.30	98.97	119.29	0.94
Liddle Brook	Reach-1	6286	50-year	291.00	1757.34	1759.10	1758.90	1759.46	0.027393	6.64	120.46	133.40	0.93
Liddle Brook	Reach-1	6286	100-year	346.00	1757.34	1759.22	1759.17	1759.61	0.027585	7.01	137.04	135.12	0.95
Liddle Brook	Reach-1	6286	500-year	485.00	1757.34	1759.51	1759.39	1759.95	0.027272	7.73	176.71	144.37	0.97
Liddle Brook	Reach-1	5827	10-year	219.00	1747.64	1749.08	1748.69	1749.28	0.021117	4.89	95.52	97.02	0.78
Liddle Brook	Reach-1	5827	25-year	296.00	1747.64	1749.42	1748.90	1749.63	0.016723	5.13	127.36	125.48	0.73
Liddle Brook	Reach-1	5827	50-year	363.00	1747.64	1749.62	1749.04	1749.88	0.017086	5.62	148.61	141.06	0.75
Liddle Brook	Reach-1	5827	100-year	432.00	1747.64	1749.77	1749.11	1750.04	0.016982	5.91	182.60	145.91	0.76
Liddle Brook	Reach-1	5827	500-year	605.00	1747.64	1750.12	1749.55	1750.43	0.016941	6.61	233.44	148.00	0.78
Liddle Brook	Reach-1	5342	10-year	219.00	1735.14	1737.64	1737.47	1738.18	0.024666	5.90	37.11	25.48	0.86
Liddle Brook	Reach-1	5342	25-year	296.00	1735.14	1737.80	1737.80	1738.61	0.032274	7.19	41.22	26.28	1.00
Liddle Brook	Reach-1	5342	50-year	363.00	1735.14	1738.04	1738.04	1738.96	0.030605	7.68	47.61	27.46	1.00
Liddle Brook	Reach-1	5342	100-year	432.00	1735.14	1738.26	1738.26	1739.29	0.029584	8.14	53.86	28.58	1.00
Liddle Brook	Reach-1	5342	500-year	605.00	1735.14	1738.78	1738.78	1740.06	0.027248	9.08	69.40	31.17	0.99
Liddle Brook	Reach-1	4944	10-year	219.00	1723.63	1725.85	1725.85	1726.44	0.035915	6.17	35.50	30.41	1.01
Liddle Brook	Reach-1	4944	25-year	296.00	1723.63	1726.76		1727.06	0.009295	4.41	76.58	61.05	0.56
Liddle Brook	Reach-1	4944	50-year	363.00	1723.63	1727.60		1727.79	0.003860	3.60	132.63	72.77	0.38
Liddle Brook	Reach-1	4944	100-year	432.00	1723.63	1728.57		1728.70	0.001808	3.01	209.37	84.27	0.27
Liddle Brook	Reach-1	4944	500-year	605.00	1723.63	1729.39		1729.53	0.001703	3.34	281.12	91.14	0.28
Liddle Brook	Reach-1	4874	10-year	219.00	1720.69	1725.46	1723.03	1725.61	0.002298	3.14	69.73	42.86	0.29
Liddle Brook	Reach-1	4874	25-year	296.00	1720.69	1726.63	1723.47	1726.79	0.001645	3.20	92.37	71.40	0.26
Liddle Brook	Reach-1	4874	50-year	363.00	1720.69	1727.45	1723.79	1727.62	0.001458	3.35	108.23	102.24	0.25
Liddle Brook	Reach-1	4874	100-year	432.00	1720.69	1728.41	1724.12	1728.59	0.001220	3.41	126.75	151.74	0.23
Liddle Brook	Reach-1	4874	500-year	605.00	1720.69	1729.11	1724.98	1729.40	0.001701	4.31	140.40	175.50	0.28
Liddle Brook	Reach-1	4832		Bridge									
Liddle Brook	Reach-1	4789	10-year	219.00	1720.73	1723.75	1722.51	1723.99	0.044527	3.94	55.54	26.66	0.42
Liddle Brook	Reach-1	4789	25-year	296.00	1720.73	1724.36	1722.86	1724.65	0.042392	4.38	67.53	29.05	0.42
Liddle Brook	Reach-1	4789	50-year	363.00	1720.73	1724.93	1723.13	1725.26	0.037792	4.59	79.01	63.56	0.41
Liddle Brook	Reach-1	4789	100-year	432.00	1720.73	1725.46	1723.42	1725.82	0.035432	4.83	89.41	80.65	0.40
Liddle Brook	Reach-1	4789	500-year	605.00	1720.73	1726.22	1724.01	1726.74	0.041277	5.79	104.54	152.46	0.44
Liddle Brook	Reach-1	4695	10-year	219.00	1719.61	1721.60	1721.18	1721.95	0.012566	4.73	49.22	56.01	0.64
Liddle Brook	Reach-1	4695	25-year	296.00	1719.61	1721.80	1721.47	1722.30	0.015817	5.71	55.96	89.36	0.73
Liddle Brook	Reach-1	4695	50-year	363.00	1719.61	1721.88	1721.69	1722.57	0.020841	6.73	58.57	92.59	0.84
Liddle Brook	Reach-1	4695	100-year	432.00	1719.61	1721.97	1721.91	1722.86	0.025337	7.64	61.75	96.43	0.93
Liddle Brook	Reach-1	4695	500-year	605.00	1719.61	1722.44	1722.44	1723.58	0.024995	8.68	79.80	136.43	0.96
Liddle Brook	Reach-1	4347	10-year	219.00	1712.55	1713.41	1713.31	1713.58	0.062028	5.01	97.71	173.08	1.18
Liddle Brook	Reach-1	4347	25-year	296.00	1712.55	1713.62	1713.40	1713.79	0.041353	5.05	134.90	190.63	1.02
Liddle Brook	Reach-1	4347	50-year	363.00	1712.55	1713.85	1713.50	1714.01	0.028250	4.96	181.62	212.56	0.88
Liddle Brook	Reach-1	4347	100-year	432.00	1712.55	1714.00	1713.60	1714.16	0.023441	4.97	214.70	213.21	0.82
Liddle Brook	Reach-1	4347	500-year	605.00	1712.55	1714.32		1714.50	0.018780	5.25	283.71	214.59	0.76
Liddle Brook	Reach-1	3858	10-year	219.00	1700.53	1702.77	1702.21	1703.06	0.010777	5.01	81.40	81.85	0.61
Liddle Brook	Reach-1	3858	25-year	296.00	1700.53	1702.96	1702.50	1703.33	0.012993	5.83	110.92	90.40	0.68
Liddle Brook	Reach-1	3858	50-year	363.00	1700.53	1703.06	1702.71	1703.56	0.016613	6.79	120.40	95.22	0.78
Liddle Brook	Reach-1	3858	100-year	432.00	1700.53	1703.19	1703.02	1703.78	0.019137	7.54	132.08	99.99	0.84
Liddle Brook	Reach-1	3858	500-year	605.00	1700.53	1703.48	1703.47	1704.27	0.023091	8.92	162.60	106.38	0.94

HEC-RAS Plan: EXC TK +LB Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Liddle Brook	Reach-1	3701	10-year	219.00	1696.64	1702.89		1702.91	0.000143	1.13	329.00	96.05	0.08
Liddle Brook	Reach-1	3701	25-year	296.00	1696.64	1703.09		1703.11	0.000233	1.48	349.74	113.52	0.11
Liddle Brook	Reach-1	3701	50-year	363.00	1696.64	1703.22		1703.26	0.000322	1.76	366.30	120.35	0.13
Liddle Brook	Reach-1	3701	100-year	432.00	1696.64	1703.37		1703.42	0.000417	2.04	383.42	124.88	0.14
Liddle Brook	Reach-1	3701	500-year	605.00	1696.64	1703.65		1703.74	0.000684	2.69	421.43	142.16	0.19
Liddle Brook	Reach-1	3671	10-year	219.00	1694.86	1702.89	1697.04	1702.90	0.000108	1.17	396.51	102.20	0.08
Liddle Brook	Reach-1	3671	25-year	296.00	1694.86	1703.08	1697.40	1703.11	0.000177	1.53	416.68	108.66	0.10
Liddle Brook	Reach-1	3671	50-year	363.00	1694.86	1703.22	1697.67	1703.26	0.000251	1.84	431.93	112.85	0.12
Liddle Brook	Reach-1	3671	100-year	432.00	1694.86	1703.35	1697.91	1703.41	0.000331	2.14	447.61	114.63	0.13
Liddle Brook	Reach-1	3671	500-year	605.00	1694.86	1703.63	1698.48	1703.72	0.000565	2.86	480.57	130.18	0.18
Liddle Brook	Reach-1	3644		Inl Struct									
Liddle Brook	Reach-1	3625	10-year	219.00	1694.29	1697.10	1696.91	1697.87	0.035807	7.06	31.03	15.40	0.87
Liddle Brook	Reach-1	3625	25-year	296.00	1694.29	1697.38	1697.32	1698.47	0.042590	8.39	35.36	15.57	0.97
Liddle Brook	Reach-1	3625	50-year	363.00	1694.29	1697.66	1697.66	1698.96	0.043282	9.15	39.88	15.75	1.00
Liddle Brook	Reach-1	3625	100-year	432.00	1694.29	1697.97	1697.97	1699.44	0.042269	9.74	44.74	15.99	1.01
Liddle Brook	Reach-1	3625	500-year	605.00	1694.29	1698.73	1698.73	1700.54	0.037974	10.78	57.41	17.18	0.99
Liddle Brook	Reach-1	3602	10-year	219.00	1694.02	1696.85		1697.26	0.014455	5.69	65.19	47.82	0.69
Liddle Brook	Reach-1	3602	25-year	296.00	1694.02	1696.85	1696.85	1697.60	0.026621	7.71	64.98	47.79	0.94
Liddle Brook	Reach-1	3602	50-year	363.00	1694.02	1697.08	1697.08	1697.93	0.026619	8.27	76.38	49.57	0.95
Liddle Brook	Reach-1	3602	100-year	432.00	1694.02	1697.30	1697.30	1698.24	0.026655	8.79	87.48	51.24	0.97
Liddle Brook	Reach-1	3602	500-year	605.00	1694.02	1697.80	1697.80	1698.92	0.026089	9.80	114.66	59.95	0.99
Liddle Brook	Reach-1	3364	10-year	219.00	1688.97	1690.87	1690.87	1691.55	0.046798	7.71	46.72	150.92	1.17
Liddle Brook	Reach-1	3364	25-year	296.00	1688.97	1690.98	1690.98	1691.03	0.007384	3.23	225.38	151.42	0.47
Liddle Brook	Reach-1	3364	50-year	363.00	1688.97	1690.99	1690.99	1691.07	0.010922	3.95	226.50	151.44	0.57
Liddle Brook	Reach-1	3364	100-year	432.00	1688.97	1690.99	1690.99	1691.10	0.015469	4.70	226.50	151.44	0.68
Liddle Brook	Reach-1	3364	500-year	605.00	1688.97	1691.17	1690.99	1691.35	0.020546	5.86	254.79	151.91	0.80
Liddle Brook	Reach-1	3286	10-year	288.00	1685.52	1688.47	1688.47	1688.91	0.019498	6.35	82.71	89.05	0.73
Liddle Brook	Reach-1	3286	25-year	388.00	1685.52	1688.77		1689.19	0.017859	6.58	109.69	91.68	0.72
Liddle Brook	Reach-1	3286	50-year	476.00	1685.52	1689.08		1689.45	0.014626	6.41	138.21	93.57	0.66
Liddle Brook	Reach-1	3286	100-year	565.00	1685.52	1689.39		1689.72	0.012122	6.24	167.28	94.80	0.61
Liddle Brook	Reach-1	3286	500-year	792.00	1685.52	1690.18		1690.45	0.008020	5.88	243.78	98.05	0.52
Liddle Brook	Reach-1	3200	10-year	288.00	1683.15	1686.55	1686.36	1687.18	0.017752	6.82	56.11	34.29	0.72
Liddle Brook	Reach-1	3200	25-year	388.00	1683.15	1687.07		1687.73	0.015687	7.18	74.25	35.63	0.70
Liddle Brook	Reach-1	3200	50-year	476.00	1683.15	1687.50		1688.18	0.014146	7.40	89.88	36.78	0.68
Liddle Brook	Reach-1	3200	100-year	565.00	1683.15	1687.90		1688.60	0.013117	7.63	104.77	37.84	0.66
Liddle Brook	Reach-1	3200	500-year	792.00	1683.15	1688.84		1689.59	0.011252	8.10	141.57	40.58	0.63
Liddle Brook	Reach-1	3100	10-year	288.00	1680.40	1683.51	1683.51	1684.74	0.033894	8.90	32.75	14.33	1.00
Liddle Brook	Reach-1	3100	25-year	388.00	1680.40	1684.08	1684.08	1685.53	0.030639	9.70	41.29	15.98	0.98
Liddle Brook	Reach-1	3100	50-year	476.00	1680.40	1684.54	1684.54	1686.15	0.028449	10.27	48.97	17.52	0.97
Liddle Brook	Reach-1	3100	100-year	565.00	1680.40	1685.00	1685.00	1686.72	0.025968	10.65	57.62	19.76	0.94
Liddle Brook	Reach-1	3100	500-year	792.00	1680.40	1686.03	1686.03	1687.96	0.022053	11.45	80.51	24.56	0.90
Liddle Brook	Reach-1	2900	10-year	288.00	1674.90	1678.09	1678.07	1679.24	0.033097	8.63	34.88	16.66	0.96
Liddle Brook	Reach-1	2900	25-year	388.00	1674.90	1678.63	1678.63	1679.98	0.030601	9.44	44.33	18.43	0.95
Liddle Brook	Reach-1	2900	50-year	476.00	1674.90	1679.05	1679.05	1680.56	0.029243	10.05	52.36	19.91	0.95
Liddle Brook	Reach-1	2900	100-year	565.00	1674.90	1679.46	1679.46	1681.09	0.027722	10.54	60.80	21.65	0.94
Liddle Brook	Reach-1	2900	500-year	792.00	1674.90	1680.41	1680.41	1682.26	0.024353	11.42	83.40	26.01	0.92
Liddle Brook	Reach-1	2800	10-year	288.00	1671.78	1675.02	1674.91	1676.11	0.029264	8.41	35.28	16.14	0.92
Liddle Brook	Reach-1	2800	25-year	388.00	1671.78	1675.48	1675.48	1676.87	0.030199	9.52	43.17	17.95	0.96
Liddle Brook	Reach-1	2800	50-year	476.00	1671.78	1675.93	1675.93	1677.46	0.028074	10.05	51.62	19.67	0.94
Liddle Brook	Reach-1	2800	100-year	565.00	1671.78	1676.37	1676.37	1677.99	0.026071	10.46	60.49	21.32	0.93
Liddle Brook	Reach-1	2800	500-year	792.00	1671.78	1677.24	1677.24	1679.18	0.024464	11.58	80.71	24.72	0.93
Liddle Brook	Reach-1	2700	10-year	288.00	1668.90	1672.04	1671.95	1672.96	0.032988	7.72	37.33	18.32	0.95
Liddle Brook	Reach-1	2700	25-year	388.00	1668.90	1672.45	1672.41	1673.61	0.032532	8.65	45.15	19.58	0.97
Liddle Brook	Reach-1	2700	50-year	476.00	1668.90	1672.80	1672.76	1674.13	0.031400	9.28	52.13	20.64	0.98
Liddle Brook	Reach-1	2700	100-year	565.00	1668.90	1673.13	1673.13	1674.62	0.030281	9.81	59.15	21.65	0.98
Liddle Brook	Reach-1	2700	500-year	792.00	1668.90	1673.93	1673.93	1675.72	0.027284	10.83	77.42	24.09	0.96
Liddle Brook	Reach-1	2600	10-year	288.00	1666.64	1669.62	1669.25	1670.25	0.021305	6.38	45.15	21.55	0.78
Liddle Brook	Reach-1	2600	25-year	388.00	1666.64	1670.01	1669.68	1670.82	0.022532	7.21	53.84	22.73	0.82
Liddle Brook	Reach-1	2600	50-year	476.00	1666.64	1670.26	1670.02	1671.26	0.024639	8.04	59.46	23.46	0.87
Liddle Brook	Reach-1	2600	100-year	565.00	1666.64	1670.49	1670.31	1671.68	0.026063	8.75	65.12	24.18	0.91
Liddle Brook	Reach-1	2600	500-year	792.00	1666.64	1671.05	1671.03	1672.68	0.028432	10.27	78.94	25.84	0.97
Liddle Brook	Reach-1	2499	10-year	288.00	1663.86	1666.49	1666.49	1667.43	0.037265	7.81	36.89	19.71	1.01
Liddle Brook	Reach-1	2499	25-year	388.00	1663.86	1666.96	1666.96	1668.04	0.033922	8.36	46.80	25.06	0.98
Liddle Brook	Reach-1	2499	50-year	476.00	1663.86	1667.33	1667.33	1668.49	0.030306	8.71	56.89	27.94	0.95
Liddle Brook	Reach-1	2499	100-year	565.00	1663.86	1667.63	1667.63	1668.91	0.028861	9.15	65.53	28.84	0.95
Liddle Brook	Reach-1	2499	500-year	792.00	1663.86	1668.30	1668.30	1669.84	0.027120	10.17	85.36	30.81	0.95
Liddle Brook	Reach-1	2400	10-year	288.00	1660.69	1663.97		1664.45	0.014192	5.53	52.10	22.67	0.64

HEC-RAS Plan: EXC TK +LB Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Liddle Brook	Reach-1	2400	25-year	388.00	1660.69	1664.51		1665.07	0.012949	6.02	64.74	24.31	0.63
Liddle Brook	Reach-1	2400	50-year	476.00	1660.69	1664.94		1665.57	0.012045	6.38	75.50	25.62	0.63
Liddle Brook	Reach-1	2400	100-year	565.00	1660.69	1665.36		1666.05	0.011252	6.69	86.44	26.89	0.62
Liddle Brook	Reach-1	2400	500-year	792.00	1660.69	1666.24		1667.10	0.010531	7.48	111.31	29.57	0.62
Liddle Brook	Reach-1	2300	10-year	288.00	1658.38	1661.77	1661.46	1662.58	0.024672	7.24	39.81	17.28	0.84
Liddle Brook	Reach-1	2300	25-year	388.00	1658.38	1662.20	1661.98	1663.24	0.026412	8.15	47.68	18.52	0.89
Liddle Brook	Reach-1	2300	50-year	476.00	1658.38	1662.48	1662.36	1663.75	0.028329	9.03	52.97	19.28	0.93
Liddle Brook	Reach-1	2300	100-year	565.00	1658.38	1662.74	1662.69	1664.24	0.029937	9.82	58.06	19.98	0.97
Liddle Brook	Reach-1	2300	500-year	792.00	1658.38	1663.53	1663.53	1665.38	0.027814	10.97	74.51	22.09	0.97
Liddle Brook	Reach-1	2205	10-year	288.00	1655.77	1658.75	1658.75	1659.76	0.035967	8.05	35.76	18.19	1.01
Liddle Brook	Reach-1	2205	25-year	388.00	1655.77	1659.21	1659.21	1660.41	0.033449	8.79	44.33	19.38	1.00
Liddle Brook	Reach-1	2205	50-year	476.00	1655.77	1659.58	1659.58	1660.93	0.031122	9.33	51.62	20.21	0.99
Liddle Brook	Reach-1	2205	100-year	565.00	1655.77	1659.92	1659.92	1661.41	0.029606	9.83	58.63	20.98	0.98
Liddle Brook	Reach-1	2205	500-year	792.00	1655.77	1660.71	1660.71	1662.53	0.026823	10.89	75.92	22.75	0.97
Liddle Brook	Reach-1	2100	10-year	288.00	1652.46	1655.25	1655.16	1655.90	0.024036	6.72	50.37	33.52	0.82
Liddle Brook	Reach-1	2100	25-year	388.00	1652.46	1655.63	1655.48	1656.37	0.023763	7.32	63.27	34.74	0.83
Liddle Brook	Reach-1	2100	50-year	476.00	1652.46	1655.82	1655.78	1656.73	0.027165	8.16	70.87	46.94	0.89
Liddle Brook	Reach-1	2100	100-year	565.00	1652.46	1656.09	1656.09	1657.05	0.025998	8.52	83.96	51.18	0.89
Liddle Brook	Reach-1	2100	500-year	792.00	1652.46	1656.65	1656.65	1657.74	0.024452	9.31	114.12	56.75	0.89
Liddle Brook	Reach-1	2000	10-year	288.00	1649.31	1651.94	1651.94	1652.89	0.037451	7.83	36.79	19.63	1.01
Liddle Brook	Reach-1	2000	25-year	388.00	1649.31	1652.39	1652.39	1653.50	0.034181	8.44	46.41	23.73	0.99
Liddle Brook	Reach-1	2000	50-year	476.00	1649.31	1652.83	1652.83	1653.95	0.027699	8.55	59.48	33.14	0.92
Liddle Brook	Reach-1	2000	100-year	565.00	1649.31	1653.13	1653.13	1654.34	0.026318	8.95	69.91	35.30	0.91
Liddle Brook	Reach-1	2000	500-year	792.00	1649.31	1653.87	1653.87	1655.18	0.022473	9.57	99.61	44.08	0.87
Liddle Brook	Reach-1	1900	10-year	288.00	1646.16	1648.77	1648.77	1649.57	0.022365	7.42	47.15	34.62	0.85
Liddle Brook	Reach-1	1900	25-year	388.00	1646.16	1649.15	1649.15	1650.07	0.022170	8.16	60.52	35.72	0.87
Liddle Brook	Reach-1	1900	50-year	476.00	1646.16	1649.44	1649.44	1650.46	0.022204	8.72	70.96	36.56	0.88
Liddle Brook	Reach-1	1900	100-year	565.00	1646.16	1649.72	1649.72	1650.83	0.021959	9.19	81.17	37.36	0.89
Liddle Brook	Reach-1	1900	500-year	792.00	1646.16	1650.28	1650.28	1651.65	0.022894	10.42	102.69	39.00	0.93
Liddle Brook	Reach-1	1738	10-year	288.00	1641.06	1643.52	1643.52	1644.31	0.038365	7.12	40.48	26.27	1.01
Liddle Brook	Reach-1	1738	25-year	388.00	1641.06	1644.24		1644.90	0.020153	6.51	60.05	28.18	0.77
Liddle Brook	Reach-1	1738	50-year	476.00	1641.06	1645.06		1645.58	0.010528	5.80	84.06	30.34	0.59
Liddle Brook	Reach-1	1738	100-year	565.00	1641.06	1645.85		1646.30	0.006731	5.41	109.00	32.43	0.49
Liddle Brook	Reach-1	1738	500-year	792.00	1641.06	1646.49		1647.12	0.007808	6.46	131.86	46.61	0.54
Liddle Brook	Reach-1	1695	10-year	288.00	1637.53	1643.03	1641.31	1643.32	0.005509	4.34	69.61	23.40	0.40
Liddle Brook	Reach-1	1695	25-year	388.00	1637.53	1644.07	1641.80	1644.38	0.004220	4.48	96.10	27.64	0.36
Liddle Brook	Reach-1	1695	50-year	476.00	1637.53	1644.92	1642.17	1645.23	0.003539	4.58	120.93	31.10	0.34
Liddle Brook	Reach-1	1695	100-year	565.00	1637.53	1645.73	1642.53	1646.05	0.003046	4.65	147.59	37.07	0.32
Liddle Brook	Reach-1	1695	500-year	792.00	1637.53	1646.31	1643.34	1646.81	0.004365	5.90	168.07	104.57	0.39
Liddle Brook	Reach-1	1662		Culvert									
Liddle Brook	Reach-1	1610	10-year	288.00	1635.55	1638.79		1639.25	0.013378	5.48	55.71	28.53	0.64
Liddle Brook	Reach-1	1610	25-year	388.00	1635.55	1639.28		1639.82	0.012918	5.96	70.66	31.69	0.65
Liddle Brook	Reach-1	1610	50-year	476.00	1635.55	1639.66		1640.27	0.012306	6.36	82.90	33.53	0.65
Liddle Brook	Reach-1	1610	100-year	565.00	1635.55	1640.02		1640.69	0.011746	6.69	95.31	35.55	0.64
Liddle Brook	Reach-1	1610	500-year	792.00	1635.55	1640.92		1641.70	0.010060	7.26	129.93	40.97	0.62
Liddle Brook	Reach-1	1581	10-year	288.00	1635.60	1638.12		1638.73	0.020179	6.26	46.89	24.05	0.77
Liddle Brook	Reach-1	1581	25-year	388.00	1635.60	1638.55		1639.30	0.020049	6.95	57.38	25.34	0.79
Liddle Brook	Reach-1	1581	50-year	476.00	1635.60	1638.86	1638.49	1639.74	0.020037	7.54	65.63	27.44	0.80
Liddle Brook	Reach-1	1581	100-year	565.00	1635.60	1639.15	1638.79	1640.15	0.020162	8.08	73.72	29.36	0.82
Liddle Brook	Reach-1	1581	500-year	792.00	1635.60	1639.61	1639.48	1641.06	0.024415	9.77	87.88	32.44	0.92
Liddle Brook	Reach-1	1519	10-year	288.00	1633.79	1636.13	1636.13	1637.05	0.036712	7.71	37.36	20.43	1.00
Liddle Brook	Reach-1	1519	25-year	388.00	1633.79	1636.54	1636.54	1637.65	0.035035	8.43	46.08	21.56	1.01
Liddle Brook	Reach-1	1519	50-year	476.00	1633.79	1636.87	1636.87	1638.13	0.033201	9.00	53.19	22.44	1.00
Liddle Brook	Reach-1	1519	100-year	565.00	1633.79	1637.19	1637.19	1638.58	0.031141	9.45	60.58	23.32	0.99
Liddle Brook	Reach-1	1519	500-year	792.00	1633.79	1638.30	1637.90	1639.67	0.019982	9.44	88.11	26.35	0.84
Liddle Brook	Reach-1	1463	10-year	288.00	1631.32	1634.70	1633.89	1635.13	0.011489	5.23	55.03	22.70	0.59
Liddle Brook	Reach-1	1463	25-year	388.00	1631.32	1635.29	1634.34	1635.78	0.011031	5.64	68.77	24.35	0.59
Liddle Brook	Reach-1	1463	50-year	476.00	1631.32	1635.73	1634.68	1636.28	0.010549	5.98	79.65	25.56	0.59
Liddle Brook	Reach-1	1463	100-year	565.00	1631.32	1636.00	1635.00	1636.66	0.011260	6.53	86.84	26.34	0.62
Liddle Brook	Reach-1	1463	500-year	792.00	1631.32	1636.36	1635.69	1638.79	0.003728	5.31	171.89	50.24	0.39
Liddle Brook	Reach-1	1453		Bridge									
Liddle Brook	Reach-1	1440	10-year	288.00	1630.85	1634.00		1634.48	0.013323	5.54	52.24	23.49	0.64
Liddle Brook	Reach-1	1440	25-year	388.00	1630.85	1634.49		1635.07	0.012704	6.15	63.95	24.60	0.65
Liddle Brook	Reach-1	1440	50-year	476.00	1630.85	1634.88		1635.55	0.012302	6.60	73.73	25.49	0.65
Liddle Brook	Reach-1	1440	100-year	565.00	1630.85	1635.22		1635.99	0.012273	7.06	82.59	26.27	0.66
Liddle Brook	Reach-1	1440	500-year	792.00	1630.85	1635.89		1636.94	0.013348	8.27	100.74	27.80	0.71

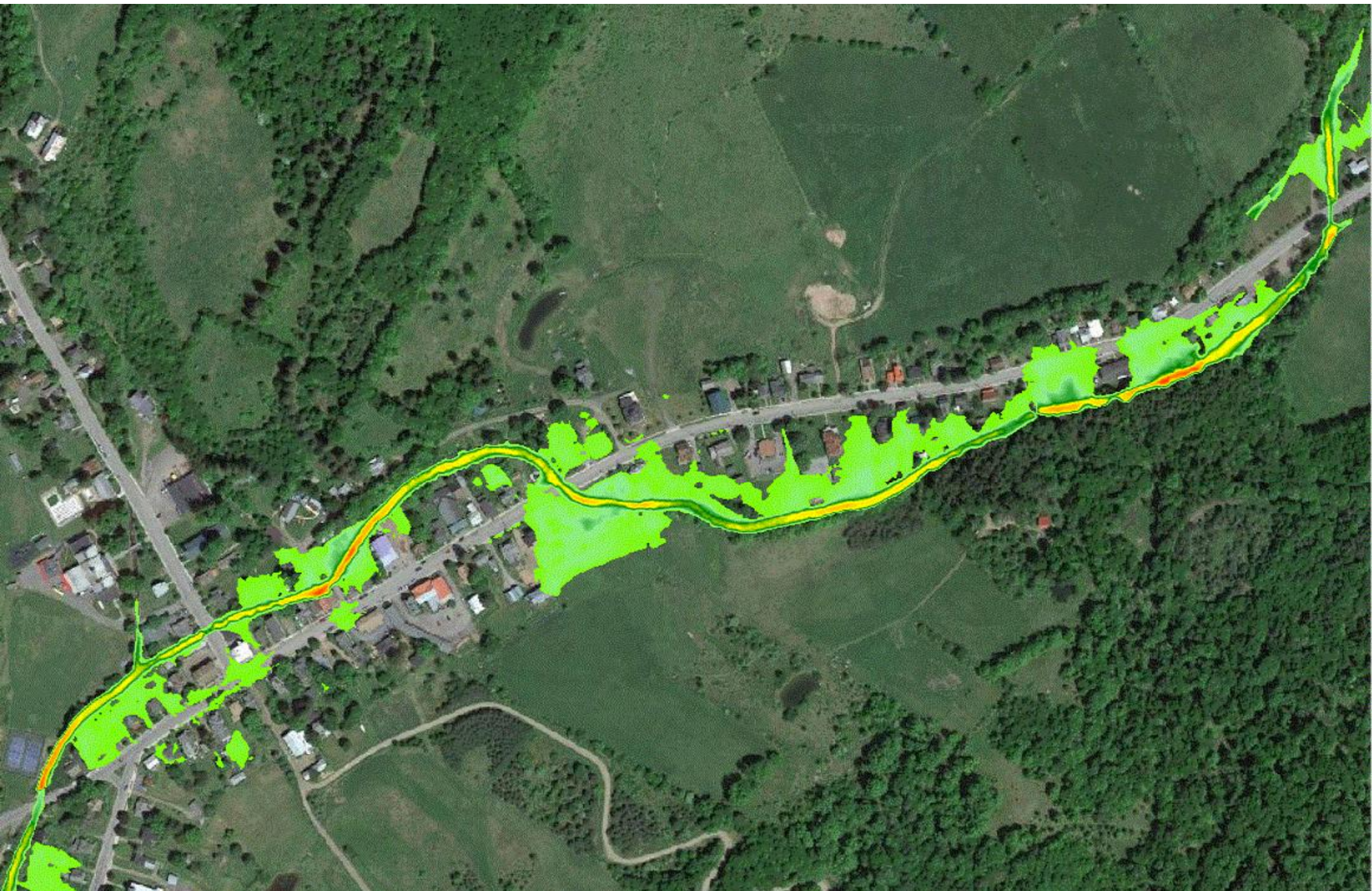
HEC-RAS Plan: EXC TK +LB Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Liddle Brook	Reach-1	1400	10-year	288.00	1630.36	1633.42		1633.91	0.014571	5.61	51.29	22.07	0.65
Liddle Brook	Reach-1	1400	25-year	388.00	1630.36	1633.96		1634.54	0.013724	6.12	63.51	23.46	0.65
Liddle Brook	Reach-1	1400	50-year	476.00	1630.36	1634.38		1635.04	0.012919	6.52	73.57	24.56	0.64
Liddle Brook	Reach-1	1400	100-year	565.00	1630.36	1634.72	1633.84	1635.48	0.012930	6.98	82.16	25.47	0.65
Liddle Brook	Reach-1	1400	500-year	792.00	1630.36	1635.38	1634.52	1636.37	0.013846	8.08	117.72	75.45	0.70
Liddle Brook	Reach-1	1326	10-year	288.00	1627.90	1631.15	1631.15	1632.24	0.036321	8.38	34.36	15.71	1.00
Liddle Brook	Reach-1	1326	25-year	388.00	1627.90	1631.68	1631.68	1632.94	0.034741	9.01	43.05	16.83	0.99
Liddle Brook	Reach-1	1326	50-year	476.00	1627.90	1632.07	1632.07	1633.49	0.034130	9.59	49.80	18.47	1.00
Liddle Brook	Reach-1	1326	100-year	565.00	1627.90	1632.49	1632.49	1634.00	0.030399	9.88	58.87	25.48	0.96
Liddle Brook	Reach-1	1326	500-year	792.00	1627.90	1633.52	1633.52	1635.04	0.022044	10.11	96.40	116.50	0.86
Liddle Brook	Reach-1	1284	10-year	288.00	1624.35	1628.85	1627.73	1629.35	0.011860	5.67	50.79	17.14	0.58
Liddle Brook	Reach-1	1284	25-year	388.00	1624.35	1629.61	1628.32	1630.17	0.011360	6.02	64.49	19.13	0.58
Liddle Brook	Reach-1	1284	50-year	476.00	1624.35	1631.44	1628.75	1631.76	0.004591	4.58	104.72	29.76	0.38
Liddle Brook	Reach-1	1284	100-year	565.00	1624.35	1632.05	1629.17	1632.40	0.004153	4.75	125.96	59.68	0.37
Liddle Brook	Reach-1	1284	500-year	792.00	1624.35	1632.96	1630.07	1633.42	0.004539	5.54	162.12	150.26	0.40
Liddle Brook	Reach-1	1260		Bridge									
Liddle Brook	Reach-1	1239	10-year	288.00	1625.08	1627.96	1627.55	1628.53	0.018922	6.06	47.56	23.47	0.74
Liddle Brook	Reach-1	1239	25-year	388.00	1625.08	1628.39	1627.95	1629.10	0.018433	6.77	57.80	25.04	0.76
Liddle Brook	Reach-1	1239	50-year	476.00	1625.08	1628.71	1628.26	1629.54	0.018401	7.34	66.08	26.24	0.77
Liddle Brook	Reach-1	1239	100-year	565.00	1625.08	1628.94	1628.55	1629.94	0.019853	8.03	72.24	27.10	0.81
Liddle Brook	Reach-1	1239	500-year	792.00	1625.08	1629.76	1629.24	1630.95	0.017341	8.80	95.63	30.15	0.79
Liddle Brook	Reach-1	1178	10-year	288.00	1623.33	1625.89	1625.89	1626.85	0.036558	7.86	36.66	19.44	1.01
Liddle Brook	Reach-1	1178	25-year	388.00	1623.33	1626.34	1626.34	1627.46	0.034944	8.52	45.57	20.90	1.01
Liddle Brook	Reach-1	1178	50-year	476.00	1623.33	1626.68	1626.68	1627.95	0.032680	9.02	53.06	22.04	1.00
Liddle Brook	Reach-1	1178	100-year	565.00	1623.33	1627.09	1626.99	1628.41	0.028167	9.23	62.20	23.34	0.95
Liddle Brook	Reach-1	1178	500-year	792.00	1623.33	1627.74	1627.72	1629.46	0.028157	10.55	78.15	25.46	0.98
Liddle Brook	Reach-1	1103	10-year	288.00	1620.28	1625.13	1622.87	1625.37	0.003631	3.90	75.11	19.14	0.33
Liddle Brook	Reach-1	1103	25-year	388.00	1620.28	1625.80	1623.35	1626.12	0.004046	4.53	88.02	19.64	0.36
Liddle Brook	Reach-1	1103	50-year	476.00	1620.28	1626.33	1623.73	1626.72	0.004306	5.01	98.64	20.21	0.38
Liddle Brook	Reach-1	1103	100-year	565.00	1620.28	1626.83	1624.09	1627.28	0.004525	5.44	108.87	76.83	0.39
Liddle Brook	Reach-1	1103	500-year	792.00	1620.28	1627.29	1624.91	1628.06	0.006899	7.06	118.78	110.79	0.49
Liddle Brook	Reach-1	1062		Bridge									
Liddle Brook	Reach-1	1040	10-year	288.00	1620.28	1623.17	1622.86	1623.94	0.023690	7.05	40.85	17.69	0.82
Liddle Brook	Reach-1	1040	25-year	388.00	1620.28	1623.57	1623.33	1624.58	0.025662	8.06	48.18	18.26	0.87
Liddle Brook	Reach-1	1040	50-year	476.00	1620.28	1623.86	1623.69	1625.10	0.027565	8.93	53.44	18.66	0.91
Liddle Brook	Reach-1	1040	100-year	565.00	1620.28	1624.11	1624.04	1625.59	0.029579	9.77	58.19	19.02	0.96
Liddle Brook	Reach-1	1040	500-year	792.00	1620.28	1624.84	1624.84	1626.77	0.029246	11.14	72.46	54.25	0.99
Liddle Brook	Reach-1	891	10-year	288.00	1616.76	1618.82	1618.82	1619.61	0.036134	7.14	40.32	25.61	1.00
Liddle Brook	Reach-1	891	25-year	388.00	1616.76	1619.18	1619.18	1620.12	0.034654	7.80	49.78	27.27	1.01
Liddle Brook	Reach-1	891	50-year	476.00	1616.76	1619.46	1619.46	1620.53	0.032987	8.30	57.69	28.59	1.00
Liddle Brook	Reach-1	891	100-year	565.00	1616.76	1619.72	1619.72	1620.91	0.031430	8.75	65.38	29.81	1.00
Liddle Brook	Reach-1	891	500-year	792.00	1616.76	1620.34	1620.34	1621.79	0.028386	9.70	84.71	32.68	0.99
Liddle Brook	Reach-1	803	10-year	288.00	1613.79	1616.44		1616.86	0.013444	5.21	55.33	27.50	0.65
Liddle Brook	Reach-1	803	25-year	388.00	1613.79	1616.93		1617.42	0.012453	5.62	69.17	29.61	0.64
Liddle Brook	Reach-1	803	50-year	476.00	1613.79	1617.31		1617.85	0.011468	5.94	80.75	31.26	0.63
Liddle Brook	Reach-1	803	100-year	565.00	1613.79	1617.68		1618.27	0.010619	6.22	92.60	32.87	0.62
Liddle Brook	Reach-1	803	500-year	792.00	1613.79	1618.55		1619.26	0.009082	6.77	123.05	36.68	0.60
Liddle Brook	Reach-1	710	10-year	288.00	1610.64	1613.92	1613.92	1614.94	0.032867	8.11	35.49	17.14	0.99
Liddle Brook	Reach-1	710	25-year	388.00	1610.64	1614.39	1614.39	1615.62	0.030488	8.90	43.86	18.59	0.99
Liddle Brook	Reach-1	710	50-year	476.00	1610.64	1614.76	1614.76	1616.16	0.028989	9.51	50.94	19.73	0.99
Liddle Brook	Reach-1	710	100-year	565.00	1610.64	1615.10	1615.10	1616.67	0.027969	10.06	57.89	20.80	0.99
Liddle Brook	Reach-1	710	500-year	792.00	1610.64	1615.95	1615.95	1617.83	0.024719	11.06	76.78	23.45	0.96
Liddle Brook	Reach-1	619	10-year	288.00	1607.30	1611.27	1609.30	1611.46	0.003342	3.42	84.15	24.18	0.32
Liddle Brook	Reach-1	619	25-year	388.00	1607.30	1612.14	1609.70	1612.35	0.003153	3.68	105.56	25.48	0.32
Liddle Brook	Reach-1	619	50-year	476.00	1607.30	1612.84	1610.02	1613.07	0.003012	3.84	123.81	92.44	0.31
Liddle Brook	Reach-1	619	100-year	565.00	1607.30	1613.51	1610.32	1613.75	0.002776	3.99	141.89	141.27	0.31
Liddle Brook	Reach-1	619	500-year	792.00	1607.30	1614.41	1611.01	1614.76	0.003214	4.77	167.37	164.63	0.34
Liddle Brook	Reach-1	528		Culvert									
Liddle Brook	Reach-1	443	10-year	288.00	1604.38	1607.07	1607.07	1608.24	0.039661	8.70	33.10	14.00	1.00
Liddle Brook	Reach-1	443	25-year	388.00	1604.38	1607.59	1607.59	1609.02	0.039976	9.60	40.42	14.14	1.00
Liddle Brook	Reach-1	443	50-year	476.00	1604.38	1608.19	1608.19	1609.58	0.032173	9.54	55.99	32.02	0.91
Liddle Brook	Reach-1	443	100-year	565.00	1604.38	1608.72	1608.72	1610.03	0.026155	9.45	74.99	38.08	0.84
Liddle Brook	Reach-1	443	500-year	792.00	1604.38	1609.50	1609.50	1610.97	0.024668	10.34	107.07	45.17	0.84
Liddle Brook	Reach-1	411	10-year	288.00	1602.53	1605.71	1605.43	1606.69	0.029960	7.95	36.20	13.46	0.85
Liddle Brook	Reach-1	411	25-year	388.00	1602.53	1606.49		1607.56	0.025981	8.30	46.75	13.64	0.79
Liddle Brook	Reach-1	411	50-year	476.00	1602.53	1607.13	1606.41	1608.27	0.024036	8.57	55.68	18.94	0.75

HEC-RAS Plan: EXC TK +LB Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Liddle Brook	Reach-1	411	100-year	565.00	1602.53	1607.79	1606.83	1608.84	0.019336	8.38	87.47	63.85	0.68
Liddle Brook	Reach-1	411	500-year	792.00	1602.53	1608.77	1608.54	1609.63	0.014527	8.25	173.55	104.68	0.61
Liddle Brook	Reach-1	388	10-year	288.00	1601.55	1605.41		1606.09	0.017158	6.63	43.41	12.42	0.63
Liddle Brook	Reach-1	388	25-year	388.00	1601.55	1606.17		1607.00	0.017669	7.33	52.93	12.59	0.63
Liddle Brook	Reach-1	388	50-year	476.00	1601.55	1606.79	1605.47	1607.75	0.017392	7.83	60.85	12.75	0.63
Liddle Brook	Reach-1	388	100-year	565.00	1601.55	1607.43	1605.92	1608.42	0.015589	8.05	85.19	71.95	0.61
Liddle Brook	Reach-1	388	500-year	792.00	1601.55	1608.58	1608.11	1609.31	0.010850	7.63	196.19	115.27	0.52
Liddle Brook	Reach-1	366	10-year	288.00	1601.02	1605.32	1603.70	1605.69	0.007590	4.86	59.27	15.65	0.44
Liddle Brook	Reach-1	366	25-year	388.00	1601.02	1606.10	1604.20	1606.56	0.008047	5.43	71.48	15.68	0.45
Liddle Brook	Reach-1	366	50-year	476.00	1601.02	1606.75	1604.60	1607.28	0.008195	5.83	81.66	15.71	0.45
Liddle Brook	Reach-1	366	100-year	565.00	1601.02	1607.39	1604.98	1607.98	0.007903	6.16	91.77	17.57	0.45
Liddle Brook	Reach-1	366	500-year	792.00	1601.02	1608.15	1605.85	1609.02	0.010045	7.54	121.18	68.73	0.52
Liddle Brook	Reach-1	351		Culvert									
Liddle Brook	Reach-1	331	10-year	288.00	1600.60	1603.56	1603.05	1604.30	0.020690	6.90	41.74	15.30	0.74
Liddle Brook	Reach-1	331	25-year	388.00	1600.60	1604.21	1603.55	1605.08	0.019729	7.50	51.73	15.44	0.72
Liddle Brook	Reach-1	331	50-year	476.00	1600.60	1604.66	1603.95	1605.68	0.019761	8.10	58.78	15.53	0.73
Liddle Brook	Reach-1	331	100-year	565.00	1600.60	1605.11	1604.32	1606.26	0.019154	8.59	65.81	15.59	0.73
Liddle Brook	Reach-1	331	500-year	792.00	1600.60	1606.08	1605.20	1607.58	0.018997	9.81	80.97	15.72	0.76
Liddle Brook	Reach-1	294	10-year	288.00	1599.35	1602.41	1602.19	1603.33	0.029591	7.69	37.44	15.50	0.87
Liddle Brook	Reach-1	294	25-year	388.00	1599.35	1602.83	1602.70	1604.04	0.033542	8.85	43.87	15.65	0.93
Liddle Brook	Reach-1	294	50-year	476.00	1599.35	1603.22	1603.10	1604.63	0.033728	9.51	50.04	15.77	0.94
Liddle Brook	Reach-1	294	100-year	565.00	1599.35	1603.53	1603.48	1605.17	0.035124	10.29	54.93	15.85	0.97
Liddle Brook	Reach-1	294	500-year	792.00	1599.35	1604.34	1604.34	1606.47	0.034317	11.69	67.88	16.04	0.99
Liddle Brook	Reach-1	209	10-year	288.00	1596.51	1599.44	1599.32	1600.56	0.035692	8.49	33.93	13.17	0.93
Liddle Brook	Reach-1	209	25-year	388.00	1596.51	1600.32	1599.87	1601.44	0.027454	8.50	45.66	13.39	0.81
Liddle Brook	Reach-1	209	50-year	476.00	1596.51	1601.04	1600.31	1602.19	0.023212	8.58	56.35	17.96	0.75
Liddle Brook	Reach-1	209	100-year	565.00	1596.51	1601.74	1600.73	1602.87	0.019025	8.60	71.34	25.25	0.69
Liddle Brook	Reach-1	209	500-year	792.00	1596.51	1602.77	1601.95	1604.11	0.017996	9.53	102.89	36.05	0.70
Liddle Brook	Reach-1	167	10-year	288.00	1594.45	1598.80	1597.49	1599.40	0.014282	6.19	46.51	11.82	0.55
Liddle Brook	Reach-1	167	25-year	388.00	1594.45	1599.71	1598.07	1600.42	0.014566	6.77	57.28	11.93	0.54
Liddle Brook	Reach-1	167	50-year	476.00	1594.45	1600.46	1598.56	1601.26	0.014391	7.18	66.32	12.20	0.54
Liddle Brook	Reach-1	167	100-year	565.00	1594.45	1601.20	1599.01	1602.08	0.013332	7.51	75.59	12.67	0.53
Liddle Brook	Reach-1	167	500-year	792.00	1594.45	1602.07	1600.08	1603.35	0.016618	9.14	95.05	51.51	0.60
Liddle Brook	Reach-1	138		Culvert									
Liddle Brook	Reach-1	117	10-year	288.00	1593.51	1597.63		1598.19	0.012603	5.98	48.22	12.85	0.54
Liddle Brook	Reach-1	117	25-year	388.00	1593.51	1597.73		1598.69	0.021067	7.86	49.45	12.85	0.70
Liddle Brook	Reach-1	117	50-year	476.00	1593.51	1597.99		1599.26	0.025583	9.05	52.82	12.86	0.78
Liddle Brook	Reach-1	117	100-year	565.00	1593.51	1598.19	1597.78	1599.82	0.030827	10.24	55.41	12.87	0.86
Liddle Brook	Reach-1	117	500-year	792.00	1593.51	1600.00	1600.00	1600.94	0.013405	8.49	174.18	147.07	0.60
Liddle Brook	Reach-1	72	10-year	288.00	1592.93	1595.84	1595.82	1597.09	0.035973	8.95	32.19	12.71	0.99
Liddle Brook	Reach-1	72	25-year	388.00	1592.93	1596.90	1596.90	1597.73	0.018781	7.64	76.81	65.15	0.72
Liddle Brook	Reach-1	72	50-year	476.00	1592.93	1597.19	1597.19	1598.07	0.019444	8.13	95.41	65.26	0.74
Liddle Brook	Reach-1	72	100-year	565.00	1592.93	1597.43	1597.43	1598.37	0.020070	8.61	111.24	65.33	0.76
Liddle Brook	Reach-1	72	500-year	792.00	1592.93	1597.75	1597.75	1599.13	0.027628	10.64	133.03	72.86	0.90
Liddle Brook	Reach-1	5	10-year	288.00	1592.07	1594.43	1594.43	1595.24	0.032819	7.21	39.95	25.02	1.01
Liddle Brook	Reach-1	5	25-year	388.00	1592.07	1594.82	1594.82	1595.75	0.031562	7.72	50.25	27.51	1.01
Liddle Brook	Reach-1	5	50-year	476.00	1592.07	1595.13	1595.13	1596.14	0.030664	8.08	58.91	29.45	1.01
Liddle Brook	Reach-1	5	100-year	565.00	1592.07	1595.41	1595.41	1596.50	0.029976	8.39	67.31	31.21	1.01
Liddle Brook	Reach-1	5	500-year	792.00	1592.07	1596.27	1596.27	1597.27	0.020059	8.08	114.60	103.83	0.86

Detention Pond Upstream of Hamlet - 100-Year Storm



Detention Pond Upstream of Hamlet

HEC-RAS Plan: Detention Pond Locations: User Defined

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk middle	Reach-1	41995	10-year	448.00	1649.40	1658.03		1658.08	0.000299	1.95	307.13	72.00	0.12
Tk middle	Reach-1	41995	25-year	539.00	1649.40	1658.49		1658.56	0.000342	2.17	340.83	72.38	0.13
Tk middle	Reach-1	41995	50-year	614.00	1649.40	1658.84		1658.92	0.000375	2.33	366.33	72.67	0.14
Tk middle	Reach-1	41995	100-year	696.00	1649.40	1659.20		1659.29	0.000408	2.50	392.45	72.97	0.15
Tk middle	Reach-1	41995	500-year	912.00	1649.40	1660.07		1660.18	0.000483	2.90	455.74	73.68	0.16
Tk middle	Reach-1	41497	10-year	448.00	1642.25	1658.05		1658.05	0.000011	0.47	1446.12	146.41	0.02
Tk middle	Reach-1	41497	25-year	539.00	1642.25	1658.52		1658.52	0.000013	0.54	1515.19	147.10	0.03
Tk middle	Reach-1	41497	50-year	614.00	1642.25	1658.87		1658.88	0.000016	0.59	1567.50	147.62	0.03
Tk middle	Reach-1	41497	100-year	696.00	1642.25	1659.23		1659.24	0.000018	0.65	1621.05	148.15	0.03
Tk middle	Reach-1	41497	500-year	912.00	1642.25	1660.11		1660.11	0.000025	0.79	1750.75	149.43	0.04
Tk middle	Reach-1	41367	10-year	448.00	1652.32	1657.81		1658.02	0.002760	3.68	124.14	42.74	0.33
Tk middle	Reach-1	41367	25-year	539.00	1652.32	1658.25		1658.49	0.002843	3.98	145.64	55.21	0.33
Tk middle	Reach-1	41367	50-year	614.00	1652.32	1658.57		1658.84	0.002873	4.19	166.94	78.92	0.34
Tk middle	Reach-1	41367	100-year	696.00	1652.32	1658.91		1659.20	0.002849	4.37	195.69	86.03	0.34
Tk middle	Reach-1	41367	500-year	912.00	1652.32	1659.75		1660.07	0.002713	4.72	268.30	90.10	0.34
Tk middle	Reach-1	41242	10-year	448.00	1652.62	1656.00	1656.00	1657.14	0.024850	8.82	63.93	33.01	0.96
Tk middle	Reach-1	41242	25-year	539.00	1652.62	1656.31	1656.31	1657.58	0.024236	9.38	74.32	34.15	0.96
Tk middle	Reach-1	41242	50-year	614.00	1652.62	1656.56	1656.56	1657.93	0.023571	9.76	82.93	37.81	0.96
Tk middle	Reach-1	41242	100-year	696.00	1652.62	1656.80	1656.80	1658.29	0.023212	10.19	91.80	46.04	0.97
Tk middle	Reach-1	41242	500-year	912.00	1652.62	1657.37	1657.37	1659.16	0.023196	11.27	112.98	55.92	0.99
Tk middle	Reach-1	41210	10-year	448.00	1652.11	1656.11	1654.39	1656.35	0.003401	3.96	113.08	48.26	0.37
Tk middle	Reach-1	41210	25-year	539.00	1652.11	1656.44	1654.62	1656.74	0.003652	4.36	123.68	55.58	0.39
Tk middle	Reach-1	41210	50-year	614.00	1652.11	1656.72	1654.81	1657.05	0.003762	4.63	132.55	59.23	0.40
Tk middle	Reach-1	41210	100-year	696.00	1652.11	1657.03	1655.01	1657.40	0.003817	4.89	142.28	61.96	0.41
Tk middle	Reach-1	41210	500-year	912.00	1652.11	1657.80	1655.50	1658.26	0.003854	5.47	166.85	70.93	0.42
Tk middle	Reach-1	41170		Bridge									
Tk middle	Reach-1	41135	10-year	448.00	1651.65	1654.62	1654.58	1655.53	0.028360	7.67	58.39	50.87	0.97
Tk middle	Reach-1	41135	25-year	539.00	1651.65	1655.07	1654.84	1655.94	0.020407	7.48	72.01	57.61	0.86
Tk middle	Reach-1	41135	50-year	614.00	1651.65	1655.48	1655.04	1656.30	0.015568	7.27	84.46	65.73	0.77
Tk middle	Reach-1	41135	100-year	696.00	1651.65	1655.82	1655.21	1656.66	0.013588	7.34	94.85	88.31	0.73
Tk middle	Reach-1	41135	500-year	912.00	1651.65	1656.66	1655.73	1657.55	0.010587	7.59	120.21	110.73	0.67
Tk Lower	Tk Lower	41106	10-year	516.20	1651.19	1654.42	1653.54	1654.92	0.008666	5.74	99.10	52.61	0.58
Tk Lower	Tk Lower	41106	25-year	632.80	1651.19	1654.88	1653.86	1655.44	0.008023	6.07	117.50	58.59	0.57
Tk Lower	Tk Lower	41106	50-year	730.00	1651.19	1655.31	1654.10	1655.89	0.007168	6.20	135.58	63.33	0.55
Tk Lower	Tk Lower	41106	100-year	836.00	1651.19	1655.65	1654.36	1656.29	0.007054	6.50	150.58	67.89	0.56
Tk Lower	Tk Lower	41106	500-year	1111.00	1651.19	1656.50	1654.96	1657.25	0.006656	7.12	189.46	76.07	0.56
Tk Lower	Tk Lower	41100	10-year	540.00	1648.76	1653.30	1652.99	1654.28	0.022026	7.95	67.92	48.00	0.85
Tk Lower	Tk Lower	41100	25-year	660.00	1648.76	1653.55	1653.38	1654.78	0.025376	8.88	74.31	50.52	0.92
Tk Lower	Tk Lower	41100	50-year	774.00	1648.76	1653.78	1653.72	1655.23	0.028080	9.66	80.15	52.69	0.97
Tk Lower	Tk Lower	41100	100-year	876.00	1648.76	1654.00	1654.00	1655.61	0.029438	10.19	85.96	54.91	1.00
Tk Lower	Tk Lower	41100	500-year	1162.00	1648.76	1654.73	1654.73	1656.58	0.028349	10.93	106.28	60.90	1.00
Tk Lower	Tk Lower	41080	10-year	540.00	1649.40	1652.62	1652.62	1653.76	0.029182	8.59	64.13	30.01	1.00
Tk Lower	Tk Lower	41080	25-year	660.00	1649.40	1652.96	1652.96	1654.24	0.027240	9.11	74.60	30.86	0.99
Tk Lower	Tk Lower	41080	50-year	774.00	1649.40	1653.24	1653.24	1654.67	0.026591	9.63	83.39	31.56	0.99
Tk Lower	Tk Lower	41080	100-year	876.00	1649.40	1653.49	1653.49	1655.04	0.025822	10.02	91.33	32.18	0.99
Tk Lower	Tk Lower	41080	500-year	1162.00	1649.40	1654.16	1654.16	1655.98	0.023720	10.91	113.37	33.83	0.98
Tk Lower	Tk Lower	40662	10-year	540.00	1642.25	1647.47		1647.66	0.002566	3.56	151.72	37.25	0.31
Tk Lower	Tk Lower	40662	25-year	660.00	1642.25	1647.99		1648.22	0.002674	3.85	171.65	38.45	0.32
Tk Lower	Tk Lower	40662	50-year	774.00	1642.25	1648.43		1648.69	0.002777	4.10	188.79	40.67	0.33
Tk Lower	Tk Lower	40662	100-year	876.00	1642.25	1648.37		1648.71	0.003700	4.70	186.34	40.06	0.38
Tk Lower	Tk Lower	40662	500-year	1162.00	1642.25	1648.95		1649.43	0.004539	5.55	211.70	54.23	0.43
Tk Lower	Tk Lower	40428	10-year	540.00	1641.79	1644.95	1644.95	1646.12	0.030293	8.70	62.05	30.99	1.00
Tk Lower	Tk Lower	40428	25-year	660.00	1641.79	1645.30	1645.30	1646.63	0.029980	9.23	71.50	48.30	1.00
Tk Lower	Tk Lower	40428	50-year	774.00	1641.79	1645.65	1645.65	1647.06	0.028696	9.55	81.30	91.42	0.99
Tk Lower	Tk Lower	40428	100-year	876.00	1641.79	1646.24	1646.24	1647.10	0.015579	7.87	169.75	131.69	0.75
Tk Lower	Tk Lower	40428	500-year	1162.00	1641.79	1646.69	1646.69	1647.60	0.015311	8.47	232.03	148.08	0.76
Tk Lower	Tk Lower	40382	10-year	540.00	1635.54	1641.54	1639.28	1641.82	0.003938	4.31	125.34	29.90	0.37
Tk Lower	Tk Lower	40382	25-year	660.00	1635.54	1642.42	1639.62	1642.71	0.003363	4.33	152.49	31.54	0.35
Tk Lower	Tk Lower	40382	50-year	774.00	1635.54	1642.90	1639.94	1643.23	0.003527	4.61	167.83	32.42	0.36
Tk Lower	Tk Lower	40382	100-year	876.00	1635.54	1643.31	1640.19	1643.67	0.003631	4.83	181.40	33.19	0.36
Tk Lower	Tk Lower	40382	500-year	1162.00	1635.54	1644.39	1640.91	1644.83	0.003513	5.35	218.36	42.77	0.37
Tk Lower	Tk Lower	40336		Bridge									
Tk Lower	Tk Lower	40303	10-year	540.00	1635.51	1640.78	1638.62	1641.07	0.003947	4.32	125.04	30.09	0.37
Tk Lower	Tk Lower	40303	25-year	660.00	1635.51	1641.77	1638.96	1642.05	0.003140	4.24	155.76	31.85	0.34
Tk Lower	Tk Lower	40303	50-year	774.00	1635.51	1642.16	1639.26	1642.49	0.003477	4.60	168.10	32.53	0.36
Tk Lower	Tk Lower	40303	100-year	876.00	1635.51	1642.49	1639.51	1642.86	0.003728	4.89	179.02	33.12	0.37
Tk Lower	Tk Lower	40303	500-year	1162.00	1635.51	1643.36	1640.19	1643.84	0.004128	5.58	208.54	52.37	0.40

HEC-RAS Plan: Detention Pond Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	40237	10-year	540.00	1635.93	1639.83	1639.24	1640.50	0.015099	6.59	82.01	31.87	0.72
Tk Lower	Tk Lower	40237	25-year	660.00	1635.93	1641.38	1639.60	1641.77	0.004712	5.02	134.03	91.90	0.43
Tk Lower	Tk Lower	40237	50-year	774.00	1635.93	1641.72	1639.89	1642.18	0.004961	5.44	145.95	103.45	0.45
Tk Lower	Tk Lower	40237	100-year	876.00	1635.93	1642.02	1640.12	1642.53	0.005103	5.76	156.59	115.40	0.46
Tk Lower	Tk Lower	40237	500-year	1162.00	1635.93	1642.84	1640.73	1643.49	0.005289	6.50	185.81	170.52	0.48
Tk Lower	Tk Lower	40196	10-year	540.00	1633.78	1639.86	1637.27	1640.06	0.002386	3.59	152.29	42.75	0.30
Tk Lower	Tk Lower	40196	25-year	660.00	1633.78	1641.40	1637.60	1641.56	0.001271	3.20	221.45	149.16	0.23
Tk Lower	Tk Lower	40196	50-year	774.00	1633.78	1641.75	1637.87	1641.94	0.001436	3.53	237.21	153.74	0.25
Tk Lower	Tk Lower	40196	100-year	876.00	1633.78	1642.06	1638.12	1642.28	0.001560	3.80	251.25	157.78	0.26
Tk Lower	Tk Lower	40196	500-year	1162.00	1633.78	1642.89	1638.73	1643.19	0.001824	4.45	289.68	168.66	0.29
Tk Lower	Tk Lower	40151		Bridge									
Tk Lower	Tk Lower	40111	10-year	540.00	1633.65	1637.28	1637.28	1638.27	0.031522	7.96	67.85	34.11	0.99
Tk Lower	Tk Lower	40111	25-year	660.00	1633.65	1637.60	1637.60	1638.69	0.030384	8.37	78.85	35.64	0.99
Tk Lower	Tk Lower	40111	50-year	774.00	1633.65	1637.84	1637.84	1639.05	0.030254	8.83	87.61	36.26	1.00
Tk Lower	Tk Lower	40111	100-year	876.00	1633.65	1638.07	1638.07	1639.37	0.029493	9.14	95.82	44.16	1.00
Tk Lower	Tk Lower	40111	500-year	1162.00	1633.65	1638.65	1638.65	1640.16	0.026740	9.87	119.10	82.89	0.98
Tk Lower	Tk Lower	40047	10-year	540.00	1631.79	1635.66	1634.70	1636.08	0.009104	5.25	102.92	38.43	0.57
Tk Lower	Tk Lower	40047	25-year	660.00	1631.79	1636.04	1635.00	1636.53	0.009136	5.59	118.04	40.03	0.57
Tk Lower	Tk Lower	40047	50-year	774.00	1631.79	1636.37	1635.26	1636.91	0.009200	5.89	131.52	41.40	0.58
Tk Lower	Tk Lower	40047	100-year	876.00	1631.79	1636.63	1635.49	1637.22	0.009374	6.15	142.44	42.48	0.59
Tk Lower	Tk Lower	40047	500-year	1162.00	1631.79	1637.29	1636.07	1638.00	0.009336	6.78	177.43	73.36	0.61
Tk Lower	Tk Lower	39767	10-year	540.00	1629.09	1633.23	1632.22	1633.63	0.008383	5.10	105.84	38.26	0.54
Tk Lower	Tk Lower	39767	25-year	660.00	1629.09	1633.64	1632.52	1634.10	0.008213	5.42	121.76	39.33	0.54
Tk Lower	Tk Lower	39767	50-year	774.00	1629.09	1633.99	1632.77	1634.50	0.008083	5.70	135.84	40.31	0.55
Tk Lower	Tk Lower	39767	100-year	876.00	1629.09	1634.34	1632.97	1634.87	0.007472	5.85	150.27	41.69	0.53
Tk Lower	Tk Lower	39767	500-year	1162.00	1629.09	1635.14	1633.54	1635.76	0.006767	6.33	197.77	81.13	0.52
Tk Lower	Tk Lower	39518	10-year	540.00	1626.68	1630.55	1629.77	1631.12	0.012164	6.05	89.22	32.99	0.65
Tk Lower	Tk Lower	39518	25-year	660.00	1626.68	1630.94	1630.09	1631.58	0.012375	6.46	102.19	34.56	0.66
Tk Lower	Tk Lower	39518	50-year	774.00	1626.68	1631.26	1630.41	1631.98	0.012593	6.80	113.74	35.89	0.67
Tk Lower	Tk Lower	39518	100-year	876.00	1626.68	1631.26	1630.67	1632.18	0.016171	7.71	113.64	35.88	0.76
Tk Lower	Tk Lower	39518	500-year	1162.00	1626.68	1631.56	1631.29	1632.91	0.021436	9.33	124.75	39.29	0.89
Tk Lower	Tk Lower	39267	10-year	540.00	1622.32	1625.38	1625.38	1626.50	0.030444	8.50	63.50	28.19	1.00
Tk Lower	Tk Lower	39267	25-year	660.00	1622.32	1625.74	1625.74	1626.97	0.029375	8.92	73.96	29.62	1.00
Tk Lower	Tk Lower	39267	50-year	774.00	1622.32	1626.05	1626.05	1627.39	0.028379	9.30	83.33	33.81	0.99
Tk Lower	Tk Lower	39267	100-year	876.00	1622.32	1626.58	1626.58	1627.71	0.019715	8.61	112.02	73.90	0.84
Tk Lower	Tk Lower	39267	500-year	1162.00	1622.32	1627.24	1627.24	1628.27	0.015613	8.58	165.97	82.43	0.77
Tk Lower	Tk Lower	38971	10-year	540.00	1617.20	1621.57	1619.83	1621.72	0.002606	3.37	223.08	215.44	0.32
Tk Lower	Tk Lower	38971	25-year	660.00	1617.20	1621.86	1620.18	1622.02	0.002562	3.52	265.94	278.03	0.32
Tk Lower	Tk Lower	38971	50-year	774.00	1617.20	1622.24	1620.70	1622.37	0.002176	3.45	321.18	315.08	0.30
Tk Lower	Tk Lower	38971	100-year	876.00	1617.20	1622.45	1620.87	1622.59	0.002151	3.55	353.46	320.37	0.30
Tk Lower	Tk Lower	38971	500-year	1162.00	1617.20	1622.93	1621.45	1623.09	0.002271	3.90	425.18	328.19	0.31
Tk Lower	Tk Lower	38901	10-year	540.00	1615.56	1621.23	1618.69	1621.48	0.003155	4.21	176.88	136.44	0.33
Tk Lower	Tk Lower	38901	25-year	660.00	1615.56	1621.39	1619.08	1621.73	0.004110	4.91	193.00	150.63	0.38
Tk Lower	Tk Lower	38901	50-year	774.00	1615.56	1621.70	1619.41	1622.09	0.004366	5.27	232.19	199.53	0.40
Tk Lower	Tk Lower	38901	100-year	876.00	1615.56	1621.84	1619.73	1622.29	0.004920	5.69	253.27	213.14	0.43
Tk Lower	Tk Lower	38901	500-year	1162.00	1615.56	1621.93	1620.86	1622.66	0.008006	7.33	267.37	227.57	0.55
Tk Lower	Tk Lower	38846		Bridge									
Tk Lower	Tk Lower	38818	10-year	540.00	1615.10	1619.60	1618.04	1620.04	0.007234	5.33	103.84	49.87	0.48
Tk Lower	Tk Lower	38818	25-year	660.00	1615.10	1620.13	1618.39	1620.57	0.006487	5.49	172.76	189.23	0.46
Tk Lower	Tk Lower	38818	50-year	774.00	1615.10	1620.81	1618.72	1621.10	0.004048	4.77	322.00	294.73	0.37
Tk Lower	Tk Lower	38818	100-year	876.00	1615.10	1621.14	1618.99	1621.39	0.003545	4.65	401.75	336.91	0.35
Tk Lower	Tk Lower	38818	500-year	1162.00	1615.10	1621.37	1620.57	1621.72	0.004873	5.61	458.58	373.38	0.42
Tk Lower	Tk Lower	38749	10-year	540.00	1614.05	1619.32	1617.20	1619.61	0.003896	4.26	126.71	84.35	0.39
Tk Lower	Tk Lower	38749	25-year	660.00	1614.05	1619.87	1617.62	1620.17	0.003616	4.46	159.04	132.89	0.38
Tk Lower	Tk Lower	38749	50-year	774.00	1614.05	1620.61	1617.95	1620.86	0.002491	4.13	234.12	230.49	0.33
Tk Lower	Tk Lower	38749	100-year	876.00	1614.05	1620.96	1618.19	1621.19	0.002252	4.11	303.31	297.08	0.32
Tk Lower	Tk Lower	38749	500-year	1162.00	1614.05	1621.08	1618.88	1621.44	0.003453	5.17	331.13	305.02	0.39
Tk Lower	Tk Lower	38683		Bridge									
Tk Lower	Tk Lower	38674	10-year	540.00	1613.24	1616.82	1615.96	1617.25	0.009937	5.27	102.52	40.69	0.59
Tk Lower	Tk Lower	38674	25-year	660.00	1613.24	1617.23	1616.26	1617.70	0.009429	5.53	119.41	42.05	0.58
Tk Lower	Tk Lower	38674	50-year	774.00	1613.24	1617.60	1616.52	1618.11	0.008921	5.72	135.40	43.11	0.57
Tk Lower	Tk Lower	38674	100-year	876.00	1613.24	1617.93	1616.73	1618.46	0.008513	5.86	149.60	44.03	0.56
Tk Lower	Tk Lower	38674	500-year	1162.00	1613.24	1618.77	1617.27	1619.34	0.007172	6.10	222.16	437.42	0.53
Tk Lower	Tk Lower	38580	10-year	540.00	1610.59	1614.35	1614.35	1615.52	0.030274	8.66	62.32	26.58	1.00
Tk Lower	Tk Lower	38580	25-year	660.00	1610.59	1614.72	1614.72	1616.02	0.028996	9.14	72.25	27.87	0.99

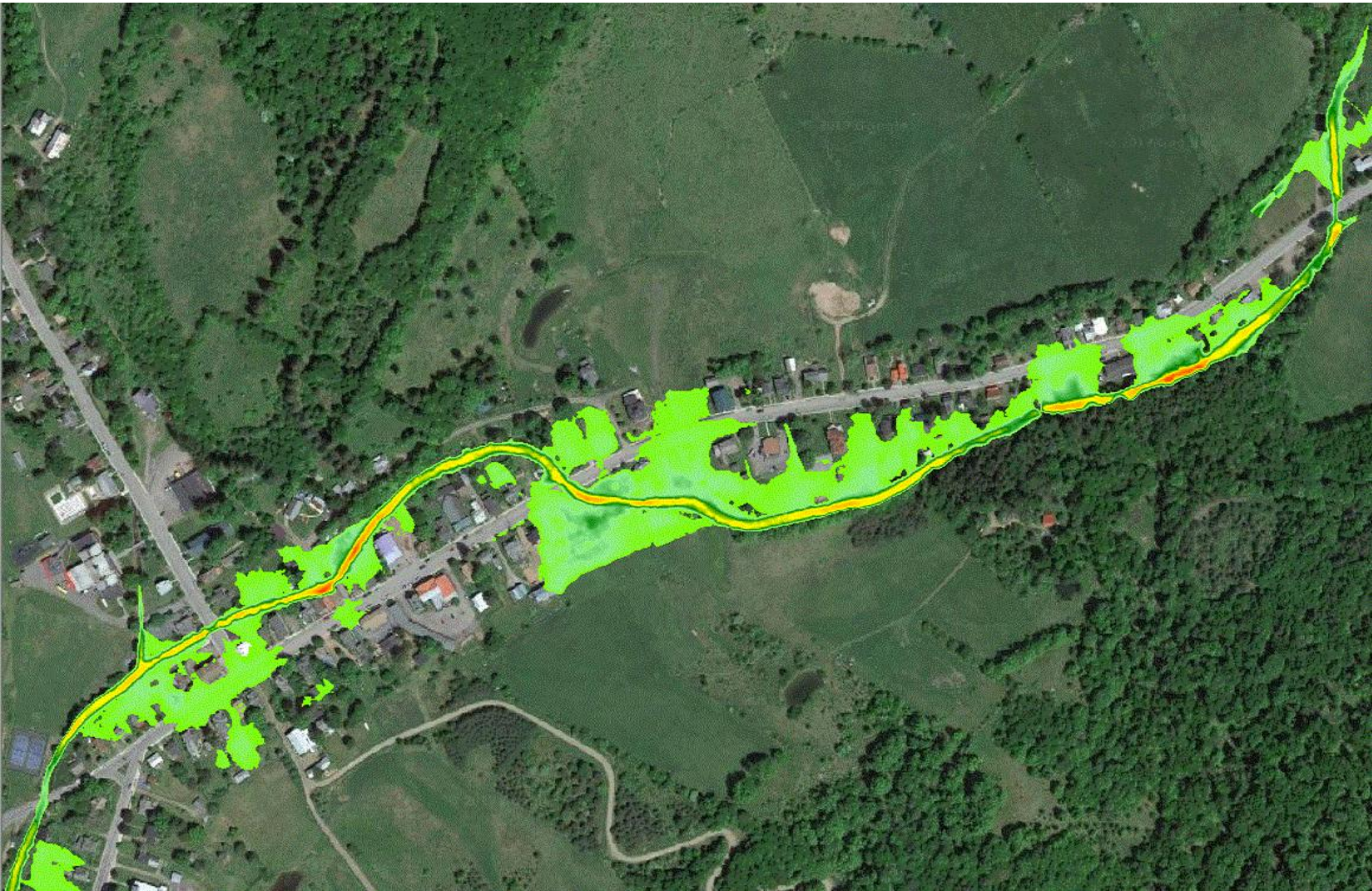
HEC-RAS Plan: Detention Pond Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	38580	50-year	774.00	1610.59	1615.01	1615.01	1616.46	0.028155	9.65	80.43	28.58	1.00
Tk Lower	Tk Lower	38580	100-year	876.00	1610.59	1615.26	1615.26	1616.83	0.027393	10.06	87.66	29.19	1.00
Tk Lower	Tk Lower	38580	500-year	1162.00	1610.59	1615.93	1615.93	1617.80	0.025397	11.00	107.67	30.81	0.99
Tk Lower	Tk Lower	38201	10-year	540.00	1603.60	1607.93	1606.60	1608.32	0.007033	5.05	107.02	33.22	0.50
Tk Lower	Tk Lower	38201	25-year	660.00	1603.60	1608.50	1606.93	1608.92	0.006455	5.22	126.38	34.61	0.48
Tk Lower	Tk Lower	38201	50-year	774.00	1603.60	1608.94	1607.22	1609.40	0.006246	5.46	141.93	35.68	0.48
Tk Lower	Tk Lower	38201	100-year	876.00	1603.60	1609.19	1607.45	1609.72	0.006646	5.81	150.93	36.29	0.50
Tk Lower	Tk Lower	38201	500-year	1162.00	1603.60	1609.86	1608.09	1610.54	0.007138	6.62	185.12	78.15	0.53
Tk Lower	Tk Lower	37955	10-year	540.00	1599.53	1604.69	1603.74	1605.73	0.016388	8.23	69.65	21.23	0.69
Tk Lower	Tk Lower	37955	25-year	660.00	1599.53	1605.23	1604.33	1606.42	0.016910	8.86	81.54	27.94	0.71
Tk Lower	Tk Lower	37955	50-year	774.00	1599.53	1606.45	1604.80	1607.40	0.010509	8.00	111.66	65.02	0.58
Tk Lower	Tk Lower	37955	100-year	876.00	1599.53	1606.74	1605.29	1607.67	0.010260	8.16	161.64	99.33	0.57
Tk Lower	Tk Lower	37955	500-year	1162.00	1599.53	1607.50	1606.21	1608.45	0.009966	8.67	249.04	137.88	0.58
Tk Lower	Tk Lower	37897	10-year	540.00	1599.41	1604.43	1602.57	1604.87	0.006428	5.32	101.50	23.79	0.45
Tk Lower	Tk Lower	37897	25-year	660.00	1599.41	1604.98	1602.96	1605.49	0.006750	5.76	114.62	24.26	0.47
Tk Lower	Tk Lower	37897	50-year	774.00	1599.41	1606.35	1603.30	1606.76	0.004290	5.17	155.44	55.79	0.38
Tk Lower	Tk Lower	37897	100-year	876.00	1599.41	1606.57	1603.57	1607.05	0.004843	5.63	163.22	59.68	0.40
Tk Lower	Tk Lower	37897	500-year	1162.00	1599.41	1607.27	1604.37	1607.86	0.005321	6.35	230.59	87.06	0.43
Tk Lower	Tk Lower	37826		Bridge									
Tk Lower	Tk Lower	37806	10-year	540.00	1598.88	1603.37	1602.24	1603.76	0.007421	5.05	107.16	36.39	0.51
Tk Lower	Tk Lower	37806	25-year	660.00	1598.88	1603.93	1602.55	1604.35	0.006399	5.20	127.75	37.30	0.49
Tk Lower	Tk Lower	37806	50-year	774.00	1598.88	1604.43	1602.81	1604.88	0.005719	5.33	146.95	38.13	0.47
Tk Lower	Tk Lower	37806	100-year	876.00	1598.88	1604.88	1603.02	1605.33	0.005218	5.42	164.41	44.54	0.45
Tk Lower	Tk Lower	37806	500-year	1162.00	1598.88	1606.07	1603.58	1606.54	0.003967	5.54	253.19	134.40	0.41
Tk Lower	Tk Lower	37747	10-year	540.00	1597.86	1601.23	1601.23	1602.65	0.033743	9.54	56.63	19.89	1.00
Tk Lower	Tk Lower	37747	25-year	660.00	1597.86	1601.64	1601.64	1603.26	0.033659	10.18	64.81	20.00	1.00
Tk Lower	Tk Lower	37747	50-year	774.00	1597.86	1602.02	1602.02	1603.80	0.033424	10.70	72.34	20.11	0.99
Tk Lower	Tk Lower	37747	100-year	876.00	1597.86	1602.33	1602.33	1604.26	0.033462	11.13	78.67	20.20	0.99
Tk Lower	Tk Lower	37747	500-year	1162.00	1597.86	1603.15	1603.15	1605.46	0.033439	12.21	95.19	25.68	1.00
Tk Lower	Tk Lower	37601	10-year	540.00	1595.08	1600.27	1597.72	1600.30	0.000550	1.84	578.94	405.68	0.15
Tk Lower	Tk Lower	37601	25-year	660.00	1595.08	1600.49	1598.08	1600.52	0.000622	2.02	644.87	421.37	0.16
Tk Lower	Tk Lower	37601	50-year	774.00	1595.08	1600.70	1598.43	1600.74	0.000662	2.14	713.22	439.71	0.17
Tk Lower	Tk Lower	37601	100-year	876.00	1595.08	1600.90	1599.00	1600.94	0.000683	2.23	775.39	448.93	0.17
Tk Lower	Tk Lower	37601	500-year	1162.00	1595.08	1601.39	1599.30	1601.44	0.000725	2.44	944.41	481.47	0.18
Tk Lower	Tk Lower	37546	10-year	540.00	1595.00	1600.17	1597.49	1600.25	0.001173	2.63	321.07	242.42	0.21
Tk Lower	Tk Lower	37546	25-year	660.00	1595.00	1600.36	1597.84	1600.45	0.001402	2.95	350.90	265.45	0.23
Tk Lower	Tk Lower	37546	50-year	774.00	1595.00	1600.56	1598.15	1600.67	0.001541	3.18	383.51	298.78	0.24
Tk Lower	Tk Lower	37546	100-year	876.00	1595.00	1600.75	1598.44	1600.86	0.001619	3.33	416.72	313.59	0.25
Tk Lower	Tk Lower	37546	500-year	1162.00	1595.00	1601.22	1599.40	1601.35	0.001797	3.70	501.95	333.56	0.27
Tk Lower	Tk Lower	37465		Bridge									
Tk Lower	Tk Lower	37428	10-year	540.00	1595.00	1597.19	1597.19	1598.04	0.031871	7.40	72.96	42.26	0.99
Tk Lower	Tk Lower	37428	25-year	660.00	1595.00	1597.60	1597.46	1598.42	0.025472	7.27	90.84	59.70	0.91
Tk Lower	Tk Lower	37428	50-year	774.00	1595.00	1597.82	1597.69	1598.73	0.025764	7.66	101.04	133.20	0.92
Tk Lower	Tk Lower	37428	100-year	876.00	1595.00	1598.05	1597.89	1599.00	0.024465	7.82	112.06	183.16	0.91
Tk Lower	Tk Lower	37428	500-year	1162.00	1595.00	1598.53	1598.39	1599.66	0.024507	8.52	136.39	284.32	0.92
Tk Lower	Tk Lower	37389	10-year	580.00	1591.39	1597.01	1595.43	1597.35	0.005695	4.69	132.72	181.29	0.50
Tk Lower	Tk Lower	37389	25-year	720.00	1591.39	1597.42	1595.92	1597.78	0.005938	4.90	179.53	232.75	0.51
Tk Lower	Tk Lower	37389	50-year	834.00	1591.39	1597.64	1596.27	1598.03	0.006370	5.14	208.05	256.69	0.53
Tk Lower	Tk Lower	37389	100-year	956.00	1591.39	1597.89	1596.58	1598.30	0.006455	5.30	245.73	339.26	0.52
Tk Lower	Tk Lower	37389	500-year	1282.00	1591.39	1598.46	1597.52	1598.89	0.006308	5.61	354.80	454.26	0.51
Tk Lower	Tk Lower	36935	10-year	580.00	1588.53	1591.99	1591.99	1592.97	0.031723	7.93	73.13	36.99	0.99
Tk Lower	Tk Lower	36935	25-year	720.00	1588.53	1592.34	1592.34	1593.42	0.028400	8.32	89.92	58.36	0.96
Tk Lower	Tk Lower	36935	50-year	834.00	1588.53	1592.69	1592.69	1593.73	0.023720	8.28	113.25	74.40	0.90
Tk Lower	Tk Lower	36935	100-year	956.00	1588.53	1592.93	1592.93	1594.03	0.022750	8.55	131.25	74.53	0.89
Tk Lower	Tk Lower	36935	500-year	1282.00	1588.53	1593.45	1593.45	1594.73	0.022158	9.35	170.63	74.81	0.90
Tk Lower	Tk Lower	36867	10-year	580.00	1585.63	1590.53	1588.61	1590.82	0.002142	4.33	133.84	35.98	0.40
Tk Lower	Tk Lower	36867	25-year	720.00	1585.63	1591.07	1588.99	1591.41	0.002196	4.69	153.38	36.72	0.40
Tk Lower	Tk Lower	36867	50-year	834.00	1585.63	1591.48	1589.27	1591.86	0.002225	4.95	168.59	37.28	0.41
Tk Lower	Tk Lower	36867	100-year	956.00	1585.63	1591.96	1589.56	1592.37	0.002157	5.11	186.93	37.96	0.41
Tk Lower	Tk Lower	36867	500-year	1282.00	1585.63	1592.96	1590.20	1593.46	0.002249	5.69	225.34	39.33	0.42
Tk Lower	Tk Lower	36805		Bridge									
Tk Lower	Tk Lower	36737	10-year	580.00	1581.36	1586.41		1586.74	0.002747	4.61	125.72	38.59	0.45
Tk Lower	Tk Lower	36737	25-year	720.00	1581.36	1586.90		1587.28	0.002741	4.98	144.61	38.91	0.46
Tk Lower	Tk Lower	36737	50-year	834.00	1581.36	1587.27		1587.69	0.002751	5.25	159.06	48.16	0.46
Tk Lower	Tk Lower	36737	100-year	956.00	1581.36	1587.79		1588.23	0.002469	5.31	185.90	51.40	0.44
Tk Lower	Tk Lower	36737	500-year	1282.00	1581.36	1588.56		1589.13	0.002678	6.04	228.43	56.90	0.46

HEC-RAS Plan: Detention Pond Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Tk Lower	Tk Lower	36658	10-year	580.00	1581.36	1585.43	1584.95	1586.24	0.018811	7.24	80.13	31.19	0.80
Tk Lower	Tk Lower	36658	25-year	720.00	1581.36	1585.93	1585.40	1586.80	0.017050	7.48	96.26	32.80	0.77
Tk Lower	Tk Lower	36658	50-year	834.00	1581.36	1586.28	1585.71	1587.21	0.016056	7.71	108.13	33.30	0.75
Tk Lower	Tk Lower	36658	100-year	956.00	1581.36	1587.04	1585.97	1587.83	0.011157	7.16	133.58	34.34	0.64
Tk Lower	Tk Lower	36658	500-year	1282.00	1581.36	1587.89	1586.63	1588.73	0.010102	7.51	204.64	140.02	0.62

Managed Farm Practices Upstream of Hamlet 100-Year Storm



Managed Farm Practices Upstream of Hamlet

HEC-RAS Plan: Farming reduction Locations: User Defined

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk middle	Reach-1	41995	10-year	618.17	1649.40	1658.86		1658.94	0.000376	2.34	367.84	72.69	0.14
Tk middle	Reach-1	41995	25-year	806.81	1649.40	1659.65		1659.75	0.000450	2.72	425.38	73.34	0.16
Tk middle	Reach-1	41995	50-year	977.50	1649.40	1660.31		1660.43	0.000504	3.01	473.56	73.88	0.17
Tk middle	Reach-1	41995	100-year	1144.85	1649.40	1660.88		1661.02	0.000555	3.27	515.87	74.36	0.18
Tk middle	Reach-1	41995	500-year	1588.20	1649.40	1662.13		1662.33	0.000688	3.93	609.66	75.39	0.20
Tk middle	Reach-1	41497	10-year	618.17	1642.25	1658.89		1658.90	0.000016	0.59	1570.59	147.65	0.03
Tk middle	Reach-1	41497	25-year	806.81	1642.25	1659.69		1659.69	0.000022	0.72	1688.57	148.82	0.03
Tk middle	Reach-1	41497	50-year	977.50	1642.25	1660.35		1660.36	0.000027	0.83	1787.26	149.79	0.04
Tk middle	Reach-1	41497	100-year	1144.85	1642.25	1660.93		1660.94	0.000032	0.93	1874.04	150.64	0.04
Tk middle	Reach-1	41497	500-year	1588.20	1642.25	1662.20		1662.21	0.000046	1.17	2066.78	152.50	0.05
Tk middle	Reach-1	41367	10-year	618.17	1652.32	1658.59		1658.86	0.002868	4.20	168.52	80.06	0.34
Tk middle	Reach-1	41367	25-year	806.81	1652.32	1659.34		1659.65	0.002791	4.57	233.07	87.06	0.34
Tk middle	Reach-1	41367	50-year	977.50	1652.32	1659.98		1660.31	0.002680	4.82	289.89	95.75	0.34
Tk middle	Reach-1	41367	100-year	1144.85	1652.32	1660.53		1660.89	0.002596	5.03	344.27	97.84	0.34
Tk middle	Reach-1	41367	500-year	1588.20	1652.32	1661.74		1662.16	0.002572	5.59	462.14	97.84	0.35
Tk middle	Reach-1	41242	10-year	618.17	1652.62	1656.56	1656.56	1657.95	0.023786	9.81	83.07	37.88	0.97
Tk middle	Reach-1	41242	25-year	806.81	1652.62	1657.13	1657.13	1658.74	0.022687	10.69	103.69	52.67	0.97
Tk middle	Reach-1	41242	50-year	977.50	1652.62	1657.57	1657.57	1659.41	0.022511	11.46	120.76	59.12	0.99
Tk middle	Reach-1	41242	100-year	1144.85	1652.62	1658.08	1658.08	1660.01	0.020575	11.83	143.20	76.43	0.96
Tk middle	Reach-1	41242	500-year	1588.20	1652.62	1659.45	1659.45	1661.35	0.015151	12.04	240.33	159.54	0.86
Tk middle	Reach-1	41210	10-year	618.17	1652.11	1656.75	1654.83	1657.08	0.003717	4.63	133.57	59.53	0.40
Tk middle	Reach-1	41210	25-year	806.81	1652.11	1657.39	1655.26	1657.82	0.003947	5.24	153.91	65.90	0.42
Tk middle	Reach-1	41210	50-year	977.50	1652.11	1657.94	1655.65	1658.45	0.004040	5.70	171.50	72.69	0.43
Tk middle	Reach-1	41210	100-year	1144.85	1652.11	1658.45	1655.98	1659.03	0.004100	6.10	187.71	88.84	0.44
Tk middle	Reach-1	41210	500-year	1588.20	1652.11	1659.69	1656.81	1660.45	0.004179	6.99	227.15	120.17	0.46
Tk middle	Reach-1	41170		Bridge									
Tk middle	Reach-1	41135	10-year	618.17	1651.65	1655.20	1655.05	1656.23	0.022441	8.14	75.99	60.13	0.91
Tk middle	Reach-1	41135	25-year	806.81	1651.65	1655.91	1655.50	1656.97	0.016715	8.28	97.39	90.31	0.81
Tk middle	Reach-1	41135	50-year	977.50	1651.65	1656.51	1655.87	1657.62	0.013846	8.45	115.63	105.97	0.76
Tk middle	Reach-1	41135	100-year	1144.85	1651.65	1656.99	1656.24	1658.19	0.012787	8.79	130.20	117.89	0.75
Tk middle	Reach-1	41135	500-year	1588.20	1651.65	1658.15	1657.11	1659.58	0.011110	9.61	165.28	130.93	0.73
Tk Lower	Tk Lower	41106	10-year	686.37	1651.19	1655.06	1653.99	1655.65	0.007945	6.24	124.96	60.57	0.58
Tk Lower	Tk Lower	41106	25-year	900.61	1651.19	1655.79	1654.48	1656.48	0.007315	6.76	156.93	69.51	0.57
Tk Lower	Tk Lower	41106	50-year	1093.50	1651.19	1656.42	1654.90	1657.17	0.006799	7.12	185.82	75.35	0.56
Tk Lower	Tk Lower	41106	100-year	1284.85	1651.19	1656.91	1655.31	1657.75	0.006793	7.58	209.25	81.07	0.57
Tk Lower	Tk Lower	41106	500-year	1787.20	1651.19	1658.09	1656.22	1659.15	0.006657	8.54	269.02	94.96	0.58
Tk Lower	Tk Lower	41100	10-year	710.17	1648.76	1653.66	1653.54	1654.98	0.026540	9.23	76.98	51.52	0.94
Tk Lower	Tk Lower	41100	25-year	927.81	1648.76	1654.15	1654.15	1655.80	0.028788	10.29	90.19	56.57	1.00
Tk Lower	Tk Lower	41100	50-year	1137.50	1648.76	1654.68	1654.68	1656.51	0.028225	10.85	104.85	60.54	1.00
Tk Lower	Tk Lower	41100	100-year	1324.85	1648.76	1655.11	1655.11	1657.09	0.027813	11.28	117.44	63.68	1.00
Tk Lower	Tk Lower	41100	500-year	1838.20	1648.76	1656.18	1656.18	1658.49	0.026634	12.19	150.77	74.17	1.00
Tk Lower	Tk Lower	41080	10-year	710.17	1649.40	1653.09	1653.09	1654.44	0.026817	9.33	78.63	31.18	0.99
Tk Lower	Tk Lower	41080	25-year	927.81	1649.40	1653.63	1653.63	1655.22	0.025055	10.16	95.81	32.52	0.98
Tk Lower	Tk Lower	41080	50-year	1137.50	1649.40	1654.11	1654.11	1655.90	0.023851	10.84	111.55	33.70	0.98
Tk Lower	Tk Lower	41080	100-year	1324.85	1649.40	1654.51	1654.51	1656.48	0.022972	11.37	125.21	34.69	0.98
Tk Lower	Tk Lower	41080	500-year	1838.20	1649.40	1655.48	1655.48	1657.90	0.021519	12.66	160.30	37.11	0.98
Tk Lower	Tk Lower	40662	10-year	710.17	1642.25	1648.19		1648.43	0.002727	3.96	179.34	38.91	0.33
Tk Lower	Tk Lower	40662	25-year	927.81	1642.25	1648.48		1648.85	0.003855	4.86	190.98	41.21	0.39
Tk Lower	Tk Lower	40662	50-year	1137.50	1642.25	1648.90		1649.37	0.004480	5.48	209.13	49.98	0.42
Tk Lower	Tk Lower	40662	100-year	1324.85	1642.25	1649.21		1649.77	0.005057	6.01	228.70	76.46	0.45
Tk Lower	Tk Lower	40662	500-year	1838.20	1642.25	1649.97		1650.74	0.006190	7.14	305.89	125.64	0.51
Tk Lower	Tk Lower	40428	10-year	710.17	1641.79	1645.46	1645.46	1646.82	0.029280	9.36	75.84	71.85	1.00
Tk Lower	Tk Lower	40428	25-year	927.81	1641.79	1646.33	1646.33	1647.20	0.015460	7.98	181.86	135.35	0.75
Tk Lower	Tk Lower	40428	50-year	1137.50	1641.79	1646.66	1646.66	1647.56	0.015160	8.39	228.27	147.61	0.76
Tk Lower	Tk Lower	40428	100-year	1324.85	1641.79	1646.91	1646.91	1647.84	0.014967	8.70	266.04	158.70	0.76
Tk Lower	Tk Lower	40428	500-year	1838.20	1641.79	1647.42	1647.42	1648.50	0.016204	9.79	348.30	165.84	0.81
Tk Lower	Tk Lower	40382	10-year	710.17	1635.54	1642.63	1639.76	1642.94	0.003445	4.46	159.22	31.93	0.35
Tk Lower	Tk Lower	40382	25-year	927.81	1635.54	1643.52	1640.34	1643.90	0.003610	4.93	188.34	33.60	0.37
Tk Lower	Tk Lower	40382	50-year	1137.50	1635.54	1644.30	1640.83	1644.74	0.003524	5.31	215.22	40.54	0.37
Tk Lower	Tk Lower	40382	100-year	1324.85	1635.54	1644.96	1641.27	1645.44	0.003400	5.56	258.58	95.02	0.37
Tk Lower	Tk Lower	40382	500-year	1838.20	1635.54	1646.65	1642.31	1647.10	0.002665	5.68	469.01	145.69	0.34
Tk Lower	Tk Lower	40336		Bridge									
Tk Lower	Tk Lower	40303	10-year	710.17	1635.51	1641.94	1639.10	1642.24	0.003300	4.41	161.15	32.15	0.35
Tk Lower	Tk Lower	40303	25-year	927.81	1635.51	1642.66	1639.63	1643.05	0.003825	5.02	184.76	33.43	0.38
Tk Lower	Tk Lower	40303	50-year	1137.50	1635.51	1643.29	1640.14	1643.77	0.004107	5.52	206.17	47.48	0.40
Tk Lower	Tk Lower	40303	100-year	1324.85	1635.51	1643.82	1640.52	1644.35	0.004134	5.85	254.70	127.55	0.40
Tk Lower	Tk Lower	40303	500-year	1838.20	1635.51	1645.34	1641.57	1645.78	0.003001	5.73	513.57	184.55	0.35

HEC-RAS Plan: Farming reduction Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	40237	10-year	710.17	1635.93	1641.53	1639.73	1641.95	0.004846	5.22	139.18	96.79	0.44
Tk Lower	Tk Lower	40237	25-year	927.81	1635.93	1642.19	1640.24	1642.72	0.005116	5.89	162.36	124.73	0.47
Tk Lower	Tk Lower	40237	50-year	1137.50	1635.93	1642.77	1640.68	1643.41	0.005269	6.44	183.49	169.20	0.48
Tk Lower	Tk Lower	40237	100-year	1324.85	1635.93	1643.24	1641.06	1643.97	0.005426	6.90	200.72	173.11	0.50
Tk Lower	Tk Lower	40237	500-year	1838.20	1635.93	1644.36	1641.99	1645.35	0.005847	8.03	242.98	180.90	0.53
Tk Lower	Tk Lower	40196	10-year	710.17	1633.78	1641.56	1637.73	1641.73	0.001349	3.35	228.28	151.15	0.24
Tk Lower	Tk Lower	40196	25-year	927.81	1633.78	1642.23	1638.24	1642.46	0.001606	3.92	258.83	159.95	0.27
Tk Lower	Tk Lower	40196	50-year	1137.50	1633.78	1642.83	1638.69	1643.12	0.001802	4.40	286.61	167.80	0.28
Tk Lower	Tk Lower	40196	100-year	1324.85	1633.78	1643.31	1639.05	1643.65	0.001966	4.79	309.27	174.10	0.30
Tk Lower	Tk Lower	40196	500-year	1838.20	1633.78	1644.46	1639.97	1644.96	0.002359	5.74	364.79	184.91	0.34
Tk Lower	Tk Lower	40151		Bridge									
Tk Lower	Tk Lower	40111	10-year	710.17	1633.65	1637.69	1637.69	1638.85	0.030936	8.64	82.22	35.88	1.01
Tk Lower	Tk Lower	40111	25-year	927.81	1633.65	1638.17	1638.17	1639.52	0.029269	9.30	99.76	46.40	1.00
Tk Lower	Tk Lower	40111	50-year	1137.50	1633.65	1638.60	1638.60	1640.10	0.027029	9.82	116.93	82.11	0.98
Tk Lower	Tk Lower	40111	100-year	1324.85	1633.65	1638.98	1638.98	1640.57	0.024802	10.15	134.02	93.36	0.96
Tk Lower	Tk Lower	40111	500-year	1838.20	1633.65	1639.79	1639.79	1641.75	0.023317	11.31	171.02	119.69	0.96
Tk Lower	Tk Lower	40047	10-year	710.17	1631.79	1636.19	1635.12	1636.70	0.009139	5.72	124.17	40.66	0.58
Tk Lower	Tk Lower	40047	25-year	927.81	1631.79	1636.76	1635.60	1637.37	0.009423	6.27	148.01	43.02	0.60
Tk Lower	Tk Lower	40047	50-year	1137.50	1631.79	1637.24	1636.03	1637.94	0.009357	6.73	173.80	71.49	0.60
Tk Lower	Tk Lower	40047	100-year	1324.85	1631.79	1637.60	1636.36	1638.37	0.009243	7.11	202.16	85.74	0.61
Tk Lower	Tk Lower	40047	500-year	1838.20	1631.79	1638.46	1637.32	1639.36	0.008809	7.85	290.03	131.29	0.61
Tk Lower	Tk Lower	39767	10-year	710.17	1629.09	1633.80	1632.63	1634.28	0.008158	5.54	128.14	39.75	0.54
Tk Lower	Tk Lower	39767	25-year	927.81	1629.09	1634.54	1633.09	1635.07	0.007067	5.88	158.77	47.82	0.52
Tk Lower	Tk Lower	39767	50-year	1137.50	1629.09	1635.08	1633.50	1635.69	0.006800	6.29	193.00	77.82	0.52
Tk Lower	Tk Lower	39767	100-year	1324.85	1629.09	1635.51	1633.83	1636.17	0.006577	6.58	228.54	82.91	0.52
Tk Lower	Tk Lower	39767	500-year	1838.20	1629.09	1636.29	1634.70	1637.13	0.007149	7.57	319.11	179.18	0.56
Tk Lower	Tk Lower	39518	10-year	710.17	1626.68	1631.09	1630.25	1631.77	0.012462	6.61	107.38	35.16	0.67
Tk Lower	Tk Lower	39518	25-year	927.81	1626.68	1631.18	1630.79	1632.27	0.019553	8.39	110.65	35.54	0.84
Tk Lower	Tk Lower	39518	50-year	1137.50	1626.68	1631.53	1631.25	1632.85	0.021241	9.23	123.42	38.71	0.88
Tk Lower	Tk Lower	39518	100-year	1324.85	1626.68	1631.80	1631.61	1633.33	0.022118	9.92	134.78	43.40	0.91
Tk Lower	Tk Lower	39518	500-year	1838.20	1626.68	1632.93	1632.93	1634.47	0.016210	10.16	208.52	102.97	0.82
Tk Lower	Tk Lower	39267	10-year	710.17	1622.32	1625.87	1625.87	1627.16	0.029044	9.10	78.02	29.99	0.99
Tk Lower	Tk Lower	39267	25-year	927.81	1622.32	1626.85	1626.85	1627.82	0.016014	8.13	133.61	81.97	0.77
Tk Lower	Tk Lower	39267	50-year	1137.50	1622.32	1627.20	1627.20	1628.23	0.015656	8.54	162.82	82.38	0.77
Tk Lower	Tk Lower	39267	100-year	1324.85	1622.32	1627.46	1627.46	1628.55	0.015857	8.97	183.64	82.76	0.78
Tk Lower	Tk Lower	39267	500-year	1838.20	1622.32	1628.32	1628.32	1629.27	0.011885	8.83	296.26	373.55	0.70
Tk Lower	Tk Lower	38971	10-year	710.17	1617.20	1622.05	1620.54	1622.19	0.002332	3.47	292.64	301.49	0.31
Tk Lower	Tk Lower	38971	25-year	927.81	1617.20	1622.55	1620.98	1622.70	0.002156	3.61	368.22	322.38	0.30
Tk Lower	Tk Lower	38971	50-year	1137.50	1617.20	1622.88	1621.43	1623.05	0.002267	3.88	418.41	326.79	0.31
Tk Lower	Tk Lower	38971	100-year	1324.85	1617.20	1623.24	1621.67	1623.41	0.002207	4.01	472.52	334.22	0.31
Tk Lower	Tk Lower	38971	500-year	1838.20	1617.20	1624.39	1622.09	1624.55	0.001654	3.97	658.13	361.42	0.28
Tk Lower	Tk Lower	38901	10-year	710.17	1615.56	1621.55	1619.24	1621.91	0.004125	5.03	212.19	169.98	0.39
Tk Lower	Tk Lower	38901	25-year	927.81	1615.56	1621.90	1619.86	1622.38	0.005258	5.92	261.91	224.67	0.44
Tk Lower	Tk Lower	38901	50-year	1137.50	1615.56	1621.91	1620.81	1622.62	0.007807	7.22	264.14	225.94	0.54
Tk Lower	Tk Lower	38901	100-year	1324.85	1615.56	1621.93	1621.24	1622.89	0.010450	8.38	267.80	227.73	0.62
Tk Lower	Tk Lower	38901	500-year	1838.20	1615.56	1623.89	1622.45	1624.31	0.004034	6.36	613.61	387.04	0.41
Tk Lower	Tk Lower	38846		Bridge									
Tk Lower	Tk Lower	38818	10-year	710.17	1615.10	1620.47	1618.53	1620.83	0.005095	5.11	244.11	245.73	0.41
Tk Lower	Tk Lower	38818	25-year	927.81	1615.10	1621.27	1619.12	1621.52	0.003422	4.65	435.25	357.46	0.35
Tk Lower	Tk Lower	38818	50-year	1137.50	1615.10	1621.30	1620.53	1621.66	0.004988	5.63	442.35	361.29	0.42
Tk Lower	Tk Lower	38818	100-year	1324.85	1615.10	1621.73	1620.78	1622.04	0.004331	5.51	561.95	440.92	0.40
Tk Lower	Tk Lower	38818	500-year	1838.20	1615.10	1622.36	1621.31	1622.70	0.004627	6.09	757.87	491.23	0.42
Tk Lower	Tk Lower	38749	10-year	710.17	1614.05	1620.25	1617.77	1620.52	0.002952	4.27	190.52	161.81	0.35
Tk Lower	Tk Lower	38749	25-year	927.81	1614.05	1621.10	1618.33	1621.32	0.002159	4.09	335.12	307.05	0.31
Tk Lower	Tk Lower	38749	50-year	1137.50	1614.05	1620.99	1618.82	1621.37	0.003656	5.26	310.94	299.42	0.40
Tk Lower	Tk Lower	38749	100-year	1324.85	1614.05	1621.50	1619.22	1621.79	0.002853	4.93	435.96	372.13	0.36
Tk Lower	Tk Lower	38749	500-year	1838.20	1614.05	1622.13	1621.01	1622.43	0.002861	5.29	643.36	461.64	0.37
Tk Lower	Tk Lower	38683		Bridge									
Tk Lower	Tk Lower	38674	10-year	710.17	1613.24	1617.41	1616.36	1617.89	0.009065	5.59	127.09	42.56	0.57
Tk Lower	Tk Lower	38674	25-year	927.81	1613.24	1618.08	1616.83	1618.63	0.008366	5.93	156.49	293.99	0.56
Tk Lower	Tk Lower	38674	50-year	1137.50	1613.24	1618.70	1617.21	1619.28	0.007337	6.11	210.15	418.17	0.53
Tk Lower	Tk Lower	38674	100-year	1324.85	1613.24	1619.26	1617.56	1619.75	0.005824	5.87	324.64	505.91	0.48
Tk Lower	Tk Lower	38674	500-year	1838.20	1613.24	1620.23	1618.56	1620.62	0.004267	5.63	571.45	557.07	0.42
Tk Lower	Tk Lower	38580	10-year	710.17	1610.59	1614.83	1614.83	1616.21	0.029378	9.45	75.28	28.14	1.01
Tk Lower	Tk Lower	38580	25-year	927.81	1610.59	1615.39	1615.39	1617.01	0.026724	10.22	91.62	29.52	0.99

HEC-RAS Plan: Farming reduction Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	38580	50-year	1137.50	1610.59	1615.87	1615.87	1617.72	0.025542	10.93	105.99	30.68	0.99
Tk Lower	Tk Lower	38580	100-year	1324.85	1610.59	1616.30	1616.30	1618.31	0.024099	11.41	119.99	99.57	0.98
Tk Lower	Tk Lower	38580	500-year	1838.20	1610.59	1617.85	1617.85	1619.55	0.014344	10.84	239.30	317.56	0.80
Tk Lower	Tk Lower	38201	10-year	710.17	1603.60	1608.67	1607.06	1609.12	0.006486	5.36	132.46	35.03	0.49
Tk Lower	Tk Lower	38201	25-year	927.81	1603.60	1609.34	1607.58	1609.89	0.006698	5.94	156.30	39.07	0.50
Tk Lower	Tk Lower	38201	50-year	1137.50	1603.60	1609.82	1608.00	1610.48	0.007017	6.53	182.46	75.10	0.53
Tk Lower	Tk Lower	38201	100-year	1324.85	1603.60	1610.05	1608.41	1610.85	0.008097	7.23	201.47	96.27	0.57
Tk Lower	Tk Lower	38201	500-year	1838.20	1603.60	1610.86	1609.36	1611.88	0.008686	8.28	296.81	189.48	0.60
Tk Lower	Tk Lower	37955	10-year	710.17	1599.53	1606.34	1604.56	1607.17	0.009504	7.51	108.48	64.10	0.55
Tk Lower	Tk Lower	37955	25-year	927.81	1599.53	1606.87	1605.46	1607.82	0.010365	8.31	175.18	104.35	0.58
Tk Lower	Tk Lower	37955	50-year	1137.50	1599.53	1607.40	1606.14	1608.38	0.010321	8.74	235.57	129.93	0.59
Tk Lower	Tk Lower	37955	100-year	1324.85	1599.53	1608.11	1606.60	1608.87	0.007916	8.17	333.55	143.34	0.52
Tk Lower	Tk Lower	37955	500-year	1838.20	1599.53	1609.30	1608.24	1609.94	0.006422	8.11	502.17	190.80	0.48
Tk Lower	Tk Lower	37897	10-year	710.17	1599.41	1606.24	1603.12	1606.60	0.003837	4.84	151.84	55.26	0.36
Tk Lower	Tk Lower	37897	25-year	927.81	1599.41	1606.72	1603.75	1607.20	0.004724	5.65	195.55	62.41	0.40
Tk Lower	Tk Lower	37897	50-year	1137.50	1599.41	1607.17	1604.31	1607.75	0.005387	6.33	224.61	83.52	0.43
Tk Lower	Tk Lower	37897	100-year	1324.85	1599.41	1607.85	1604.78	1608.42	0.004866	6.41	297.84	150.06	0.42
Tk Lower	Tk Lower	37897	500-year	1838.20	1599.41	1609.03	1606.06	1609.60	0.004458	6.77	493.21	174.91	0.41
Tk Lower	Tk Lower	37826		Bridge									
Tk Lower	Tk Lower	37806	10-year	710.17	1598.88	1604.15	1602.67	1604.58	0.006081	5.26	136.18	37.67	0.48
Tk Lower	Tk Lower	37806	25-year	927.81	1598.88	1605.11	1603.12	1605.57	0.004947	5.46	175.72	54.99	0.44
Tk Lower	Tk Lower	37806	50-year	1137.50	1598.88	1605.97	1603.54	1606.44	0.004071	5.55	241.56	118.95	0.41
Tk Lower	Tk Lower	37806	100-year	1324.85	1598.88	1606.76	1603.88	1607.18	0.003253	5.41	346.27	212.61	0.38
Tk Lower	Tk Lower	37806	500-year	1838.20	1598.88	1608.85	1604.72	1609.07	0.001469	4.40	856.32	246.64	0.27
Tk Lower	Tk Lower	37747	10-year	710.17	1597.86	1601.82	1601.82	1603.50	0.033417	10.40	68.25	20.05	0.99
Tk Lower	Tk Lower	37747	25-year	927.81	1597.86	1602.47	1602.47	1604.49	0.034016	11.40	81.37	20.23	1.00
Tk Lower	Tk Lower	37747	50-year	1137.50	1597.86	1603.08	1603.08	1605.36	0.033538	12.13	93.80	24.67	1.00
Tk Lower	Tk Lower	37747	100-year	1324.85	1597.86	1603.56	1603.56	1606.10	0.033457	12.79	103.64	60.05	1.00
Tk Lower	Tk Lower	37747	500-year	1838.20	1597.86	1604.82	1604.82	1607.96	0.032609	14.21	129.82	198.41	0.99
Tk Lower	Tk Lower	37601	10-year	710.17	1595.08	1600.58	1598.25	1600.62	0.000636	2.07	676.34	432.10	0.16
Tk Lower	Tk Lower	37601	25-year	927.81	1595.08	1600.99	1599.06	1601.03	0.000704	2.29	806.89	466.48	0.17
Tk Lower	Tk Lower	37601	50-year	1137.50	1595.08	1601.36	1599.30	1601.40	0.000717	2.42	933.56	481.07	0.18
Tk Lower	Tk Lower	37601	100-year	1324.85	1595.08	1601.65	1599.44	1601.70	0.000730	2.52	1036.24	494.16	0.18
Tk Lower	Tk Lower	37601	500-year	1838.20	1595.08	1601.89	1599.80	1601.94	0.000746	2.62	1426.36	514.46	0.18
Tk Lower	Tk Lower	37546	10-year	710.17	1595.00	1600.45	1597.97	1600.55	0.001461	3.05	365.71	280.53	0.23
Tk Lower	Tk Lower	37546	25-year	927.81	1595.00	1600.84	1598.58	1600.95	0.001656	3.40	432.95	316.74	0.25
Tk Lower	Tk Lower	37546	50-year	1137.50	1595.00	1601.19	1599.39	1601.32	0.001767	3.66	496.87	332.51	0.26
Tk Lower	Tk Lower	37546	100-year	1324.85	1595.00	1601.47	1599.74	1601.61	0.001863	3.87	547.87	340.46	0.27
Tk Lower	Tk Lower	37546	500-year	1838.20	1595.00	1601.53	1600.15	1601.80	0.003394	5.27	559.41	345.23	0.37
Tk Lower	Tk Lower	37465		Bridge									
Tk Lower	Tk Lower	37428	10-year	710.17	1595.00	1597.65	1597.57	1598.55	0.027504	7.63	93.11	71.09	0.95
Tk Lower	Tk Lower	37428	25-year	927.81	1595.00	1598.09	1597.97	1599.12	0.026125	8.14	113.99	192.23	0.94
Tk Lower	Tk Lower	37428	50-year	1137.50	1595.00	1598.38	1598.35	1599.60	0.027917	8.86	128.38	258.69	0.98
Tk Lower	Tk Lower	37428	100-year	1324.85	1595.00	1599.18	1598.63	1599.37	0.005102	4.30	497.16	423.89	0.43
Tk Lower	Tk Lower	37428	500-year	1838.20	1595.00	1599.90	1599.12	1600.01	0.002828	3.65	849.28	572.57	0.33
Tk Lower	Tk Lower	37389	10-year	750.17	1591.39	1597.49	1596.02	1597.85	0.006020	4.95	188.02	235.32	0.51
Tk Lower	Tk Lower	37389	25-year	987.81	1591.39	1597.96	1596.65	1598.37	0.006399	5.32	257.97	354.14	0.52
Tk Lower	Tk Lower	37389	50-year	1197.50	1591.39	1598.33	1597.37	1598.75	0.006353	5.53	326.86	431.09	0.51
Tk Lower	Tk Lower	37389	100-year	1404.85	1591.39	1598.62	1597.71	1599.06	0.006423	5.78	389.37	495.57	0.52
Tk Lower	Tk Lower	37389	500-year	1958.20	1591.39	1599.20	1598.38	1599.72	0.007066	6.51	519.44	604.26	0.54
Tk Lower	Tk Lower	36935	10-year	750.17	1588.53	1592.43	1592.43	1593.50	0.027358	8.34	95.02	63.55	0.95
Tk Lower	Tk Lower	36935	25-year	987.81	1588.53	1592.97	1592.97	1594.10	0.023055	8.69	134.36	74.55	0.90
Tk Lower	Tk Lower	36935	50-year	1197.50	1588.53	1593.32	1593.32	1594.56	0.022347	9.17	160.74	74.74	0.90
Tk Lower	Tk Lower	36935	100-year	1404.85	1588.53	1593.71	1593.62	1594.97	0.020518	9.40	189.40	74.94	0.87
Tk Lower	Tk Lower	36935	500-year	1958.20	1588.53	1594.87	1594.42	1596.00	0.014069	9.19	302.50	177.75	0.75
Tk Lower	Tk Lower	36867	10-year	750.17	1585.63	1591.17	1589.06	1591.52	0.002217	4.77	157.16	36.86	0.41
Tk Lower	Tk Lower	36867	25-year	987.81	1585.63	1592.00	1589.63	1592.43	0.002253	5.25	188.33	38.01	0.42
Tk Lower	Tk Lower	36867	50-year	1197.50	1585.63	1592.72	1590.05	1593.20	0.002217	5.54	216.06	39.00	0.42
Tk Lower	Tk Lower	36867	100-year	1404.85	1585.63	1593.39	1590.43	1593.91	0.002171	5.80	242.67	43.22	0.41
Tk Lower	Tk Lower	36867	500-year	1958.20	1585.63	1594.34	1591.37	1595.09	0.002635	6.94	319.36	295.45	0.46
Tk Lower	Tk Lower	36805		Bridge									
Tk Lower	Tk Lower	36737	10-year	750.17	1581.36	1586.98		1587.38	0.002786	5.08	147.73	38.97	0.46
Tk Lower	Tk Lower	36737	25-year	987.81	1581.36	1587.69		1588.18	0.002831	5.62	180.58	51.16	0.47
Tk Lower	Tk Lower	36737	50-year	1197.50	1581.36	1588.38		1588.91	0.002629	5.86	217.85	56.56	0.46
Tk Lower	Tk Lower	36737	100-year	1404.85	1581.36	1588.71		1589.35	0.002934	6.43	236.98	57.18	0.49
Tk Lower	Tk Lower	36737	500-year	1958.20	1581.36	1589.11		1590.17	0.004517	8.32	259.94	57.91	0.61

HEC-RAS Plan: Farming reduction Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Tk Lower	Tk Lower	36658	10-year	750.17	1581.36	1585.92	1585.49	1586.87	0.018549	7.80	96.19	32.80	0.80
Tk Lower	Tk Lower	36658	25-year	987.81	1581.36	1586.57	1586.04	1587.66	0.017479	8.40	117.58	33.69	0.79
Tk Lower	Tk Lower	36658	50-year	1197.50	1581.36	1587.49	1586.46	1588.47	0.012380	7.96	158.75	91.61	0.68
Tk Lower	Tk Lower	36658	100-year	1404.85	1581.36	1587.96	1586.88	1588.91	0.011417	8.04	214.12	148.05	0.66
Tk Lower	Tk Lower	36658	500-year	1958.20	1581.36	1588.80	1588.60	1589.60	0.009040	7.96	362.18	197.59	0.60

Floodplain Conveyance Through Andes - Tremper Kill 100-Year Storm



Floodplain Conveyance Through Andes - Tremper Kill

HEC-RAS Plan: Alt 4 Locations: User Defined

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk middle	Reach-1	41995	10-year	654.00	1649.40	1659.02		1659.10	0.000391	2.42	379.45	72.82	0.14
Tk middle	Reach-1	41995	25-year	879.00	1649.40	1659.93		1660.04	0.000475	2.85	445.61	73.57	0.16
Tk middle	Reach-1	41995	50-year	1070.00	1649.40	1660.63		1660.76	0.000533	3.16	497.23	74.15	0.17
Tk middle	Reach-1	41995	100-year	1270.00	1649.40	1661.29		1661.44	0.000587	3.45	546.62	74.70	0.18
Tk middle	Reach-1	41995	500-year	1780.00	1649.40	1662.12		1662.36	0.000868	4.41	608.74	75.38	0.23
Tk middle	Reach-1	41497	10-year	654.00	1642.25	1659.05		1659.06	0.000017	0.62	1594.38	147.89	0.03
Tk middle	Reach-1	41497	25-year	879.00	1642.25	1659.97		1659.97	0.000024	0.77	1730.04	149.23	0.04
Tk middle	Reach-1	41497	50-year	1070.00	1642.25	1660.67		1660.68	0.000030	0.88	1835.81	150.26	0.04
Tk middle	Reach-1	41497	100-year	1270.00	1642.25	1661.35		1661.36	0.000035	1.00	1937.02	151.25	0.04
Tk middle	Reach-1	41497	500-year	1780.00	1642.25	1662.21		1662.22	0.000057	1.31	2067.67	152.51	0.06
Tk middle	Reach-1	41367	10-year	654.00	1652.32	1658.74		1659.02	0.002862	4.28	181.13	85.63	0.34
Tk middle	Reach-1	41367	25-year	879.00	1652.32	1659.61		1659.93	0.002757	4.69	256.24	87.93	0.34
Tk middle	Reach-1	41367	50-year	1070.00	1652.32	1660.29		1660.64	0.002635	4.94	320.25	97.84	0.34
Tk middle	Reach-1	41367	100-year	1270.00	1652.32	1660.94		1661.31	0.002521	5.15	383.94	97.84	0.34
Tk middle	Reach-1	41367	500-year	1780.00	1652.32	1661.60		1662.15	0.003477	6.42	448.03	97.84	0.41
Tk middle	Reach-1	41242	10-year	654.00	1652.62	1656.67	1656.67	1658.10	0.023622	10.00	86.95	40.12	0.97
Tk middle	Reach-1	41242	25-year	879.00	1652.62	1657.34	1657.34	1659.03	0.022104	10.95	111.86	55.48	0.97
Tk middle	Reach-1	41242	50-year	1070.00	1652.62	1657.88	1657.88	1659.75	0.020889	11.59	134.04	67.88	0.96
Tk middle	Reach-1	41242	100-year	1270.00	1652.62	1658.60	1658.60	1660.48	0.017503	11.71	174.61	104.08	0.90
Tk middle	Reach-1	41242	500-year	1780.00	1652.62	1660.15	1660.14	1661.38	0.009853	10.44	459.72	213.61	0.71
Tk middle	Reach-1	41210	10-year	654.00	1652.11	1656.90	1654.91	1657.25	0.003693	4.72	138.43	60.92	0.40
Tk middle	Reach-1	41210	25-year	879.00	1652.11	1657.68	1655.43	1658.13	0.003863	5.39	163.08	69.40	0.42
Tk middle	Reach-1	41210	50-year	1070.00	1652.11	1658.30	1655.83	1658.83	0.003923	5.86	182.66	81.42	0.43
Tk middle	Reach-1	41210	100-year	1270.00	1652.11	1658.88	1656.24	1659.50	0.004004	6.31	201.21	94.89	0.44
Tk middle	Reach-1	41210	500-year	1780.00	1652.11	1660.24	1657.15	1661.06	0.004113	7.28	244.39	164.17	0.46
Tk middle	Reach-1	41170		Bridge									
Tk middle	Reach-1	41135	10-year	654.00	1651.65	1655.19	1655.11	1656.35	0.025323	8.63	75.80	60.01	0.96
Tk middle	Reach-1	41135	25-year	879.00	1651.65	1655.72	1655.67	1657.15	0.024278	9.59	91.67	83.51	0.97
Tk middle	Reach-1	41135	50-year	1070.00	1651.65	1656.08	1656.07	1657.77	0.024637	10.42	102.70	94.20	1.00
Tk middle	Reach-1	41135	100-year	1270.00	1651.65	1656.49	1656.49	1658.38	0.023658	11.02	115.21	105.65	1.00
Tk middle	Reach-1	41135	500-year	1780.00	1651.65	1657.44	1657.44	1659.82	0.022125	12.37	143.94	122.73	1.00
Tk Lower	Tk Lower	41106	10-year	722.20	1651.19	1655.10		1655.69	0.008016	6.32	147.39	60.46	0.58
Tk Lower	Tk Lower	41106	25-year	972.80	1651.19	1655.66		1656.43	0.008765	7.26	182.97	67.02	0.62
Tk Lower	Tk Lower	41106	50-year	1186.00	1651.19	1656.03	1655.12	1656.98	0.009909	8.15	208.41	89.94	0.67
Tk Lower	Tk Lower	41106	100-year	1410.00	1651.19	1656.25	1655.52	1657.44	0.011706	9.13	228.49	92.02	0.73
Tk Lower	Tk Lower	41106	500-year	1979.00	1651.19	1657.31	1656.62	1658.65	0.010620	9.94	332.93	103.83	0.72
Tk Lower	Tk Lower	41100	10-year	746.00	1648.76	1653.80	1653.64	1655.03	0.025396	8.91	83.77	55.88	0.93
Tk Lower	Tk Lower	41100	25-year	1000.00	1648.76	1654.57	1654.57	1655.80	0.020325	9.04	118.76	83.42	0.85
Tk Lower	Tk Lower	41100	50-year	1230.00	1648.76	1655.01	1655.01	1656.33	0.019686	9.50	141.85	86.88	0.85
Tk Lower	Tk Lower	41100	100-year	1450.00	1648.76	1655.68	1655.35	1656.83	0.014780	8.99	178.68	92.50	0.75
Tk Lower	Tk Lower	41100	500-year	2030.00	1648.76	1657.03	1656.11	1658.10	0.010366	8.83	257.88	111.44	0.66
Tk Lower	Tk Lower	41080	10-year	746.00	1649.40	1653.32	1653.32	1654.55	0.022222	8.96	92.11	51.56	0.91
Tk Lower	Tk Lower	41080	25-year	1000.00	1649.40	1653.92	1653.92	1655.31	0.020390	9.68	123.29	53.24	0.90
Tk Lower	Tk Lower	41080	50-year	1230.00	1649.40	1654.35	1654.35	1655.91	0.020086	10.37	146.65	54.47	0.91
Tk Lower	Tk Lower	41080	100-year	1450.00	1649.40	1654.75	1654.75	1656.44	0.019583	10.90	168.45	55.59	0.91
Tk Lower	Tk Lower	41080	500-year	2030.00	1649.40	1655.62	1655.62	1657.72	0.019751	12.34	219.02	61.90	0.94
Tk Lower	Tk Lower	40662	10-year	746.00	1642.25	1648.04		1648.33	0.003303	4.30	173.65	38.57	0.36
Tk Lower	Tk Lower	40662	25-year	1000.00	1642.25	1648.53		1648.95	0.004322	5.18	197.88	59.48	0.41
Tk Lower	Tk Lower	40662	50-year	1230.00	1642.25	1648.96		1649.48	0.004976	5.82	224.00	69.96	0.45
Tk Lower	Tk Lower	40662	100-year	1450.00	1642.25	1649.30		1649.92	0.005585	6.38	252.40	94.23	0.48
Tk Lower	Tk Lower	40662	500-year	2030.00	1642.25	1650.08	1647.92	1650.91	0.006749	7.52	341.39	133.52	0.53
Tk Lower	Tk Lower	40428	10-year	746.00	1641.79	1645.32	1645.32	1646.49	0.030916	8.66	86.17	60.67	1.00
Tk Lower	Tk Lower	40428	25-year	1000.00	1641.79	1646.10	1646.10	1647.00	0.020517	7.95	168.29	122.64	0.81
Tk Lower	Tk Lower	40428	50-year	1230.00	1641.79	1646.46	1646.46	1647.38	0.019455	8.24	217.06	138.09	0.79
Tk Lower	Tk Lower	40428	100-year	1450.00	1641.79	1646.77	1646.77	1647.70	0.018719	8.48	261.44	149.28	0.78
Tk Lower	Tk Lower	40428	500-year	2030.00	1641.79	1647.34	1647.34	1648.39	0.019423	9.37	351.48	162.92	0.80
Tk Lower	Tk Lower	40382	10-year	746.00	1635.54	1642.45	1639.87	1642.81	0.004226	4.86	153.38	31.59	0.39
Tk Lower	Tk Lower	40382	25-year	1000.00	1635.54	1643.38	1640.50	1643.84	0.004547	5.44	183.80	33.32	0.41
Tk Lower	Tk Lower	40382	50-year	1230.00	1635.54	1644.23	1641.06	1644.75	0.004279	5.80	212.68	39.24	0.41
Tk Lower	Tk Lower	40382	100-year	1450.00	1635.54	1645.10	1641.54	1645.65	0.003788	5.95	272.12	99.94	0.39
Tk Lower	Tk Lower	40382	500-year	2030.00	1635.54	1646.98	1642.65	1647.46	0.002736	5.90	518.42	152.17	0.34
Tk Lower	Tk Lower	40336		Bridge									
Tk Lower	Tk Lower	40303	10-year	746.00	1635.51	1641.47	1639.18	1641.83	0.007066	4.78	155.95	52.12	0.49
Tk Lower	Tk Lower	40303	25-year	1000.00	1635.51	1641.92	1639.81	1642.40	0.008198	5.57	179.66	53.21	0.53
Tk Lower	Tk Lower	40303	50-year	1230.00	1635.51	1642.27	1640.34	1642.87	0.009113	6.19	198.63	54.07	0.57
Tk Lower	Tk Lower	40303	100-year	1450.00	1635.51	1642.56	1641.36	1643.27	0.010038	6.77	214.34	57.77	0.60
Tk Lower	Tk Lower	40303	500-year	2030.00	1635.51	1643.22	1642.13	1644.23	0.012049	8.10	251.25	71.59	0.67

HEC-RAS Plan: Alt 4 Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	40237	10-year	746.00	1635.93	1641.24	1639.36	1641.46	0.003129	4.20	244.07	90.01	0.36
Tk Lower	Tk Lower	40237	25-year	1000.00	1635.93	1641.58	1639.77	1641.94	0.004612	5.36	281.87	97.97	0.44
Tk Lower	Tk Lower	40237	50-year	1230.00	1635.93	1641.87	1640.07	1642.34	0.005610	6.16	311.75	108.79	0.49
Tk Lower	Tk Lower	40237	100-year	1450.00	1635.93	1642.11	1640.41	1642.68	0.006427	6.81	339.15	119.50	0.53
Tk Lower	Tk Lower	40237	500-year	2030.00	1635.93	1642.71	1641.12	1643.47	0.007901	8.12	426.22	167.73	0.60
Tk Lower	Tk Lower	40196	10-year	746.00	1633.78	1641.25	1637.85	1641.33	0.000857	2.69	421.77	136.69	0.20
Tk Lower	Tk Lower	40196	25-year	1000.00	1633.78	1641.61	1638.29	1641.74	0.001201	3.32	472.78	141.49	0.23
Tk Lower	Tk Lower	40196	50-year	1230.00	1633.78	1641.92	1638.63	1642.08	0.001493	3.82	516.42	145.48	0.26
Tk Lower	Tk Lower	40196	100-year	1450.00	1633.78	1642.17	1638.95	1642.37	0.001776	4.27	553.06	148.73	0.29
Tk Lower	Tk Lower	40196	500-year	2030.00	1633.78	1642.77	1639.63	1643.07	0.002437	5.29	645.47	156.66	0.34
Tk Lower	Tk Lower	40151		Bridge									
Tk Lower	Tk Lower	40111	10-year	746.00	1633.65	1637.49	1637.49	1638.20	0.033108	6.79	110.28	76.07	0.99
Tk Lower	Tk Lower	40111	25-year	1000.00	1633.65	1637.80	1637.80	1638.67	0.031265	7.47	134.62	77.38	0.99
Tk Lower	Tk Lower	40111	50-year	1230.00	1633.65	1638.07	1638.07	1639.05	0.030008	7.99	155.04	78.32	0.99
Tk Lower	Tk Lower	40111	100-year	1450.00	1633.65	1638.30	1638.30	1639.40	0.028820	8.41	173.81	79.18	0.99
Tk Lower	Tk Lower	40111	500-year	2030.00	1633.65	1638.98	1638.98	1640.22	0.023393	9.02	230.14	93.18	0.93
Tk Lower	Tk Lower	40047	10-year	746.00	1631.79	1636.03		1636.46	0.008979	5.52	166.43	84.82	0.57
Tk Lower	Tk Lower	40047	25-year	1000.00	1631.79	1636.52		1637.03	0.009045	6.08	208.61	86.44	0.59
Tk Lower	Tk Lower	40047	50-year	1230.00	1631.79	1636.91		1637.49	0.009090	6.53	242.77	87.73	0.60
Tk Lower	Tk Lower	40047	100-year	1450.00	1631.79	1637.25		1637.90	0.009122	6.93	273.33	90.73	0.61
Tk Lower	Tk Lower	40047	500-year	2030.00	1631.79	1638.19		1638.96	0.008450	7.66	368.95	125.98	0.60
Tk Lower	Tk Lower	39767	10-year	746.00	1629.09	1633.31	1632.75	1633.77	0.010375	5.79	166.54	82.37	0.61
Tk Lower	Tk Lower	39767	25-year	1000.00	1629.09	1633.80	1633.15	1634.34	0.010260	6.35	207.36	83.73	0.62
Tk Lower	Tk Lower	39767	50-year	1230.00	1629.09	1634.19	1633.46	1634.80	0.010223	6.82	239.86	84.91	0.63
Tk Lower	Tk Lower	39767	100-year	1450.00	1629.09	1634.53	1633.71	1635.20	0.010219	7.23	268.73	85.94	0.64
Tk Lower	Tk Lower	39767	500-year	2030.00	1629.09	1635.36	1634.34	1636.27	0.010822	8.44	345.23	109.75	0.68
Tk Lower	Tk Lower	39518	10-year	746.00	1626.68	1630.40	1629.93	1630.84	0.013283	5.36	139.36	70.58	0.67
Tk Lower	Tk Lower	39518	25-year	1000.00	1626.68	1630.79	1630.27	1631.35	0.014128	6.01	166.89	71.47	0.69
Tk Lower	Tk Lower	39518	50-year	1230.00	1626.68	1631.11	1630.54	1631.76	0.014603	6.50	189.77	72.20	0.70
Tk Lower	Tk Lower	39518	100-year	1450.00	1626.68	1631.38	1630.79	1632.13	0.015007	6.94	209.88	72.84	0.71
Tk Lower	Tk Lower	39518	500-year	2030.00	1626.68	1631.98	1631.39	1632.99	0.016241	8.06	254.00	74.21	0.75
Tk Lower	Tk Lower	39267	10-year	746.00	1622.32	1625.09	1625.09	1625.81	0.033559	6.81	110.15	77.00	0.99
Tk Lower	Tk Lower	39267	25-year	1000.00	1622.32	1625.41	1625.41	1626.27	0.031115	7.45	135.24	78.35	0.99
Tk Lower	Tk Lower	39267	50-year	1230.00	1622.32	1625.67	1625.67	1626.65	0.030013	7.97	155.62	79.43	0.99
Tk Lower	Tk Lower	39267	100-year	1450.00	1622.32	1625.90	1625.90	1626.99	0.029257	8.43	173.66	80.06	1.00
Tk Lower	Tk Lower	39267	500-year	2030.00	1622.32	1626.47	1626.47	1627.81	0.026850	9.35	219.87	81.63	0.99
Tk Lower	Tk Lower	38971	10-year	746.00	1617.20	1621.86	1619.37	1621.92	0.000932	2.17	424.83	324.17	0.19
Tk Lower	Tk Lower	38971	25-year	1000.00	1617.20	1622.28	1619.68	1622.36	0.001060	2.47	507.02	364.56	0.21
Tk Lower	Tk Lower	38971	50-year	1230.00	1617.20	1622.53	1619.97	1622.63	0.001239	2.78	557.40	369.08	0.23
Tk Lower	Tk Lower	38971	100-year	1450.00	1617.20	1622.73	1620.23	1622.85	0.001430	3.07	595.84	371.73	0.25
Tk Lower	Tk Lower	38971	500-year	2030.00	1617.20	1623.15	1620.93	1623.33	0.001954	3.80	679.25	379.52	0.29
Tk Lower	Tk Lower	38901	10-year	746.00	1615.56	1621.75	1618.93	1621.84	0.001323	2.45	391.12	204.45	0.21
Tk Lower	Tk Lower	38901	25-year	1000.00	1615.56	1622.13	1619.30	1622.26	0.001685	2.93	477.19	240.92	0.24
Tk Lower	Tk Lower	38901	50-year	1230.00	1615.56	1622.35	1619.60	1622.51	0.002098	3.37	531.64	266.17	0.27
Tk Lower	Tk Lower	38901	100-year	1450.00	1615.56	1622.50	1619.85	1622.70	0.002553	3.79	574.05	305.84	0.30
Tk Lower	Tk Lower	38901	500-year	2030.00	1615.56	1622.76	1620.59	1623.09	0.004051	4.94	662.29	346.63	0.38
Tk Lower	Tk Lower	38846		Bridge									
Tk Lower	Tk Lower	38818	10-year	746.00	1615.10	1620.78	1618.03	1620.86	0.001040	2.36	430.24	292.42	0.20
Tk Lower	Tk Lower	38818	25-year	1000.00	1615.10	1621.49	1618.40	1621.58	0.000967	2.52	606.73	396.33	0.20
Tk Lower	Tk Lower	38818	50-year	1230.00	1615.10	1621.84	1618.68	1621.95	0.001087	2.80	711.24	464.48	0.22
Tk Lower	Tk Lower	38818	100-year	1450.00	1615.10	1622.09	1618.92	1622.21	0.001236	3.08	787.61	486.08	0.23
Tk Lower	Tk Lower	38818	500-year	2030.00	1615.10	1622.42	1619.54	1622.61	0.001865	3.93	891.84	492.27	0.29
Tk Lower	Tk Lower	38749	10-year	746.00	1614.05	1620.56	1617.83	1620.72	0.002946	3.29	241.26	213.31	0.33
Tk Lower	Tk Lower	38749	25-year	1000.00	1614.05	1621.33	1618.44	1621.47	0.002087	3.18	404.01	336.87	0.29
Tk Lower	Tk Lower	38749	50-year	1230.00	1614.05	1621.69	1619.53	1621.83	0.002033	3.34	506.58	396.00	0.29
Tk Lower	Tk Lower	38749	100-year	1450.00	1614.05	1621.92	1619.76	1622.08	0.002223	3.62	581.88	441.99	0.30
Tk Lower	Tk Lower	38749	500-year	2030.00	1614.05	1622.19	1620.61	1622.43	0.003132	4.47	679.49	464.33	0.37
Tk Lower	Tk Lower	38683		Bridge									
Tk Lower	Tk Lower	38674	10-year	746.00	1613.24	1617.28	1616.52	1617.58	0.008498	4.37	170.58	80.16	0.53
Tk Lower	Tk Lower	38674	25-year	1000.00	1613.24	1617.74	1616.83	1618.10	0.008097	4.81	207.84	81.08	0.53
Tk Lower	Tk Lower	38674	50-year	1230.00	1613.24	1618.11	1617.08	1618.53	0.007895	5.16	238.30	333.72	0.53
Tk Lower	Tk Lower	38674	100-year	1450.00	1613.24	1618.44	1617.33	1618.91	0.007707	5.46	270.74	382.06	0.53
Tk Lower	Tk Lower	38674	500-year	2030.00	1613.24	1619.23	1617.87	1619.75	0.006827	5.91	420.81	504.99	0.52
Tk Lower	Tk Lower	38580	10-year	746.00	1610.59	1615.39	1615.39	1616.32	0.015989	7.89	106.69	69.23	0.77
Tk Lower	Tk Lower	38580	25-year	1000.00	1610.59	1615.87	1615.87	1616.88	0.015423	8.49	140.60	70.63	0.77

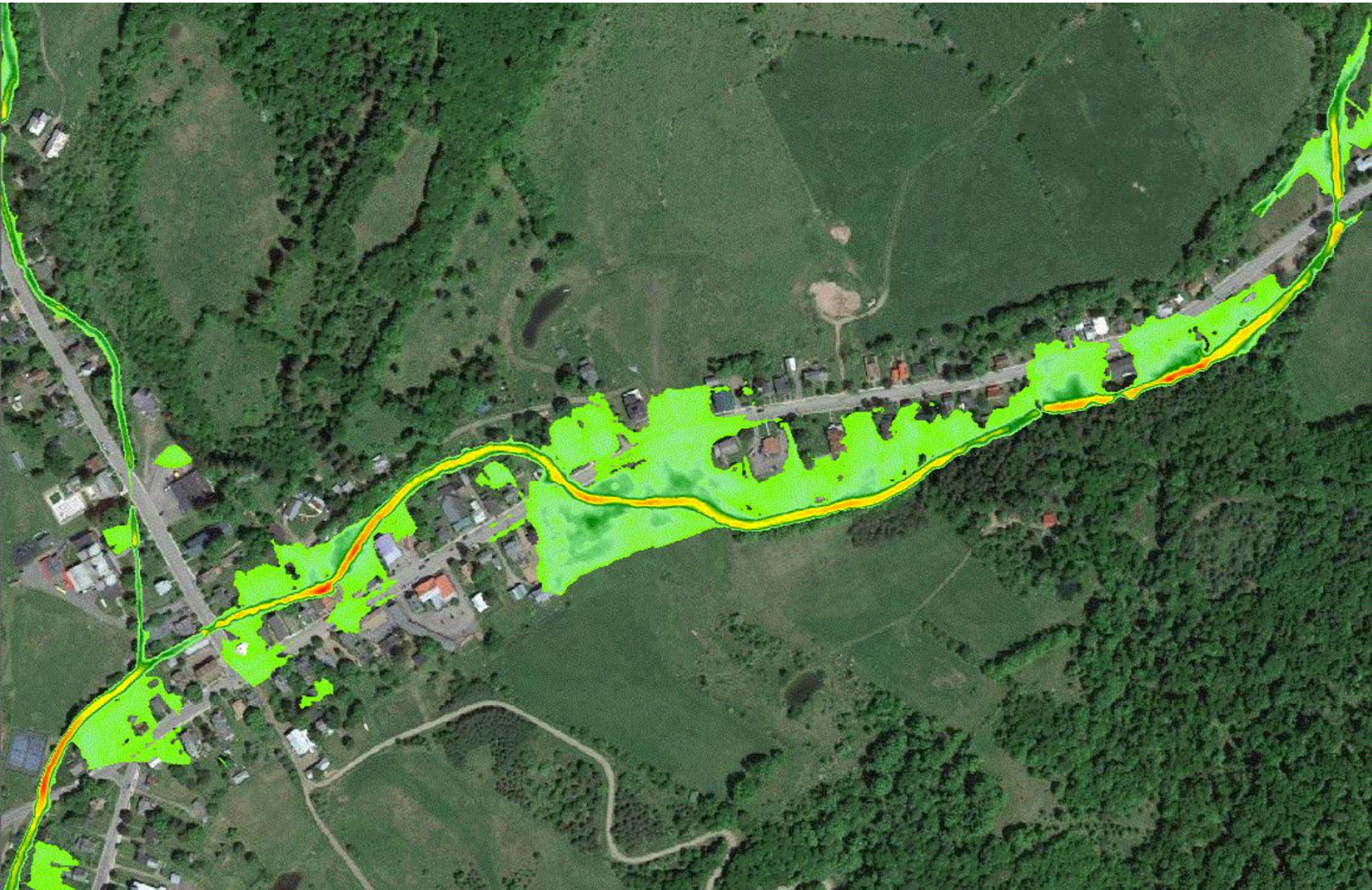
HEC-RAS Plan: Alt 4 Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	38580	50-year	1230.00	1610.59	1616.23	1616.23	1617.32	0.015383	9.00	166.09	134.82	0.78
Tk Lower	Tk Lower	38580	100-year	1450.00	1610.59	1616.52	1616.52	1617.69	0.015556	9.47	188.38	160.29	0.79
Tk Lower	Tk Lower	38580	500-year	2030.00	1610.59	1617.18	1617.18	1618.56	0.015768	10.47	244.61	253.39	0.82
Tk Lower	Tk Lower	38201	10-year	746.00	1603.60	1607.62	1607.04	1608.01	0.011942	5.02	148.73	72.65	0.62
Tk Lower	Tk Lower	38201	25-year	1000.00	1603.60	1608.06	1607.37	1608.53	0.011461	5.53	180.93	73.79	0.62
Tk Lower	Tk Lower	38201	50-year	1230.00	1603.60	1608.56	1607.65	1609.06	0.009405	5.62	219.07	78.04	0.58
Tk Lower	Tk Lower	38201	100-year	1450.00	1603.60	1608.94	1607.89	1609.48	0.008671	5.86	249.76	83.61	0.57
Tk Lower	Tk Lower	38201	500-year	2030.00	1603.60	1609.71	1608.49	1610.38	0.008265	6.57	318.79	103.99	0.57
Tk Lower	Tk Lower	37955	10-year	746.00	1599.53	1605.56	1604.41	1605.87	0.006523	4.47	179.25	80.64	0.47
Tk Lower	Tk Lower	37955	25-year	1000.00	1599.53	1607.15	1604.80	1607.34	0.002384	3.63	339.66	116.07	0.30
Tk Lower	Tk Lower	37955	50-year	1230.00	1599.53	1607.80	1605.06	1608.00	0.002153	3.78	424.57	138.70	0.30
Tk Lower	Tk Lower	37955	100-year	1450.00	1599.53	1608.18	1605.42	1608.41	0.002264	4.07	477.75	147.05	0.31
Tk Lower	Tk Lower	37955	500-year	2030.00	1599.53	1608.82	1606.13	1609.16	0.002885	4.95	568.51	186.37	0.35
Tk Lower	Tk Lower	37897	10-year	746.00	1599.41	1605.24	1603.97	1605.49	0.005455	4.01	185.82	66.73	0.42
Tk Lower	Tk Lower	37897	25-year	1000.00	1599.41	1607.04	1604.34	1607.20	0.001909	3.23	314.42	97.55	0.27
Tk Lower	Tk Lower	37897	50-year	1230.00	1599.41	1607.69	1604.63	1607.87	0.001788	3.43	388.88	132.28	0.27
Tk Lower	Tk Lower	37897	100-year	1450.00	1599.41	1608.07	1604.89	1608.28	0.001919	3.72	449.01	175.72	0.28
Tk Lower	Tk Lower	37897	500-year	2030.00	1599.41	1608.68	1605.54	1608.99	0.002501	4.56	559.17	181.61	0.33
Tk Lower	Tk Lower	37826		Bridge									
Tk Lower	Tk Lower	37806	10-year	746.00	1598.88	1602.95	1602.69	1603.49	0.019787	5.91	126.90	73.47	0.78
Tk Lower	Tk Lower	37806	25-year	1000.00	1598.88	1603.28	1603.01	1603.97	0.019861	6.64	151.70	74.54	0.81
Tk Lower	Tk Lower	37806	50-year	1230.00	1598.88	1603.57	1603.29	1604.37	0.019505	7.17	173.32	75.47	0.82
Tk Lower	Tk Lower	37806	100-year	1450.00	1598.88	1603.82	1603.53	1604.72	0.019341	7.63	192.44	76.28	0.83
Tk Lower	Tk Lower	37806	500-year	2030.00	1598.88	1604.46	1604.12	1605.59	0.018376	8.58	241.25	78.30	0.84
Tk Lower	Tk Lower	37747	10-year	746.00	1597.86	1601.10	1601.10	1601.90	0.034353	7.20	103.64	64.98	1.00
Tk Lower	Tk Lower	37747	25-year	1000.00	1597.86	1601.45	1601.45	1602.42	0.031984	7.87	128.99	65.61	1.00
Tk Lower	Tk Lower	37747	50-year	1230.00	1597.86	1601.74	1601.74	1602.84	0.030894	8.43	145.99	66.12	1.00
Tk Lower	Tk Lower	37747	100-year	1450.00	1597.86	1602.01	1602.01	1603.23	0.029769	8.86	163.64	66.59	1.00
Tk Lower	Tk Lower	37747	500-year	2030.00	1597.86	1602.64	1602.64	1604.15	0.028103	9.86	205.80	67.70	1.00
Tk Lower	Tk Lower	37601	10-year	746.00	1595.08	1600.61	1597.35	1600.64	0.000337	1.49	766.75	435.17	0.12
Tk Lower	Tk Lower	37601	25-year	1000.00	1595.08	1601.09	1597.70	1601.13	0.000383	1.70	924.02	471.10	0.13
Tk Lower	Tk Lower	37601	50-year	1230.00	1595.08	1601.48	1597.98	1601.51	0.000410	1.84	1057.38	482.64	0.14
Tk Lower	Tk Lower	37601	100-year	1450.00	1595.08	1601.69	1598.31	1601.74	0.000478	2.04	1132.82	500.74	0.15
Tk Lower	Tk Lower	37601	500-year	2030.00	1595.08	1601.99	1599.15	1602.03	0.000527	2.21	1557.18	517.70	0.16
Tk Lower	Tk Lower	37546	10-year	746.00	1595.00	1600.54	1598.19	1600.60	0.001321	2.18	432.72	310.67	0.19
Tk Lower	Tk Lower	37546	25-year	1000.00	1595.00	1601.01	1598.62	1601.08	0.001461	2.41	525.69	341.05	0.20
Tk Lower	Tk Lower	37546	50-year	1230.00	1595.00	1601.38	1598.98	1601.46	0.001556	2.58	600.98	354.38	0.20
Tk Lower	Tk Lower	37546	100-year	1450.00	1595.00	1601.58	1599.35	1601.67	0.001824	2.85	640.22	372.34	0.22
Tk Lower	Tk Lower	37546	500-year	2030.00	1595.00	1601.89	1599.87	1601.97	0.001748	2.87	1005.68	427.23	0.21
Tk Lower	Tk Lower	37465		Bridge									
Tk Lower	Tk Lower	37428	10-year	746.00	1595.00	1597.63	1597.63	1598.64	0.030944	8.07	92.47	69.17	1.00
Tk Lower	Tk Lower	37428	25-year	1000.00	1595.00	1598.12	1598.12	1599.28	0.029115	8.65	115.64	197.15	0.99
Tk Lower	Tk Lower	37428	50-year	1230.00	1595.00	1598.50	1598.50	1599.79	0.028567	9.14	134.51	278.85	1.00
Tk Lower	Tk Lower	37428	100-year	1450.00	1595.00	1598.83	1598.83	1600.24	0.028032	9.54	152.01	347.46	1.00
Tk Lower	Tk Lower	37428	500-year	2030.00	1595.00	1599.12	1599.12	1599.60	0.013658	6.94	469.78	411.91	0.70
Tk Lower	Tk Lower	37389	10-year	786.00	1591.39	1594.49	1593.36	1594.67	0.004480	3.40	231.30	98.82	0.39
Tk Lower	Tk Lower	37389	25-year	1060.00	1591.39	1594.66	1593.66	1594.94	0.006521	4.28	247.89	99.94	0.48
Tk Lower	Tk Lower	37389	50-year	1290.00	1591.39	1594.87	1593.88	1595.23	0.007348	4.78	270.06	102.86	0.52
Tk Lower	Tk Lower	37389	100-year	1530.00	1591.39	1595.25	1594.09	1595.63	0.006790	4.95	309.08	107.80	0.52
Tk Lower	Tk Lower	37389	500-year	2150.00	1591.39	1596.14	1594.61	1596.56	0.005721	5.24	410.39	119.70	0.50
Tk Lower	Tk Lower	36935	10-year	786.00	1588.53	1591.71	1591.23	1591.99	0.012205	4.30	182.80	117.38	0.61
Tk Lower	Tk Lower	36935	25-year	1060.00	1588.53	1592.67	1591.48	1592.86	0.004460	3.54	311.56	157.11	0.40
Tk Lower	Tk Lower	36935	50-year	1290.00	1588.53	1593.49	1591.70	1593.64	0.002492	3.18	440.77	158.45	0.31
Tk Lower	Tk Lower	36935	100-year	1530.00	1588.53	1594.26	1591.90	1594.39	0.001702	3.00	572.27	202.79	0.26
Tk Lower	Tk Lower	36935	500-year	2150.00	1588.53	1595.33	1592.35	1595.48	0.001480	3.24	773.07	276.45	0.26
Tk Lower	Tk Lower	36867	10-year	786.00	1585.63	1591.23	1589.15	1591.45	0.001779	3.71	212.02	108.71	0.47
Tk Lower	Tk Lower	36867	25-year	1060.00	1585.63	1592.41	1589.77	1592.56	0.001195	3.10	342.38	112.69	0.31
Tk Lower	Tk Lower	36867	50-year	1290.00	1585.63	1593.30	1590.91	1593.43	0.000936	2.90	444.54	117.23	0.26
Tk Lower	Tk Lower	36867	100-year	1530.00	1585.63	1594.11	1591.11	1594.24	0.000776	2.84	554.91	354.58	0.23
Tk Lower	Tk Lower	36867	500-year	2150.00	1585.63	1595.18	1591.59	1595.33	0.000803	3.15	818.21	445.08	0.23
Tk Lower	Tk Lower	36805		Bridge									
Tk Lower	Tk Lower	36737	10-year	786.00	1581.36	1587.07		1587.49	0.002833	5.19	151.45	39.03	0.46
Tk Lower	Tk Lower	36737	25-year	1060.00	1581.36	1587.86		1588.38	0.002901	5.80	189.32	51.54	0.48
Tk Lower	Tk Lower	36737	50-year	1290.00	1581.36	1588.46		1589.05	0.002901	6.21	222.32	56.71	0.48
Tk Lower	Tk Lower	36737	100-year	1530.00	1581.36	1588.92		1589.62	0.003075	6.73	248.97	57.56	0.50
Tk Lower	Tk Lower	36737	500-year	2150.00	1581.36	1589.18		1590.43	0.005234	9.01	264.06	58.04	0.66

HEC-RAS Plan: Alt 4 Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	36658	10-year	786.00	1581.36	1585.84	1585.60	1586.94	0.022330	8.42	93.33	32.67	0.88
Tk Lower	Tk Lower	36658	25-year	1060.00	1581.36	1586.50	1586.20	1587.81	0.021355	9.19	115.30	33.59	0.87
Tk Lower	Tk Lower	36658	50-year	1290.00	1581.36	1586.97	1586.67	1588.47	0.021432	9.83	131.21	34.24	0.89
Tk Lower	Tk Lower	36658	100-year	1530.00	1581.36	1587.78	1587.11	1589.09	0.015946	9.32	189.38	126.00	0.77
Tk Lower	Tk Lower	36658	500-year	2150.00	1581.36	1588.77	1588.77	1589.77	0.011274	8.85	355.86	195.88	0.67

Retaining Wall Relocation & Construction - Tremper Kill & Liddle Brook Combined 100-Year Storm



Retaining Wall Relocation & Construction Tremper Kill & Liddle Brook Combined

HEC-RAS Plan: TK ww + LB ww Locations: User Defined

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk middle	Reach-1	41995	10-year	654.00	1649.40	1659.02		1659.10	0.000391	2.42	379.45	72.82	0.14
Tk middle	Reach-1	41995	25-year	879.00	1649.40	1659.93		1660.04	0.000475	2.85	445.61	73.57	0.16
Tk middle	Reach-1	41995	50-year	1070.00	1649.40	1660.63		1660.76	0.000533	3.16	497.23	74.15	0.17
Tk middle	Reach-1	41995	100-year	1270.00	1649.40	1661.29		1661.44	0.000587	3.45	546.63	74.70	0.18
Tk middle	Reach-1	41995	500-year	1780.00	1649.40	1662.12		1662.36	0.000867	4.41	608.78	75.38	0.23
Tk middle	Reach-1	41497	10-year	654.00	1642.25	1659.05		1659.06	0.000017	0.62	1594.38	147.89	0.03
Tk middle	Reach-1	41497	25-year	879.00	1642.25	1659.97		1659.97	0.000024	0.77	1730.04	149.23	0.04
Tk middle	Reach-1	41497	50-year	1070.00	1642.25	1660.67		1660.68	0.000030	0.88	1835.81	150.26	0.04
Tk middle	Reach-1	41497	100-year	1270.00	1642.25	1661.35		1661.36	0.000035	1.00	1937.04	151.25	0.04
Tk middle	Reach-1	41497	500-year	1780.00	1642.25	1662.21		1662.22	0.000057	1.31	2067.77	152.51	0.06
Tk middle	Reach-1	41367	10-year	654.00	1652.32	1658.74		1659.02	0.002861	4.28	181.14	85.63	0.34
Tk middle	Reach-1	41367	25-year	879.00	1652.32	1659.61		1659.93	0.002757	4.69	256.24	87.93	0.34
Tk middle	Reach-1	41367	50-year	1070.00	1652.32	1660.29		1660.64	0.002635	4.94	320.25	97.84	0.34
Tk middle	Reach-1	41367	100-year	1270.00	1652.32	1660.94		1661.31	0.002521	5.15	383.95	97.84	0.34
Tk middle	Reach-1	41367	500-year	1780.00	1652.32	1661.60		1662.15	0.003476	6.42	448.11	97.84	0.41
Tk middle	Reach-1	41242	10-year	654.00	1652.62	1656.67	1656.67	1658.10	0.023622	10.00	86.95	40.12	0.97
Tk middle	Reach-1	41242	25-year	879.00	1652.62	1657.34	1657.34	1659.03	0.022104	10.95	111.86	55.48	0.97
Tk middle	Reach-1	41242	50-year	1070.00	1652.62	1657.88	1657.88	1659.75	0.020889	11.59	134.04	67.88	0.96
Tk middle	Reach-1	41242	100-year	1270.00	1652.62	1658.60	1658.60	1660.48	0.017503	11.71	174.61	104.08	0.90
Tk middle	Reach-1	41242	500-year	1780.00	1652.62	1660.14	1660.14	1661.38	0.009879	10.45	459.04	213.58	0.71
Tk middle	Reach-1	41210	10-year	654.00	1652.11	1656.88	1654.91	1657.23	0.003765	4.75	137.63	60.71	0.40
Tk middle	Reach-1	41210	25-year	879.00	1652.11	1657.63	1655.43	1658.09	0.003999	5.45	161.40	68.80	0.43
Tk middle	Reach-1	41210	50-year	1070.00	1652.11	1658.23	1655.83	1658.77	0.004086	5.93	180.45	80.17	0.44
Tk middle	Reach-1	41210	100-year	1270.00	1652.11	1658.81	1656.24	1659.44	0.004151	6.38	199.04	93.69	0.45
Tk middle	Reach-1	41210	500-year	1780.00	1652.11	1660.13	1657.15	1660.98	0.004313	7.39	240.94	155.35	0.47
Tk middle	Reach-1	41170		Bridge									
Tk middle	Reach-1	41135	10-year	654.00	1651.65	1655.32	1655.11	1656.37	0.021579	8.22	79.53	62.42	0.89
Tk middle	Reach-1	41135	25-year	879.00	1651.65	1656.10	1655.67	1657.23	0.016268	8.50	103.37	95.94	0.81
Tk middle	Reach-1	41135	50-year	1070.00	1651.65	1656.74	1656.07	1657.92	0.013613	8.72	122.70	113.54	0.76
Tk middle	Reach-1	41135	100-year	1270.00	1651.65	1657.27	1656.49	1658.57	0.012710	9.15	138.81	120.44	0.75
Tk middle	Reach-1	41135	500-year	1780.00	1651.65	1658.02	1657.44	1659.91	0.015143	11.04	161.28	129.29	0.84
Tk Lower	Tk Lower	41106	10-year	722.20	1651.19	1655.19	1654.08	1655.80	0.007823	6.34	130.34	61.97	0.57
Tk Lower	Tk Lower	41106	25-year	972.80	1651.19	1656.01	1654.65	1656.73	0.007241	6.95	166.66	71.49	0.57
Tk Lower	Tk Lower	41106	50-year	1186.00	1651.19	1656.67	1655.11	1657.46	0.006751	7.33	197.73	78.19	0.56
Tk Lower	Tk Lower	41106	100-year	1410.00	1651.19	1657.21	1655.52	1658.12	0.006777	7.85	224.26	84.37	0.57
Tk Lower	Tk Lower	41106	500-year	1979.00	1651.19	1657.96	1656.57	1659.32	0.008770	9.67	261.95	93.28	0.67
Tk Lower	Tk Lower	41100	10-year	746.00	1648.76	1653.73	1653.65	1655.12	0.027200	9.44	78.99	52.27	0.96
Tk Lower	Tk Lower	41100	25-year	1000.00	1648.76	1654.35	1654.35	1656.05	0.028384	10.47	95.55	58.29	0.99
Tk Lower	Tk Lower	41100	50-year	1230.00	1648.76	1654.89	1654.89	1656.80	0.028154	11.09	110.92	62.06	1.00
Tk Lower	Tk Lower	41100	100-year	1450.00	1648.76	1655.39	1655.39	1657.45	0.027408	11.52	125.89	65.73	1.00
Tk Lower	Tk Lower	41100	500-year	2030.00	1648.76	1658.12	1656.53	1658.78	0.006157	7.33	488.10	257.06	0.51
Tk Lower	Tk Lower	41080	10-year	746.00	1649.40	1653.17	1653.17	1654.57	0.026924	9.53	81.08	31.38	0.99
Tk Lower	Tk Lower	41080	25-year	1000.00	1649.40	1653.80	1653.80	1655.46	0.024605	10.40	101.30	32.94	0.98
Tk Lower	Tk Lower	41080	50-year	1230.00	1649.40	1654.31	1654.31	1656.19	0.023384	11.11	118.36	34.20	0.98
Tk Lower	Tk Lower	41080	100-year	1450.00	1649.40	1654.75	1654.75	1656.84	0.022742	11.74	133.60	35.28	0.98
Tk Lower	Tk Lower	41080	500-year	2030.00	1649.40	1655.88	1655.88	1658.39	0.020377	12.93	175.07	38.08	0.97
Tk Lower	Tk Lower	40662	10-year	746.00	1642.25	1648.34		1648.59	0.002742	4.03	185.02	39.73	0.33
Tk Lower	Tk Lower	40662	25-year	1000.00	1642.25	1648.62		1649.02	0.004103	5.09	196.78	42.60	0.40
Tk Lower	Tk Lower	40662	50-year	1230.00	1642.25	1649.04		1649.56	0.004805	5.77	217.27	62.47	0.44
Tk Lower	Tk Lower	40662	100-year	1450.00	1642.25	1649.50		1650.10	0.005086	6.20	254.11	95.49	0.46
Tk Lower	Tk Lower	40662	500-year	2030.00	1642.25	1650.24		1651.06	0.006414	7.43	341.72	136.74	0.52
Tk Lower	Tk Lower	40428	10-year	746.00	1641.79	1645.53	1645.53	1646.96	0.029865	9.57	77.94	80.37	1.01
Tk Lower	Tk Lower	40428	25-year	1000.00	1641.79	1646.47	1646.47	1647.32	0.014991	8.06	200.15	138.13	0.75
Tk Lower	Tk Lower	40428	50-year	1230.00	1641.79	1646.81	1646.81	1647.70	0.014689	8.47	250.16	149.69	0.75
Tk Lower	Tk Lower	40428	100-year	1450.00	1641.79	1646.91	1646.91	1648.02	0.017928	9.52	266.04	158.70	0.83
Tk Lower	Tk Lower	40428	500-year	2030.00	1641.79	1647.55	1647.55	1648.72	0.017176	10.27	370.40	168.39	0.83
Tk Lower	Tk Lower	40382	10-year	746.00	1635.54	1642.78	1639.87	1643.10	0.003490	4.55	164.12	32.21	0.36
Tk Lower	Tk Lower	40382	25-year	1000.00	1635.54	1643.80	1640.50	1644.20	0.003576	5.06	197.73	34.17	0.37
Tk Lower	Tk Lower	40382	50-year	1230.00	1635.54	1644.63	1641.06	1645.09	0.003491	5.46	226.85	58.16	0.37
Tk Lower	Tk Lower	40382	100-year	1450.00	1635.54	1645.42	1641.54	1645.90	0.003206	5.63	305.27	109.64	0.36
Tk Lower	Tk Lower	40382	500-year	2030.00	1635.54	1647.01	1642.65	1647.48	0.002699	5.87	522.59	153.04	0.34
Tk Lower	Tk Lower	40336		Bridge									
Tk Lower	Tk Lower	40303	10-year	746.00	1635.51	1642.07	1639.18	1642.38	0.003397	4.52	165.15	32.37	0.35
Tk Lower	Tk Lower	40303	25-year	1000.00	1635.51	1642.89	1639.81	1643.31	0.003969	5.20	192.32	36.21	0.38
Tk Lower	Tk Lower	40303	50-year	1230.00	1635.51	1643.55	1640.34	1644.06	0.004176	5.72	215.18	90.53	0.40
Tk Lower	Tk Lower	40303	100-year	1450.00	1635.51	1644.19	1640.80	1644.72	0.003966	5.94	304.61	152.02	0.40
Tk Lower	Tk Lower	40303	500-year	2030.00	1635.51	1645.35	1641.92	1645.88	0.003625	6.30	516.28	184.56	0.39

HEC-RAS Plan: TK ww + LB ww Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	40237	10-year	746.00	1635.93	1641.64	1639.82	1642.08	0.004901	5.34	143.11	100.18	0.45
Tk Lower	Tk Lower	40237	25-year	1000.00	1635.93	1642.39	1640.39	1642.96	0.005175	6.09	169.77	151.03	0.47
Tk Lower	Tk Lower	40237	50-year	1230.00	1635.93	1643.02	1640.86	1643.70	0.005325	6.66	192.40	172.16	0.49
Tk Lower	Tk Lower	40237	100-year	1450.00	1635.93	1643.54	1641.29	1644.33	0.005512	7.18	211.86	174.44	0.50
Tk Lower	Tk Lower	40237	500-year	2030.00	1635.93	1645.33	1642.29	1645.57	0.001834	4.89	792.49	186.31	0.30
Tk Lower	Tk Lower	40196	10-year	746.00	1633.78	1641.67	1637.82	1641.85	0.001396	3.45	233.46	152.65	0.24
Tk Lower	Tk Lower	40196	25-year	1000.00	1633.78	1642.44	1638.40	1642.69	0.001678	4.09	268.59	162.72	0.27
Tk Lower	Tk Lower	40196	50-year	1230.00	1633.78	1643.08	1638.82	1643.39	0.001879	4.59	298.32	171.07	0.29
Tk Lower	Tk Lower	40196	100-year	1450.00	1633.78	1643.62	1639.27	1644.00	0.002062	5.03	323.89	178.13	0.31
Tk Lower	Tk Lower	40196	500-year	2030.00	1633.78	1644.85	1640.37	1645.39	0.002492	6.07	383.59	186.22	0.35
Tk Lower	Tk Lower	40151	Bridge										
Tk Lower	Tk Lower	40111	10-year	746.00	1633.65	1637.79	1637.79	1638.97	0.030055	8.70	85.71	36.13	1.00
Tk Lower	Tk Lower	40111	25-year	1000.00	1633.65	1638.30	1638.30	1639.72	0.029296	9.56	104.61	58.07	1.01
Tk Lower	Tk Lower	40111	50-year	1230.00	1633.65	1638.79	1638.79	1640.34	0.026040	10.01	124.96	88.22	0.97
Tk Lower	Tk Lower	40111	100-year	1450.00	1633.65	1639.17	1639.17	1640.87	0.024695	10.50	142.78	100.27	0.97
Tk Lower	Tk Lower	40111	500-year	2030.00	1633.65	1640.07	1640.07	1642.15	0.022799	11.67	184.26	160.75	0.96
Tk Lower	Tk Lower	40047	10-year	746.00	1631.79	1636.30	1635.19	1636.82	0.009151	5.81	128.42	41.09	0.58
Tk Lower	Tk Lower	40047	25-year	1000.00	1631.79	1636.94	1635.74	1637.58	0.009457	6.43	155.43	43.73	0.60
Tk Lower	Tk Lower	40047	50-year	1230.00	1631.79	1637.42	1636.19	1638.16	0.009294	6.92	187.58	78.36	0.61
Tk Lower	Tk Lower	40047	100-year	1450.00	1631.79	1637.82	1636.59	1638.64	0.009160	7.32	223.00	99.17	0.61
Tk Lower	Tk Lower	40047	500-year	2030.00	1631.79	1638.82	1637.68	1639.72	0.008137	7.90	330.90	141.09	0.60
Tk Lower	Tk Lower	39767	10-year	746.00	1629.09	1633.91	1632.69	1634.40	0.008132	5.64	132.39	40.06	0.55
Tk Lower	Tk Lower	39767	25-year	1000.00	1629.09	1634.74	1633.24	1635.30	0.006935	6.02	169.51	58.90	0.52
Tk Lower	Tk Lower	39767	50-year	1230.00	1629.09	1635.30	1633.68	1635.93	0.006700	6.45	210.67	82.69	0.52
Tk Lower	Tk Lower	39767	100-year	1450.00	1629.09	1635.79	1634.06	1636.47	0.006401	6.74	251.65	83.20	0.52
Tk Lower	Tk Lower	39767	500-year	2030.00	1629.09	1636.21	1635.11	1637.28	0.009229	8.52	305.65	175.84	0.63
Tk Lower	Tk Lower	39518	10-year	746.00	1626.68	1631.19	1630.34	1631.89	0.012453	6.71	111.24	35.61	0.67
Tk Lower	Tk Lower	39518	25-year	1000.00	1626.68	1631.29	1630.96	1632.47	0.020477	8.71	114.81	36.02	0.86
Tk Lower	Tk Lower	39518	50-year	1230.00	1626.68	1631.67	1631.42	1633.09	0.021632	9.57	129.10	41.12	0.90
Tk Lower	Tk Lower	39518	100-year	1450.00	1626.68	1631.96	1631.88	1633.64	0.022904	10.39	141.92	46.10	0.94
Tk Lower	Tk Lower	39518	500-year	2030.00	1626.68	1633.56	1633.56	1634.73	0.011236	9.18	294.90	168.74	0.70
Tk Lower	Tk Lower	39267	10-year	746.00	1622.32	1625.96	1625.96	1627.29	0.029010	9.24	80.70	30.24	1.00
Tk Lower	Tk Lower	39267	25-year	1000.00	1622.32	1627.00	1627.00	1627.97	0.015569	8.21	145.70	82.08	0.76
Tk Lower	Tk Lower	39267	50-year	1230.00	1622.32	1627.33	1627.33	1628.39	0.015791	8.76	173.19	82.57	0.78
Tk Lower	Tk Lower	39267	100-year	1450.00	1622.32	1627.62	1627.62	1628.76	0.015823	9.20	197.52	87.79	0.79
Tk Lower	Tk Lower	39267	500-year	2030.00	1622.32	1628.50	1628.50	1629.45	0.011856	9.03	329.19	374.61	0.70
Tk Lower	Tk Lower	38971	10-year	746.00	1617.20	1622.16	1620.62	1622.30	0.002221	3.45	309.84	311.87	0.30
Tk Lower	Tk Lower	38971	25-year	1000.00	1617.20	1622.69	1621.23	1622.84	0.002149	3.67	388.93	324.40	0.30
Tk Lower	Tk Lower	38971	50-year	1230.00	1617.20	1623.06	1621.40	1623.23	0.002243	3.95	445.11	330.48	0.31
Tk Lower	Tk Lower	38971	100-year	1450.00	1617.20	1623.95	1621.77	1624.08	0.001435	3.52	585.30	352.40	0.26
Tk Lower	Tk Lower	38971	500-year	2030.00	1617.20	1624.60	1622.23	1624.78	0.001786	4.21	692.78	368.51	0.29
Tk Lower	Tk Lower	38901	10-year	746.00	1615.56	1621.65	1619.35	1622.02	0.004225	5.15	224.58	185.94	0.39
Tk Lower	Tk Lower	38901	25-year	1000.00	1615.56	1621.97	1620.36	1622.49	0.005776	6.25	273.33	229.87	0.46
Tk Lower	Tk Lower	38901	50-year	1230.00	1615.56	1621.95	1620.96	1622.76	0.008874	7.74	270.51	228.75	0.57
Tk Lower	Tk Lower	38901	100-year	1450.00	1615.56	1623.55	1621.46	1623.87	0.003217	5.50	551.60	365.12	0.36
Tk Lower	Tk Lower	38901	500-year	2030.00	1615.56	1624.05	1622.66	1624.50	0.004414	6.74	642.01	397.21	0.43
Tk Lower	Tk Lower	38846	Bridge										
Tk Lower	Tk Lower	38818	10-year	746.00	1615.10	1620.69	1618.62	1621.00	0.004324	4.85	294.24	280.62	0.38
Tk Lower	Tk Lower	38818	25-year	1000.00	1615.10	1621.42	1619.29	1621.67	0.003390	4.71	474.14	384.58	0.35
Tk Lower	Tk Lower	38818	50-year	1230.00	1615.10	1621.54	1620.66	1621.87	0.004555	5.53	505.42	404.37	0.40
Tk Lower	Tk Lower	38818	100-year	1450.00	1615.10	1621.95	1620.94	1622.27	0.004313	5.64	630.95	477.02	0.40
Tk Lower	Tk Lower	38818	500-year	2030.00	1615.10	1622.52	1621.46	1622.88	0.004828	6.32	809.94	493.55	0.43
Tk Lower	Tk Lower	38749	10-year	746.00	1614.05	1620.49	1617.84	1620.74	0.002607	4.15	216.77	196.93	0.33
Tk Lower	Tk Lower	38749	25-year	1000.00	1614.05	1621.26	1618.51	1621.47	0.002125	4.14	371.30	326.10	0.31
Tk Lower	Tk Lower	38749	50-year	1230.00	1614.05	1621.29	1619.01	1621.60	0.003111	5.02	378.68	330.43	0.37
Tk Lower	Tk Lower	38749	100-year	1450.00	1614.05	1621.75	1619.81	1622.02	0.002637	4.88	509.79	411.30	0.35
Tk Lower	Tk Lower	38749	500-year	2030.00	1614.05	1622.30	1621.19	1622.59	0.002879	5.40	704.50	468.58	0.37
Tk Lower	Tk Lower	38683	Bridge										
Tk Lower	Tk Lower	38674	10-year	746.00	1613.24	1617.51	1616.44	1618.01	0.009064	5.68	131.38	42.84	0.57
Tk Lower	Tk Lower	38674	25-year	1000.00	1613.24	1618.30	1616.97	1618.86	0.008081	6.02	167.26	315.65	0.55
Tk Lower	Tk Lower	38674	50-year	1230.00	1613.24	1618.99	1617.37	1619.53	0.006587	6.02	263.37	476.37	0.51
Tk Lower	Tk Lower	38674	100-year	1450.00	1613.24	1619.69	1617.75	1620.09	0.004467	5.43	431.67	531.58	0.42
Tk Lower	Tk Lower	38674	500-year	2030.00	1613.24	1620.54	1619.35	1620.90	0.003941	5.58	657.97	585.99	0.40
Tk Lower	Tk Lower	38580	10-year	746.00	1610.59	1614.94	1614.94	1616.35	0.028204	9.52	78.57	28.42	0.99
Tk Lower	Tk Lower	38580	25-year	1000.00	1610.59	1615.57	1615.57	1617.26	0.026204	10.46	96.72	29.94	0.99

HEC-RAS Plan: TK ww + LB ww Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	38580	50-year	1230.00	1610.59	1616.06	1616.06	1618.02	0.025318	11.24	111.90	83.97	0.99
Tk Lower	Tk Lower	38580	100-year	1450.00	1610.59	1616.44	1616.44	1618.69	0.025889	12.08	125.00	111.03	1.02
Tk Lower	Tk Lower	38580	500-year	2030.00	1610.59	1618.25	1618.25	1619.90	0.013068	10.82	285.15	519.16	0.77
Tk Lower	Tk Lower	38201	10-year	746.00	1603.60	1608.83	1607.14	1609.28	0.006349	5.42	137.78	35.40	0.48
Tk Lower	Tk Lower	38201	25-year	1000.00	1603.60	1609.50	1607.74	1610.09	0.006861	6.17	163.50	47.96	0.51
Tk Lower	Tk Lower	38201	50-year	1230.00	1603.60	1609.92	1608.23	1610.65	0.007668	6.92	189.85	85.99	0.55
Tk Lower	Tk Lower	38201	100-year	1450.00	1603.60	1610.25	1608.66	1611.12	0.008350	7.54	222.59	117.21	0.58
Tk Lower	Tk Lower	38201	500-year	2030.00	1603.60	1611.16	1609.79	1612.20	0.008591	8.51	336.03	198.52	0.61
Tk Lower	Tk Lower	37955	10-year	746.00	1599.53	1606.39	1604.71	1607.29	0.010116	7.80	110.06	64.56	0.56
Tk Lower	Tk Lower	37955	25-year	1000.00	1599.53	1607.11	1605.70	1608.04	0.010010	8.37	200.89	113.48	0.57
Tk Lower	Tk Lower	37955	50-year	1230.00	1599.53	1607.80	1606.44	1608.64	0.008705	8.34	291.09	138.71	0.54
Tk Lower	Tk Lower	37955	100-year	1450.00	1599.53	1608.44	1606.68	1609.15	0.007360	8.10	379.66	161.01	0.51
Tk Lower	Tk Lower	37955	500-year	2030.00	1599.53	1609.70	1608.48	1610.31	0.006072	8.12	559.09	194.92	0.47
Tk Lower	Tk Lower	37897	10-year	746.00	1599.41	1606.29	1603.23	1606.68	0.004113	5.04	153.59	55.29	0.37
Tk Lower	Tk Lower	37897	25-year	1000.00	1599.41	1606.93	1603.95	1607.44	0.004813	5.84	209.15	70.04	0.40
Tk Lower	Tk Lower	37897	50-year	1230.00	1599.41	1607.56	1604.54	1608.13	0.004990	6.32	262.84	100.04	0.42
Tk Lower	Tk Lower	37897	100-year	1450.00	1599.41	1608.16	1605.06	1608.75	0.004776	6.53	348.01	164.03	0.42
Tk Lower	Tk Lower	37897	500-year	2030.00	1599.41	1609.43	1606.77	1609.99	0.004253	6.82	566.07	181.82	0.40
Tk Lower	Tk Lower	37826		Bridge									
Tk Lower	Tk Lower	37806	10-year	746.00	1598.88	1604.31	1602.75	1604.75	0.005852	5.29	142.38	37.94	0.47
Tk Lower	Tk Lower	37806	25-year	1000.00	1598.88	1605.41	1603.27	1605.88	0.004632	5.51	194.33	67.42	0.43
Tk Lower	Tk Lower	37806	50-year	1230.00	1598.88	1606.36	1603.71	1606.81	0.003650	5.49	289.76	179.30	0.40
Tk Lower	Tk Lower	37806	100-year	1450.00	1598.88	1607.27	1604.11	1607.66	0.002762	5.26	423.43	219.50	0.35
Tk Lower	Tk Lower	37806	500-year	2030.00	1598.88	1609.58	1605.12	1609.77	0.001186	4.18	1040.23	256.53	0.24
Tk Lower	Tk Lower	37747	10-year	746.00	1597.86	1601.92	1601.92	1603.67	0.033668	10.60	70.38	20.08	1.00
Tk Lower	Tk Lower	37747	25-year	1000.00	1597.86	1602.68	1602.68	1604.80	0.034003	11.67	85.68	20.29	1.00
Tk Lower	Tk Lower	37747	50-year	1230.00	1597.86	1603.31	1603.31	1605.73	0.033726	12.49	98.49	34.46	1.00
Tk Lower	Tk Lower	37747	100-year	1450.00	1597.86	1603.89	1603.89	1606.58	0.033093	13.16	110.35	94.35	1.00
Tk Lower	Tk Lower	37747	500-year	2030.00	1597.86	1605.23	1605.23	1608.61	0.032945	14.75	138.32	232.77	1.00
Tk Lower	Tk Lower	37601	10-year	746.00	1595.08	1600.65	1598.35	1600.69	0.000655	2.12	696.70	438.68	0.17
Tk Lower	Tk Lower	37601	25-year	1000.00	1595.08	1601.12	1599.14	1601.17	0.000708	2.34	852.26	472.69	0.18
Tk Lower	Tk Lower	37601	50-year	1230.00	1595.08	1601.51	1599.38	1601.55	0.000723	2.47	984.96	482.99	0.18
Tk Lower	Tk Lower	37601	100-year	1450.00	1595.08	1601.71	1599.54	1601.77	0.000835	2.72	1057.91	501.89	0.19
Tk Lower	Tk Lower	37601	500-year	2030.00	1595.08	1601.99	1599.90	1602.04	0.000828	2.79	1475.31	517.68	0.20
Tk Lower	Tk Lower	37546	10-year	746.00	1595.00	1600.51	1598.08	1600.62	0.001509	3.12	375.27	286.55	0.24
Tk Lower	Tk Lower	37546	25-year	1000.00	1595.00	1600.96	1598.82	1601.09	0.001694	3.49	456.01	321.37	0.26
Tk Lower	Tk Lower	37546	50-year	1230.00	1595.00	1601.33	1599.44	1601.47	0.001816	3.77	522.54	335.32	0.27
Tk Lower	Tk Lower	37546	100-year	1450.00	1595.00	1601.50	1599.85	1601.67	0.002176	4.20	553.11	341.67	0.30
Tk Lower	Tk Lower	37546	500-year	2030.00	1595.00	1601.81	1600.30	1601.94	0.002027	4.19	895.37	402.76	0.29
Tk Lower	Tk Lower	37465		Bridge									
Tk Lower	Tk Lower	37428	10-year	746.00	1595.00	1597.63	1597.63	1598.64	0.030944	8.07	92.47	69.17	1.00
Tk Lower	Tk Lower	37428	25-year	1000.00	1595.00	1598.12	1598.12	1599.28	0.029115	8.65	115.64	197.15	0.99
Tk Lower	Tk Lower	37428	50-year	1230.00	1595.00	1598.50	1598.50	1599.79	0.028567	9.14	134.51	278.85	1.00
Tk Lower	Tk Lower	37428	100-year	1450.00	1595.00	1599.26	1598.83	1599.45	0.005308	4.45	528.87	432.75	0.44
Tk Lower	Tk Lower	37428	500-year	2030.00	1595.00	1600.01	1599.12	1600.13	0.002867	3.74	911.94	577.26	0.33
Tk Lower	Tk Lower	37389	10-year	786.00	1591.39	1597.04	1596.12	1597.65	0.010151	6.27	135.86	189.26	0.67
Tk Lower	Tk Lower	37389	25-year	1060.00	1591.39	1597.61	1596.94	1598.26	0.010596	6.62	204.11	250.51	0.68
Tk Lower	Tk Lower	37389	50-year	1290.00	1591.39	1597.92	1597.53	1598.64	0.011414	7.07	250.58	349.30	0.70
Tk Lower	Tk Lower	37389	100-year	1530.00	1591.39	1598.18	1597.86	1598.97	0.012234	7.52	296.69	400.44	0.71
Tk Lower	Tk Lower	37389	500-year	2150.00	1591.39	1598.74	1598.56	1599.67	0.013371	8.46	415.18	527.81	0.74
Tk Lower	Tk Lower	37332.2*	10-year	786.00	1591.03	1596.55	1595.51	1597.10	0.012168	5.94	137.96	145.82	0.63
Tk Lower	Tk Lower	37332.2*	25-year	1060.00	1591.03	1597.11	1596.19	1597.71	0.011987	6.34	213.76	320.83	0.64
Tk Lower	Tk Lower	37332.2*	50-year	1290.00	1591.03	1597.40	1596.95	1598.06	0.012216	6.77	275.33	398.35	0.65
Tk Lower	Tk Lower	37332.2*	100-year	1530.00	1591.03	1597.68	1597.44	1598.36	0.012037	7.06	335.24	443.37	0.65
Tk Lower	Tk Lower	37332.2*	500-year	2150.00	1591.03	1598.30	1597.97	1599.02	0.011492	7.63	478.27	558.99	0.65
Tk Lower	Tk Lower	37275.5*	10-year	786.00	1590.68	1595.99	1594.97	1596.52	0.011667	5.82	135.83	63.24	0.62
Tk Lower	Tk Lower	37275.5*	25-year	1060.00	1590.68	1596.51	1595.60	1597.14	0.011900	6.41	199.81	277.96	0.64
Tk Lower	Tk Lower	37275.5*	50-year	1290.00	1590.68	1596.82	1596.10	1597.49	0.011795	6.77	265.34	341.19	0.65
Tk Lower	Tk Lower	37275.5*	100-year	1530.00	1590.68	1597.09	1596.84	1597.80	0.011744	7.09	323.64	400.25	0.65
Tk Lower	Tk Lower	37275.5*	500-year	2150.00	1590.68	1597.80	1597.39	1598.50	0.010470	7.47	473.53	458.94	0.63
Tk Lower	Tk Lower	37218.7*	10-year	786.00	1590.32	1595.46	1594.45	1595.96	0.011320	5.69	138.14	52.23	0.61
Tk Lower	Tk Lower	37218.7*	25-year	1060.00	1590.32	1595.95	1595.06	1596.57	0.011587	6.37	194.26	212.42	0.63
Tk Lower	Tk Lower	37218.7*	50-year	1290.00	1590.32	1596.28	1595.48	1596.93	0.011360	6.71	261.52	260.95	0.64
Tk Lower	Tk Lower	37218.7*	100-year	1530.00	1590.32	1596.56	1596.26	1597.25	0.011294	7.02	319.92	357.11	0.64
Tk Lower	Tk Lower	37218.7*	500-year	2150.00	1590.32	1597.42	1596.83	1598.03	0.008724	7.01	498.63	422.71	0.58
Tk Lower	Tk Lower	37162.0*	10-year	786.00	1589.96	1594.93	1593.96	1595.42	0.010935	5.59	140.95	60.01	0.60

HEC-RAS Plan: TK ww + LB ww Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total	Mn Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Tk Lower	Tk Lower	37162.0*	25-year	1060.00	1589.96	1595.42	1594.56	1596.02	0.011194	6.28	195.68	172.24	0.62
Tk Lower	Tk Lower	37162.0*	50-year	1290.00	1589.96	1595.75	1594.93	1596.40	0.010996	6.63	261.30	208.97	0.63
Tk Lower	Tk Lower	37162.0*	100-year	1530.00	1589.96	1596.05	1595.70	1596.72	0.010732	6.89	322.38	263.26	0.62
Tk Lower	Tk Lower	37162.0*	500-year	2150.00	1589.96	1597.14	1596.29	1597.64	0.006824	6.41	542.18	418.11	0.51
Liddle Brook	Reach-1	8289	10-year	176.00	1801.12	1806.60		1806.61	0.000042	0.57	387.63	120.08	0.04
Liddle Brook	Reach-1	8289	25-year	238.00	1801.12	1806.74		1806.75	0.000069	0.74	404.28	122.36	0.06
Liddle Brook	Reach-1	8289	50-year	291.00	1801.12	1806.84		1806.85	0.000095	0.89	416.60	127.57	0.07
Liddle Brook	Reach-1	8289	100-year	346.00	1801.12	1806.94		1806.95	0.000124	1.02	429.58	128.77	0.08
Liddle Brook	Reach-1	8289	500-year	485.00	1801.12	1807.17		1807.19	0.000204	1.35	459.58	131.00	0.10
Liddle Brook	Reach-1	8014	10-year	176.00	1795.84	1806.60	1797.88	1806.60	0.000010	0.39	876.96	171.62	0.02
Liddle Brook	Reach-1	8014	25-year	238.00	1795.84	1806.74	1798.22	1806.74	0.000017	0.51	900.18	172.70	0.03
Liddle Brook	Reach-1	8014	50-year	291.00	1795.84	1806.83	1798.47	1806.84	0.000024	0.62	916.74	173.43	0.04
Liddle Brook	Reach-1	8014	100-year	346.00	1795.84	1806.93	1798.71	1806.94	0.000033	0.72	933.76	174.15	0.04
Liddle Brook	Reach-1	8014	500-year	485.00	1795.84	1807.15	1799.40	1807.16	0.000058	0.98	972.44	175.67	0.06
Liddle Brook	Reach-1	7961		Inl Struct									
Liddle Brook	Reach-1	7913	10-year	176.00	1794.19	1796.09	1796.09	1796.91	0.030629	7.27	25.91	18.13	0.98
Liddle Brook	Reach-1	7913	25-year	238.00	1794.19	1796.46	1796.46	1797.44	0.028749	8.02	32.84	19.77	0.98
Liddle Brook	Reach-1	7913	50-year	291.00	1794.19	1796.74	1796.74	1797.86	0.027624	8.57	38.64	21.17	0.99
Liddle Brook	Reach-1	7913	100-year	346.00	1794.19	1797.05	1797.05	1798.26	0.025734	8.97	45.41	23.70	0.97
Liddle Brook	Reach-1	7913	500-year	485.00	1794.19	1797.72	1797.72	1799.14	0.022790	9.81	63.20	28.92	0.95
Liddle Brook	Reach-1	7853	10-year	176.00	1793.28	1795.57		1795.80	0.011592	4.51	65.51	44.60	0.61
Liddle Brook	Reach-1	7853	25-year	238.00	1793.28	1795.87		1796.19	0.012982	5.33	80.53	51.75	0.66
Liddle Brook	Reach-1	7853	50-year	291.00	1793.28	1796.07		1796.46	0.013700	5.84	91.41	53.90	0.69
Liddle Brook	Reach-1	7853	100-year	346.00	1793.28	1796.27		1796.72	0.014194	6.30	102.23	55.41	0.72
Liddle Brook	Reach-1	7853	500-year	485.00	1793.28	1796.71		1797.29	0.015154	7.27	127.09	58.13	0.76
Liddle Brook	Reach-1	7783	10-year	176.00	1792.15	1793.98	1793.98	1794.49	0.032514	5.80	35.17	42.87	0.96
Liddle Brook	Reach-1	7783	25-year	238.00	1792.15	1794.21	1794.21	1794.82	0.031550	6.44	44.91	44.60	0.97
Liddle Brook	Reach-1	7783	50-year	291.00	1792.15	1794.40	1794.40	1795.08	0.029646	6.81	53.64	47.02	0.96
Liddle Brook	Reach-1	7783	100-year	346.00	1792.15	1794.57	1794.57	1795.32	0.028571	7.18	62.05	48.54	0.96
Liddle Brook	Reach-1	7783	500-year	485.00	1792.15	1794.98	1794.98	1795.88	0.026546	7.97	82.69	53.25	0.96
Liddle Brook	Reach-1	7284	10-year	176.00	1780.76	1782.68		1782.92	0.013408	4.82	83.61	89.50	0.66
Liddle Brook	Reach-1	7284	25-year	238.00	1780.76	1782.86	1782.63	1783.18	0.015969	5.64	100.72	97.28	0.73
Liddle Brook	Reach-1	7284	50-year	291.00	1780.76	1783.05		1783.39	0.015375	5.90	119.31	98.00	0.73
Liddle Brook	Reach-1	7284	100-year	346.00	1780.76	1783.22		1783.58	0.015364	6.22	135.76	98.67	0.74
Liddle Brook	Reach-1	7284	500-year	485.00	1780.76	1783.61	1783.27	1784.02	0.014875	6.83	175.13	100.12	0.75
Liddle Brook	Reach-1	6828	10-year	176.00	1770.93	1773.05	1773.05	1773.49	0.032415	6.41	58.84	69.08	0.97
Liddle Brook	Reach-1	6828	25-year	238.00	1770.93	1773.38	1773.22	1773.80	0.025063	6.51	82.25	76.21	0.89
Liddle Brook	Reach-1	6828	50-year	291.00	1770.93	1773.53	1773.44	1774.02	0.026244	7.06	94.16	78.71	0.92
Liddle Brook	Reach-1	6828	100-year	346.00	1770.93	1773.69	1773.59	1774.22	0.026242	7.47	106.93	80.26	0.93
Liddle Brook	Reach-1	6828	500-year	485.00	1770.93	1774.06	1773.82	1774.71	0.026948	8.47	137.36	88.40	0.97
Liddle Brook	Reach-1	6286	10-year	176.00	1757.34	1758.82	1758.65	1759.05	0.021462	5.16	86.10	108.99	0.80
Liddle Brook	Reach-1	6286	25-year	238.00	1757.34	1758.93	1758.80	1759.27	0.028683	6.30	98.97	119.29	0.94
Liddle Brook	Reach-1	6286	50-year	291.00	1757.34	1759.10	1758.90	1759.46	0.027393	6.64	120.46	133.40	0.93
Liddle Brook	Reach-1	6286	100-year	346.00	1757.34	1759.22	1759.17	1759.61	0.027585	7.01	137.04	135.12	0.95
Liddle Brook	Reach-1	6286	500-year	485.00	1757.34	1759.51	1759.39	1759.95	0.027272	7.73	176.71	144.37	0.97
Liddle Brook	Reach-1	5827	10-year	219.00	1747.64	1749.08	1748.69	1749.28	0.021117	4.89	95.52	97.02	0.78
Liddle Brook	Reach-1	5827	25-year	296.00	1747.64	1749.42	1748.90	1749.63	0.016723	5.13	127.36	125.48	0.73
Liddle Brook	Reach-1	5827	50-year	363.00	1747.64	1749.62	1749.04	1749.88	0.017086	5.62	148.61	141.06	0.75
Liddle Brook	Reach-1	5827	100-year	432.00	1747.64	1749.77	1749.11	1750.04	0.016982	5.91	182.60	145.91	0.76
Liddle Brook	Reach-1	5827	500-year	605.00	1747.64	1750.12	1749.55	1750.43	0.016941	6.61	233.44	148.00	0.78
Liddle Brook	Reach-1	5342	10-year	219.00	1735.14	1737.64	1737.47	1738.18	0.024666	5.90	37.11	25.48	0.86
Liddle Brook	Reach-1	5342	25-year	296.00	1735.14	1737.80	1737.80	1738.61	0.032274	7.19	41.22	26.28	1.00
Liddle Brook	Reach-1	5342	50-year	363.00	1735.14	1738.04	1738.04	1738.96	0.030605	7.68	47.61	27.46	1.00
Liddle Brook	Reach-1	5342	100-year	432.00	1735.14	1738.26	1738.26	1739.29	0.029584	8.14	53.86	28.58	1.00
Liddle Brook	Reach-1	5342	500-year	605.00	1735.14	1738.78	1738.78	1740.06	0.027248	9.08	69.40	31.17	0.99
Liddle Brook	Reach-1	4944	10-year	219.00	1723.63	1725.85	1725.85	1726.44	0.035915	6.17	35.50	30.41	1.01
Liddle Brook	Reach-1	4944	25-year	296.00	1723.63	1726.76		1727.06	0.009295	4.41	76.58	61.05	0.56
Liddle Brook	Reach-1	4944	50-year	363.00	1723.63	1727.60		1727.79	0.003860	3.60	132.63	72.77	0.38
Liddle Brook	Reach-1	4944	100-year	432.00	1723.63	1728.57		1728.70	0.001808	3.01	209.37	84.27	0.27
Liddle Brook	Reach-1	4944	500-year	605.00	1723.63	1729.39		1729.53	0.001703	3.34	281.12	91.14	0.28
Liddle Brook	Reach-1	4874	10-year	219.00	1720.69	1725.46	1723.03	1725.61	0.002298	3.14	69.73	42.86	0.29
Liddle Brook	Reach-1	4874	25-year	296.00	1720.69	1726.63	1723.47	1726.79	0.001645	3.20	92.37	71.40	0.26
Liddle Brook	Reach-1	4874	50-year	363.00	1720.69	1727.45	1723.79	1727.62	0.001458	3.35	108.23	102.24	0.25
Liddle Brook	Reach-1	4874	100-year	432.00	1720.69	1728.41	1724.12	1728.59	0.001220	3.41	126.75	151.74	0.23
Liddle Brook	Reach-1	4874	500-year	605.00	1720.69	1729.11	1724.98	1729.40	0.001701	4.31	140.40	175.50	0.28
Liddle Brook	Reach-1	4832		Bridge									

HEC-RAS Plan: TK ww + LB ww Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Liddle Brook	Reach-1	4789	10-year	219.00	1720.73	1723.75	1722.51	1723.99	0.044527	3.94	55.54	26.66	0.42
Liddle Brook	Reach-1	4789	25-year	296.00	1720.73	1724.36	1722.86	1724.65	0.042392	4.38	67.53	29.05	0.42
Liddle Brook	Reach-1	4789	50-year	363.00	1720.73	1724.93	1723.13	1725.26	0.037792	4.59	79.01	63.56	0.41
Liddle Brook	Reach-1	4789	100-year	432.00	1720.73	1725.46	1723.42	1725.82	0.035432	4.83	89.41	80.65	0.40
Liddle Brook	Reach-1	4789	500-year	605.00	1720.73	1726.22	1724.01	1726.74	0.041277	5.79	104.54	152.46	0.44
Liddle Brook	Reach-1	4695	10-year	219.00	1719.61	1721.60	1721.18	1721.95	0.012566	4.73	49.22	56.01	0.64
Liddle Brook	Reach-1	4695	25-year	296.00	1719.61	1721.80	1721.47	1722.30	0.015817	5.71	55.96	89.36	0.73
Liddle Brook	Reach-1	4695	50-year	363.00	1719.61	1721.88	1721.69	1722.57	0.020841	6.73	58.57	92.59	0.84
Liddle Brook	Reach-1	4695	100-year	432.00	1719.61	1721.97	1721.91	1722.86	0.025337	7.64	61.75	96.43	0.93
Liddle Brook	Reach-1	4695	500-year	605.00	1719.61	1722.44	1722.44	1723.58	0.024995	8.68	79.80	136.43	0.96
Liddle Brook	Reach-1	4347	10-year	219.00	1712.55	1713.41	1713.31	1713.58	0.062028	5.01	97.71	173.08	1.18
Liddle Brook	Reach-1	4347	25-year	296.00	1712.55	1713.62	1713.40	1713.79	0.041353	5.05	134.90	190.63	1.02
Liddle Brook	Reach-1	4347	50-year	363.00	1712.55	1713.85	1713.50	1714.01	0.028250	4.96	181.62	212.56	0.88
Liddle Brook	Reach-1	4347	100-year	432.00	1712.55	1714.00	1713.60	1714.16	0.023441	4.97	214.70	213.21	0.82
Liddle Brook	Reach-1	4347	500-year	605.00	1712.55	1714.32		1714.50	0.018780	5.25	283.71	214.59	0.76
Liddle Brook	Reach-1	3858	10-year	219.00	1700.53	1702.77	1702.21	1703.06	0.010777	5.01	81.40	81.85	0.61
Liddle Brook	Reach-1	3858	25-year	296.00	1700.53	1702.96	1702.50	1703.33	0.012993	5.83	110.92	90.40	0.68
Liddle Brook	Reach-1	3858	50-year	363.00	1700.53	1703.06	1702.71	1703.56	0.016613	6.79	120.40	95.22	0.78
Liddle Brook	Reach-1	3858	100-year	432.00	1700.53	1703.19	1703.02	1703.78	0.019137	7.54	132.08	99.99	0.84
Liddle Brook	Reach-1	3858	500-year	605.00	1700.53	1703.48	1703.47	1704.27	0.023091	8.92	162.60	106.38	0.94
Liddle Brook	Reach-1	3701	10-year	219.00	1696.64	1702.89		1702.91	0.000143	1.13	329.00	96.05	0.08
Liddle Brook	Reach-1	3701	25-year	296.00	1696.64	1703.09		1703.11	0.000233	1.48	349.74	113.52	0.11
Liddle Brook	Reach-1	3701	50-year	363.00	1696.64	1703.22		1703.26	0.000322	1.76	366.30	120.35	0.13
Liddle Brook	Reach-1	3701	100-year	432.00	1696.64	1703.37		1703.42	0.000417	2.04	383.42	124.88	0.14
Liddle Brook	Reach-1	3701	500-year	605.00	1696.64	1703.65		1703.74	0.000684	2.69	421.43	142.16	0.19
Liddle Brook	Reach-1	3671	10-year	219.00	1694.86	1702.89	1697.04	1702.90	0.000108	1.17	396.51	102.20	0.08
Liddle Brook	Reach-1	3671	25-year	296.00	1694.86	1703.08	1697.40	1703.11	0.000177	1.53	416.68	108.66	0.10
Liddle Brook	Reach-1	3671	50-year	363.00	1694.86	1703.22	1697.67	1703.26	0.000251	1.84	431.93	112.85	0.12
Liddle Brook	Reach-1	3671	100-year	432.00	1694.86	1703.35	1697.91	1703.41	0.000331	2.14	447.61	114.63	0.13
Liddle Brook	Reach-1	3671	500-year	605.00	1694.86	1703.63	1698.48	1703.72	0.000565	2.86	480.57	130.18	0.18
Liddle Brook	Reach-1	3644		Inl Struct									
Liddle Brook	Reach-1	3625	10-year	219.00	1694.29	1697.10	1696.91	1697.87	0.035807	7.06	31.03	15.40	0.87
Liddle Brook	Reach-1	3625	25-year	296.00	1694.29	1697.38	1697.32	1698.47	0.042590	8.39	35.36	15.57	0.97
Liddle Brook	Reach-1	3625	50-year	363.00	1694.29	1697.66	1697.66	1698.96	0.043282	9.15	39.88	15.75	1.00
Liddle Brook	Reach-1	3625	100-year	432.00	1694.29	1697.97	1697.97	1699.44	0.042269	9.74	44.74	15.99	1.01
Liddle Brook	Reach-1	3625	500-year	605.00	1694.29	1698.73	1698.73	1700.54	0.037974	10.78	57.41	17.18	0.99
Liddle Brook	Reach-1	3602	10-year	219.00	1694.02	1696.85		1697.26	0.014455	5.69	65.19	47.82	0.69
Liddle Brook	Reach-1	3602	25-year	296.00	1694.02	1696.85	1696.85	1697.60	0.026621	7.71	64.98	47.79	0.94
Liddle Brook	Reach-1	3602	50-year	363.00	1694.02	1697.08	1697.08	1697.93	0.026619	8.27	76.38	49.57	0.95
Liddle Brook	Reach-1	3602	100-year	432.00	1694.02	1697.30	1697.30	1698.24	0.026655	8.79	87.48	51.24	0.97
Liddle Brook	Reach-1	3602	500-year	605.00	1694.02	1697.80	1697.80	1698.92	0.026089	9.80	114.66	59.95	0.99
Liddle Brook	Reach-1	3364	10-year	219.00	1688.97	1690.87	1690.87	1691.55	0.046798	7.71	46.72	150.92	1.17
Liddle Brook	Reach-1	3364	25-year	296.00	1688.97	1690.98	1690.98	1691.03	0.007384	3.23	225.38	151.42	0.47
Liddle Brook	Reach-1	3364	50-year	363.00	1688.97	1690.99	1690.99	1691.07	0.010922	3.95	226.50	151.44	0.57
Liddle Brook	Reach-1	3364	100-year	432.00	1688.97	1690.99	1690.99	1691.10	0.015469	4.70	226.50	151.44	0.68
Liddle Brook	Reach-1	3364	500-year	605.00	1688.97	1691.17	1690.99	1691.35	0.020546	5.86	254.79	151.91	0.80
Liddle Brook	Reach-1	3286	10-year	288.00	1685.52	1688.47	1688.47	1688.91	0.019498	6.35	82.71	89.05	0.73
Liddle Brook	Reach-1	3286	25-year	388.00	1685.52	1688.77		1689.19	0.017859	6.58	109.69	91.68	0.72
Liddle Brook	Reach-1	3286	50-year	476.00	1685.52	1689.08		1689.45	0.014626	6.41	138.21	93.57	0.66
Liddle Brook	Reach-1	3286	100-year	565.00	1685.52	1689.39		1689.72	0.012122	6.24	167.28	94.80	0.61
Liddle Brook	Reach-1	3286	500-year	792.00	1685.52	1690.18		1690.45	0.008020	5.88	243.78	98.05	0.52
Liddle Brook	Reach-1	3200	10-year	288.00	1683.15	1686.55	1686.36	1687.18	0.017752	6.82	56.11	34.29	0.72
Liddle Brook	Reach-1	3200	25-year	388.00	1683.15	1687.07		1687.73	0.015687	7.18	74.25	35.63	0.70
Liddle Brook	Reach-1	3200	50-year	476.00	1683.15	1687.50		1688.18	0.014146	7.40	89.88	36.78	0.68
Liddle Brook	Reach-1	3200	100-year	565.00	1683.15	1687.90		1688.60	0.013117	7.63	104.77	37.84	0.66
Liddle Brook	Reach-1	3200	500-year	792.00	1683.15	1688.84		1689.59	0.011252	8.10	141.57	40.58	0.63
Liddle Brook	Reach-1	3100	10-year	288.00	1680.40	1683.51	1683.51	1684.74	0.033894	8.90	32.75	14.33	1.00
Liddle Brook	Reach-1	3100	25-year	388.00	1680.40	1684.08	1684.08	1685.53	0.030639	9.70	41.29	15.98	0.98
Liddle Brook	Reach-1	3100	50-year	476.00	1680.40	1684.54	1684.54	1686.15	0.028449	10.27	48.97	17.52	0.97
Liddle Brook	Reach-1	3100	100-year	565.00	1680.40	1685.00	1685.00	1686.72	0.025968	10.65	57.62	19.76	0.94
Liddle Brook	Reach-1	3100	500-year	792.00	1680.40	1686.03	1686.03	1687.96	0.022053	11.45	80.51	24.56	0.90
Liddle Brook	Reach-1	2900	10-year	288.00	1674.90	1678.09	1678.07	1679.24	0.033097	8.63	34.88	16.66	0.96
Liddle Brook	Reach-1	2900	25-year	388.00	1674.90	1678.63	1678.63	1679.98	0.030601	9.44	44.33	18.43	0.95
Liddle Brook	Reach-1	2900	50-year	476.00	1674.90	1679.05	1679.05	1680.56	0.029243	10.05	52.36	19.91	0.95
Liddle Brook	Reach-1	2900	100-year	565.00	1674.90	1679.46	1679.46	1681.09	0.027722	10.54	60.80	21.65	0.94
Liddle Brook	Reach-1	2900	500-year	792.00	1674.90	1680.41	1680.41	1682.26	0.024353	11.42	83.40	26.01	0.92
Liddle Brook	Reach-1	2800	10-year	288.00	1671.78	1675.02	1674.91	1676.11	0.029264	8.41	35.28	16.14	0.92

HEC-RAS Plan: TK ww + LB ww Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Liddle Brook	Reach-1	2800	25-year	388.00	1671.78	1675.48	1675.48	1676.87	0.030199	9.52	43.17	17.95	0.96
Liddle Brook	Reach-1	2800	50-year	476.00	1671.78	1675.93	1675.93	1677.46	0.028074	10.05	51.62	19.67	0.94
Liddle Brook	Reach-1	2800	100-year	565.00	1671.78	1676.37	1676.37	1677.99	0.026071	10.46	60.49	21.32	0.93
Liddle Brook	Reach-1	2800	500-year	792.00	1671.78	1677.24	1677.24	1679.18	0.024464	11.58	80.71	24.72	0.93
Liddle Brook	Reach-1	2700	10-year	288.00	1668.90	1672.04	1671.95	1672.96	0.032988	7.72	37.33	18.32	0.95
Liddle Brook	Reach-1	2700	25-year	388.00	1668.90	1672.45	1672.41	1673.61	0.032532	8.65	45.15	19.58	0.97
Liddle Brook	Reach-1	2700	50-year	476.00	1668.90	1672.80	1672.76	1674.13	0.031400	9.28	52.13	20.64	0.98
Liddle Brook	Reach-1	2700	100-year	565.00	1668.90	1673.13	1673.13	1674.62	0.030281	9.81	59.15	21.65	0.98
Liddle Brook	Reach-1	2700	500-year	792.00	1668.90	1673.93	1673.93	1675.72	0.027284	10.83	77.42	24.09	0.96
Liddle Brook	Reach-1	2600	10-year	288.00	1666.64	1669.62	1669.25	1670.25	0.021305	6.38	45.15	21.55	0.78
Liddle Brook	Reach-1	2600	25-year	388.00	1666.64	1670.01	1669.68	1670.82	0.022532	7.21	53.84	22.73	0.82
Liddle Brook	Reach-1	2600	50-year	476.00	1666.64	1670.26	1670.02	1671.26	0.024639	8.04	59.46	23.46	0.87
Liddle Brook	Reach-1	2600	100-year	565.00	1666.64	1670.49	1670.31	1671.68	0.026063	8.75	65.12	24.18	0.91
Liddle Brook	Reach-1	2600	500-year	792.00	1666.64	1671.05	1671.03	1672.68	0.028432	10.27	78.94	25.84	0.97
Liddle Brook	Reach-1	2499	10-year	288.00	1663.86	1666.49	1666.49	1667.43	0.037265	7.81	36.89	19.71	1.01
Liddle Brook	Reach-1	2499	25-year	388.00	1663.86	1666.96	1666.96	1668.04	0.033922	8.36	46.80	25.06	0.98
Liddle Brook	Reach-1	2499	50-year	476.00	1663.86	1667.33	1667.33	1668.49	0.030306	8.71	56.89	27.94	0.95
Liddle Brook	Reach-1	2499	100-year	565.00	1663.86	1667.63	1667.63	1668.91	0.028861	9.15	65.53	28.84	0.95
Liddle Brook	Reach-1	2499	500-year	792.00	1663.86	1668.30	1668.30	1669.84	0.027120	10.17	85.36	30.81	0.95
Liddle Brook	Reach-1	2400	10-year	288.00	1660.69	1663.97		1664.45	0.014192	5.53	52.10	22.67	0.64
Liddle Brook	Reach-1	2400	25-year	388.00	1660.69	1664.51		1665.07	0.012949	6.02	64.74	24.31	0.63
Liddle Brook	Reach-1	2400	50-year	476.00	1660.69	1664.94		1665.57	0.012045	6.38	75.50	25.62	0.63
Liddle Brook	Reach-1	2400	100-year	565.00	1660.69	1665.36		1666.05	0.011252	6.69	86.44	26.89	0.62
Liddle Brook	Reach-1	2400	500-year	792.00	1660.69	1666.24		1667.10	0.010531	7.48	111.31	29.57	0.62
Liddle Brook	Reach-1	2300	10-year	288.00	1658.38	1661.77	1661.46	1662.58	0.024672	7.24	39.81	17.28	0.84
Liddle Brook	Reach-1	2300	25-year	388.00	1658.38	1662.20	1661.98	1663.24	0.026412	8.15	47.68	18.52	0.89
Liddle Brook	Reach-1	2300	50-year	476.00	1658.38	1662.48	1662.36	1663.75	0.028329	9.03	52.97	19.28	0.93
Liddle Brook	Reach-1	2300	100-year	565.00	1658.38	1662.74	1662.69	1664.24	0.029937	9.82	58.06	19.98	0.97
Liddle Brook	Reach-1	2300	500-year	792.00	1658.38	1663.53	1663.53	1665.38	0.027814	10.97	74.51	22.09	0.97
Liddle Brook	Reach-1	2205	10-year	288.00	1655.77	1658.75	1658.75	1659.76	0.035967	8.05	35.76	18.19	1.01
Liddle Brook	Reach-1	2205	25-year	388.00	1655.77	1659.21	1659.21	1660.41	0.033449	8.79	44.33	19.38	1.00
Liddle Brook	Reach-1	2205	50-year	476.00	1655.77	1659.58	1659.58	1660.93	0.031122	9.33	51.62	20.21	0.99
Liddle Brook	Reach-1	2205	100-year	565.00	1655.77	1659.92	1659.92	1661.41	0.029606	9.83	58.63	20.98	0.98
Liddle Brook	Reach-1	2205	500-year	792.00	1655.77	1660.71	1660.71	1662.53	0.026823	10.89	75.92	22.75	0.97
Liddle Brook	Reach-1	2100	10-year	288.00	1652.46	1655.25	1655.16	1655.90	0.024036	6.72	50.37	33.52	0.82
Liddle Brook	Reach-1	2100	25-year	388.00	1652.46	1655.63	1655.48	1656.37	0.023763	7.32	63.27	34.74	0.83
Liddle Brook	Reach-1	2100	50-year	476.00	1652.46	1655.82	1655.78	1656.73	0.027165	8.16	70.87	46.94	0.89
Liddle Brook	Reach-1	2100	100-year	565.00	1652.46	1656.09	1656.09	1657.05	0.025998	8.52	83.96	51.18	0.89
Liddle Brook	Reach-1	2100	500-year	792.00	1652.46	1656.65	1656.65	1657.74	0.024452	9.31	114.12	56.75	0.89
Liddle Brook	Reach-1	2000	10-year	288.00	1649.31	1651.94	1651.94	1652.89	0.037451	7.83	36.79	19.63	1.01
Liddle Brook	Reach-1	2000	25-year	388.00	1649.31	1652.39	1652.39	1653.50	0.034181	8.44	46.41	23.73	0.99
Liddle Brook	Reach-1	2000	50-year	476.00	1649.31	1652.83	1652.83	1653.95	0.027699	8.55	59.48	33.14	0.92
Liddle Brook	Reach-1	2000	100-year	565.00	1649.31	1653.13	1653.13	1654.34	0.026318	8.95	69.91	35.30	0.91
Liddle Brook	Reach-1	2000	500-year	792.00	1649.31	1653.87	1653.87	1655.18	0.022473	9.57	99.61	44.08	0.87
Liddle Brook	Reach-1	1900	10-year	288.00	1646.16	1648.77	1648.77	1649.57	0.022365	7.42	47.15	34.62	0.85
Liddle Brook	Reach-1	1900	25-year	388.00	1646.16	1649.15	1649.15	1650.07	0.022170	8.16	60.52	35.72	0.87
Liddle Brook	Reach-1	1900	50-year	476.00	1646.16	1649.44	1649.44	1650.46	0.022204	8.72	70.96	36.56	0.88
Liddle Brook	Reach-1	1900	100-year	565.00	1646.16	1649.72	1649.72	1650.83	0.021959	9.19	81.17	37.36	0.89
Liddle Brook	Reach-1	1900	500-year	792.00	1646.16	1650.28	1650.28	1651.65	0.022894	10.42	102.69	39.00	0.93
Liddle Brook	Reach-1	1738	10-year	288.00	1641.06	1643.52	1643.52	1644.31	0.038365	7.12	40.48	26.27	1.01
Liddle Brook	Reach-1	1738	25-year	388.00	1641.06	1644.24		1644.90	0.020153	6.51	60.05	28.18	0.77
Liddle Brook	Reach-1	1738	50-year	476.00	1641.06	1645.06		1645.58	0.010528	5.80	84.06	30.34	0.59
Liddle Brook	Reach-1	1738	100-year	565.00	1641.06	1645.85		1646.30	0.006731	5.41	109.00	32.43	0.49
Liddle Brook	Reach-1	1738	500-year	792.00	1641.06	1646.49		1647.12	0.007808	6.46	131.86	46.61	0.54
Liddle Brook	Reach-1	1695	10-year	288.00	1637.53	1643.03	1641.31	1643.32	0.005509	4.34	69.61	23.40	0.40
Liddle Brook	Reach-1	1695	25-year	388.00	1637.53	1644.07	1641.80	1644.38	0.004220	4.48	96.10	27.64	0.36
Liddle Brook	Reach-1	1695	50-year	476.00	1637.53	1644.92	1642.17	1645.23	0.003539	4.58	120.93	31.10	0.34
Liddle Brook	Reach-1	1695	100-year	565.00	1637.53	1645.73	1642.53	1646.05	0.003046	4.65	147.59	37.07	0.32
Liddle Brook	Reach-1	1695	500-year	792.00	1637.53	1646.31	1643.34	1646.81	0.004365	5.90	168.07	104.57	0.39
Liddle Brook	Reach-1	1662		Culvert									
Liddle Brook	Reach-1	1610	10-year	288.00	1635.55	1638.79		1639.25	0.013378	5.48	55.71	28.53	0.64
Liddle Brook	Reach-1	1610	25-year	388.00	1635.55	1639.28		1639.82	0.012918	5.96	70.66	31.69	0.65
Liddle Brook	Reach-1	1610	50-year	476.00	1635.55	1639.66		1640.27	0.012306	6.36	82.90	33.53	0.65
Liddle Brook	Reach-1	1610	100-year	565.00	1635.55	1640.02		1640.69	0.011746	6.69	95.31	35.55	0.64
Liddle Brook	Reach-1	1610	500-year	792.00	1635.55	1640.92		1641.70	0.010060	7.26	129.93	40.97	0.62
Liddle Brook	Reach-1	1581	10-year	288.00	1635.60	1638.12		1638.73	0.020179	6.26	46.89	24.05	0.77
Liddle Brook	Reach-1	1581	25-year	388.00	1635.60	1638.55		1639.30	0.020049	6.95	57.38	25.34	0.79

HEC-RAS Plan: TK ww + LB ww Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Liddle Brook	Reach-1	1581	50-year	476.00	1635.60	1638.86	1638.49	1639.74	0.020037	7.54	65.63	27.44	0.80
Liddle Brook	Reach-1	1581	100-year	565.00	1635.60	1639.15	1638.79	1640.15	0.020162	8.08	73.72	29.36	0.82
Liddle Brook	Reach-1	1581	500-year	792.00	1635.60	1639.61	1639.48	1641.06	0.024415	9.77	87.88	32.44	0.92
Liddle Brook	Reach-1	1519	10-year	288.00	1633.79	1636.13	1636.13	1637.05	0.036712	7.71	37.36	20.43	1.00
Liddle Brook	Reach-1	1519	25-year	388.00	1633.79	1636.54	1636.54	1637.65	0.035035	8.43	46.08	21.56	1.01
Liddle Brook	Reach-1	1519	50-year	476.00	1633.79	1636.87	1636.87	1638.13	0.033201	9.00	53.19	22.44	1.00
Liddle Brook	Reach-1	1519	100-year	565.00	1633.79	1637.19	1637.19	1638.58	0.031141	9.45	60.58	23.32	0.99
Liddle Brook	Reach-1	1519	500-year	792.00	1633.79	1638.30	1637.90	1639.67	0.019982	9.44	88.11	26.35	0.84
Liddle Brook	Reach-1	1463	10-year	288.00	1631.32	1634.70	1633.89	1635.13	0.011489	5.23	55.03	22.70	0.59
Liddle Brook	Reach-1	1463	25-year	388.00	1631.32	1635.29	1634.34	1635.78	0.011031	5.64	68.77	24.35	0.59
Liddle Brook	Reach-1	1463	50-year	476.00	1631.32	1635.73	1634.68	1636.28	0.010549	5.98	79.65	25.56	0.59
Liddle Brook	Reach-1	1463	100-year	565.00	1631.32	1636.00	1635.00	1636.66	0.011260	6.53	86.84	26.34	0.62
Liddle Brook	Reach-1	1463	500-year	792.00	1631.32	1638.36	1635.69	1638.79	0.003728	5.31	171.89	50.24	0.39
Liddle Brook	Reach-1	1453	Bridge										
Liddle Brook	Reach-1	1440	10-year	288.00	1630.85	1634.00		1634.48	0.013323	5.54	52.24	23.49	0.64
Liddle Brook	Reach-1	1440	25-year	388.00	1630.85	1634.49		1635.07	0.012704	6.15	63.95	24.60	0.65
Liddle Brook	Reach-1	1440	50-year	476.00	1630.85	1634.88		1635.55	0.012302	6.60	73.73	25.49	0.65
Liddle Brook	Reach-1	1440	100-year	565.00	1630.85	1635.22		1635.99	0.012273	7.06	82.59	26.27	0.66
Liddle Brook	Reach-1	1440	500-year	792.00	1630.85	1635.89		1636.94	0.013348	8.27	100.74	27.80	0.71
Liddle Brook	Reach-1	1400	10-year	288.00	1630.36	1633.42		1633.91	0.014571	5.61	51.29	22.07	0.65
Liddle Brook	Reach-1	1400	25-year	388.00	1630.36	1633.96		1634.54	0.013724	6.12	63.51	23.46	0.65
Liddle Brook	Reach-1	1400	50-year	476.00	1630.36	1634.38		1635.04	0.012919	6.52	73.57	24.56	0.64
Liddle Brook	Reach-1	1400	100-year	565.00	1630.36	1634.72	1633.84	1635.48	0.012930	6.98	82.16	25.47	0.65
Liddle Brook	Reach-1	1400	500-year	792.00	1630.36	1635.38	1634.52	1636.37	0.013846	8.08	117.72	75.45	0.70
Liddle Brook	Reach-1	1326	10-year	288.00	1627.90	1631.15	1631.15	1632.24	0.036321	8.38	34.36	15.71	1.00
Liddle Brook	Reach-1	1326	25-year	388.00	1627.90	1631.68	1631.68	1632.94	0.034741	9.01	43.05	16.83	0.99
Liddle Brook	Reach-1	1326	50-year	476.00	1627.90	1632.07	1632.07	1633.49	0.034130	9.59	49.80	18.47	1.00
Liddle Brook	Reach-1	1326	100-year	565.00	1627.90	1632.49	1632.49	1634.00	0.030399	9.88	58.87	25.48	0.96
Liddle Brook	Reach-1	1326	500-year	792.00	1627.90	1633.52	1633.52	1635.04	0.022044	10.11	96.40	116.50	0.86
Liddle Brook	Reach-1	1284	10-year	288.00	1624.35	1628.85	1627.73	1629.35	0.011860	5.67	50.79	17.14	0.58
Liddle Brook	Reach-1	1284	25-year	388.00	1624.35	1629.61	1628.32	1630.17	0.011360	6.02	64.49	19.13	0.58
Liddle Brook	Reach-1	1284	50-year	476.00	1624.35	1631.44	1628.75	1631.76	0.004591	4.58	104.72	29.76	0.38
Liddle Brook	Reach-1	1284	100-year	565.00	1624.35	1632.05	1629.17	1632.40	0.004153	4.75	125.96	59.68	0.37
Liddle Brook	Reach-1	1284	500-year	792.00	1624.35	1632.96	1630.07	1633.42	0.004539	5.54	162.12	150.26	0.40
Liddle Brook	Reach-1	1260	Bridge										
Liddle Brook	Reach-1	1239	10-year	288.00	1625.08	1627.96	1627.55	1628.53	0.018922	6.06	47.56	23.47	0.74
Liddle Brook	Reach-1	1239	25-year	388.00	1625.08	1628.39	1627.95	1629.10	0.018433	6.77	57.80	25.04	0.76
Liddle Brook	Reach-1	1239	50-year	476.00	1625.08	1628.71	1628.26	1629.54	0.018401	7.34	66.08	26.24	0.77
Liddle Brook	Reach-1	1239	100-year	565.00	1625.08	1628.94	1628.55	1629.94	0.019853	8.03	72.24	27.10	0.81
Liddle Brook	Reach-1	1239	500-year	792.00	1625.08	1629.76	1629.24	1630.95	0.017341	8.80	95.63	30.15	0.79
Liddle Brook	Reach-1	1178	10-year	288.00	1623.33	1625.89	1625.89	1626.85	0.036558	7.86	36.66	19.44	1.01
Liddle Brook	Reach-1	1178	25-year	388.00	1623.33	1626.34	1626.34	1627.46	0.034944	8.52	45.57	20.90	1.01
Liddle Brook	Reach-1	1178	50-year	476.00	1623.33	1626.68	1626.68	1627.95	0.032680	9.02	53.06	22.04	1.00
Liddle Brook	Reach-1	1178	100-year	565.00	1623.33	1627.09	1626.99	1628.41	0.028167	9.23	62.20	23.34	0.95
Liddle Brook	Reach-1	1178	500-year	792.00	1623.33	1627.74	1627.72	1629.46	0.028157	10.55	78.15	25.46	0.98
Liddle Brook	Reach-1	1103	10-year	288.00	1620.28	1625.13	1622.87	1625.37	0.003631	3.90	75.11	19.14	0.33
Liddle Brook	Reach-1	1103	25-year	388.00	1620.28	1625.80	1623.35	1626.12	0.004046	4.53	88.02	19.64	0.36
Liddle Brook	Reach-1	1103	50-year	476.00	1620.28	1626.33	1623.73	1626.72	0.004306	5.01	98.64	20.21	0.38
Liddle Brook	Reach-1	1103	100-year	565.00	1620.28	1626.83	1624.09	1627.28	0.004525	5.44	108.87	76.83	0.39
Liddle Brook	Reach-1	1103	500-year	792.00	1620.28	1627.29	1624.91	1628.06	0.006899	7.06	118.78	110.79	0.49
Liddle Brook	Reach-1	1062	Bridge										
Liddle Brook	Reach-1	1040	10-year	288.00	1620.28	1623.17	1622.86	1623.94	0.023690	7.05	40.85	17.69	0.82
Liddle Brook	Reach-1	1040	25-year	388.00	1620.28	1623.57	1623.33	1624.58	0.025662	8.06	48.18	18.26	0.87
Liddle Brook	Reach-1	1040	50-year	476.00	1620.28	1623.86	1623.69	1625.10	0.027565	8.93	53.44	18.66	0.91
Liddle Brook	Reach-1	1040	100-year	565.00	1620.28	1624.11	1624.04	1625.59	0.029579	9.77	58.19	19.02	0.96
Liddle Brook	Reach-1	1040	500-year	792.00	1620.28	1624.84	1624.84	1626.77	0.029246	11.14	72.46	54.25	0.99
Liddle Brook	Reach-1	891	10-year	288.00	1616.76	1618.82	1618.82	1619.61	0.036134	7.14	40.32	25.61	1.00
Liddle Brook	Reach-1	891	25-year	388.00	1616.76	1619.18	1619.18	1620.12	0.034654	7.80	49.78	27.27	1.01
Liddle Brook	Reach-1	891	50-year	476.00	1616.76	1619.46	1619.46	1620.53	0.032987	8.30	57.69	28.59	1.00
Liddle Brook	Reach-1	891	100-year	565.00	1616.76	1619.72	1619.72	1620.91	0.031430	8.75	65.38	29.81	1.00
Liddle Brook	Reach-1	891	500-year	792.00	1616.76	1620.34	1620.34	1621.79	0.028386	9.70	84.71	32.68	0.99
Liddle Brook	Reach-1	803	10-year	288.00	1613.79	1616.44		1616.86	0.013444	5.21	55.33	27.50	0.65
Liddle Brook	Reach-1	803	25-year	388.00	1613.79	1616.93		1617.42	0.012453	5.62	69.17	29.61	0.64
Liddle Brook	Reach-1	803	50-year	476.00	1613.79	1617.31		1617.85	0.011468	5.94	80.75	31.26	0.63
Liddle Brook	Reach-1	803	100-year	565.00	1613.79	1617.68		1618.27	0.010619	6.22	92.60	32.87	0.62
Liddle Brook	Reach-1	803	500-year	792.00	1613.79	1618.55		1619.26	0.009082	6.77	123.05	36.68	0.60

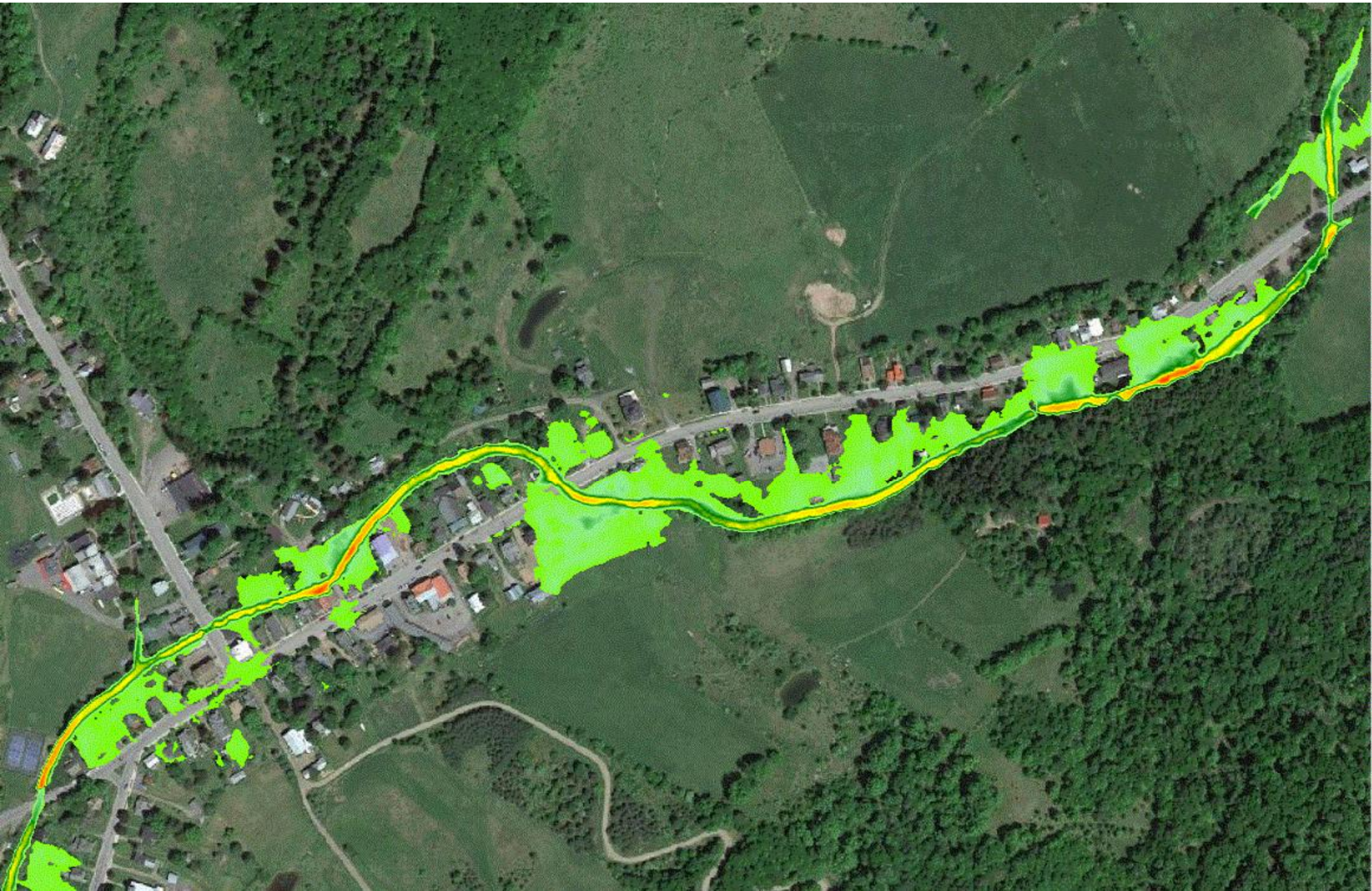
HEC-RAS Plan: TK ww + LB ww Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Liddle Brook	Reach-1	710	10-year	288.00	1610.64	1613.92	1613.92	1614.94	0.032867	8.11	35.49	17.14	0.99
Liddle Brook	Reach-1	710	25-year	388.00	1610.64	1614.39	1614.39	1615.62	0.030488	8.90	43.86	18.59	0.99
Liddle Brook	Reach-1	710	50-year	476.00	1610.64	1614.76	1614.76	1616.16	0.028989	9.51	50.94	19.73	0.99
Liddle Brook	Reach-1	710	100-year	565.00	1610.64	1615.10	1615.10	1616.67	0.027969	10.06	57.89	20.80	0.99
Liddle Brook	Reach-1	710	500-year	792.00	1610.64	1615.95	1615.95	1617.83	0.024719	11.06	76.78	23.45	0.96
Liddle Brook	Reach-1	619	10-year	288.00	1607.30	1611.27	1609.30	1611.46	0.003342	3.42	84.15	24.18	0.32
Liddle Brook	Reach-1	619	25-year	388.00	1607.30	1612.14	1609.70	1612.35	0.003153	3.68	105.56	25.48	0.32
Liddle Brook	Reach-1	619	50-year	476.00	1607.30	1612.84	1610.02	1613.07	0.003012	3.84	123.81	92.44	0.31
Liddle Brook	Reach-1	619	100-year	565.00	1607.30	1613.51	1610.32	1613.75	0.002776	3.99	141.89	141.27	0.31
Liddle Brook	Reach-1	619	500-year	792.00	1607.30	1614.41	1611.01	1614.76	0.003214	4.77	167.37	164.63	0.34
Liddle Brook	Reach-1	528		Culvert									
Liddle Brook	Reach-1	443	10-year	288.00	1604.38	1606.45	1606.45	1607.22	0.050101	7.04	40.91	26.38	1.00
Liddle Brook	Reach-1	443	25-year	388.00	1604.38	1606.80	1606.80	1607.73	0.050961	7.72	50.24	27.09	1.00
Liddle Brook	Reach-1	443	50-year	476.00	1604.38	1607.31	1607.08	1608.16	0.038684	7.40	64.35	28.13	0.86
Liddle Brook	Reach-1	443	100-year	565.00	1604.38	1608.15	1607.36	1608.76	0.022262	6.31	94.76	47.02	0.64
Liddle Brook	Reach-1	443	500-year	792.00	1604.38	1609.23	1608.09	1609.76	0.016341	6.05	152.80	57.67	0.54
Liddle Brook	Reach-1	411	10-year	288.00	1602.53	1605.61		1605.96	0.009481	4.72	61.04	23.47	0.52
Liddle Brook	Reach-1	411	25-year	388.00	1602.53	1606.45		1606.81	0.007321	4.80	80.78	23.65	0.46
Liddle Brook	Reach-1	411	50-year	476.00	1602.53	1607.14		1607.51	0.006339	4.90	97.37	30.71	0.43
Liddle Brook	Reach-1	411	100-year	565.00	1602.53	1607.86		1608.19	0.008965	4.72	139.46	74.88	0.42
Liddle Brook	Reach-1	411	500-year	792.00	1602.53	1608.96		1609.20	0.009892	4.28	244.88	108.33	0.38
Liddle Brook	Reach-1	388	10-year	288.00	1601.55	1605.59		1605.78	0.003721	3.52	81.77	22.46	0.33
Liddle Brook	Reach-1	388	25-year	388.00	1601.55	1606.42		1606.66	0.003585	3.86	100.59	22.65	0.32
Liddle Brook	Reach-1	388	50-year	476.00	1601.55	1607.11		1607.37	0.003379	4.09	118.57	46.97	0.32
Liddle Brook	Reach-1	388	100-year	565.00	1601.55	1607.80		1608.06	0.002946	4.16	170.76	94.22	0.30
Liddle Brook	Reach-1	388	500-year	792.00	1601.55	1608.82		1609.09	0.002762	4.48	281.57	125.53	0.30
Liddle Brook	Reach-1	366	10-year	288.00	1601.02	1605.55	1603.33	1605.69	0.002380	2.95	97.48	25.66	0.27
Liddle Brook	Reach-1	366	25-year	388.00	1601.02	1606.39	1603.68	1606.56	0.002368	3.26	119.06	25.69	0.27
Liddle Brook	Reach-1	366	50-year	476.00	1601.02	1607.09	1603.95	1607.28	0.002282	3.48	136.95	25.74	0.27
Liddle Brook	Reach-1	366	100-year	565.00	1601.02	1607.77	1604.22	1607.98	0.002148	3.65	157.95	43.84	0.26
Liddle Brook	Reach-1	366	500-year	792.00	1601.02	1608.76	1604.86	1609.03	0.002367	4.25	236.22	107.33	0.28
Liddle Brook	Reach-1	351		Culvert									
Liddle Brook	Reach-1	331	10-year	288.00	1600.60	1602.56	1602.33	1603.19	0.024159	6.33	45.50	25.10	0.83
Liddle Brook	Reach-1	331	25-year	388.00	1600.60	1602.94	1602.71	1603.71	0.024154	7.06	54.99	25.18	0.84
Liddle Brook	Reach-1	331	50-year	476.00	1600.60	1603.25	1602.99	1604.14	0.024165	7.60	62.67	25.24	0.85
Liddle Brook	Reach-1	331	100-year	565.00	1600.60	1603.54	1603.26	1604.55	0.024113	8.07	70.05	25.30	0.85
Liddle Brook	Reach-1	331	500-year	792.00	1600.60	1604.21	1603.89	1605.50	0.024096	9.09	87.11	25.44	0.87
Liddle Brook	Reach-1	294	10-year	288.00	1599.35	1601.69	1601.44	1602.28	0.023930	6.18	46.64	25.51	0.81
Liddle Brook	Reach-1	294	25-year	388.00	1599.35	1602.06	1601.79	1602.81	0.024258	6.91	56.13	25.58	0.82
Liddle Brook	Reach-1	294	50-year	476.00	1599.35	1602.37	1602.07	1603.23	0.024235	7.44	64.01	25.65	0.83
Liddle Brook	Reach-1	294	100-year	565.00	1599.35	1602.67	1602.35	1603.64	0.023973	7.87	71.76	25.71	0.83
Liddle Brook	Reach-1	294	500-year	792.00	1599.35	1603.37	1602.98	1604.58	0.023279	8.82	89.78	25.81	0.83
Liddle Brook	Reach-1	209	10-year	288.00	1596.51	1598.84	1598.84	1599.69	0.039280	7.41	38.89	23.02	1.00
Liddle Brook	Reach-1	209	25-year	388.00	1596.51	1599.23	1599.23	1600.25	0.037256	8.12	47.81	23.11	0.99
Liddle Brook	Reach-1	209	50-year	476.00	1596.51	1599.53	1599.53	1600.70	0.036447	8.67	54.90	23.19	0.99
Liddle Brook	Reach-1	209	100-year	565.00	1596.51	1599.82	1599.82	1601.13	0.036231	9.19	61.46	23.26	1.00
Liddle Brook	Reach-1	209	500-year	792.00	1596.51	1600.49	1600.49	1602.12	0.035468	10.26	77.20	23.44	1.00
Liddle Brook	Reach-1	167	10-year	288.00	1594.45	1597.66	1595.97	1597.78	0.002603	2.77	103.86	36.86	0.29
Liddle Brook	Reach-1	167	25-year	388.00	1594.45	1598.31	1596.27	1598.45	0.002507	3.03	128.15	38.16	0.29
Liddle Brook	Reach-1	167	50-year	476.00	1594.45	1598.76	1596.50	1598.92	0.002589	3.27	145.41	39.06	0.30
Liddle Brook	Reach-1	167	100-year	565.00	1594.45	1599.30	1596.72	1599.48	0.002428	3.39	166.86	40.15	0.29
Liddle Brook	Reach-1	167	500-year	792.00	1594.45	1600.40	1597.23	1600.61	0.002290	3.73	212.47	43.51	0.29
Liddle Brook	Reach-1	138		Culvert									
Liddle Brook	Reach-1	117	10-year	288.00	1593.51	1596.43		1596.59	0.003881	3.24	88.84	32.02	0.34
Liddle Brook	Reach-1	117	25-year	388.00	1593.51	1597.12		1597.31	0.003520	3.49	111.07	32.36	0.33
Liddle Brook	Reach-1	117	50-year	476.00	1593.51	1597.66		1597.87	0.003359	3.70	128.66	32.85	0.33
Liddle Brook	Reach-1	117	100-year	565.00	1593.51	1598.19		1598.42	0.003366	3.87	146.09	33.12	0.32
Liddle Brook	Reach-1	117	500-year	792.00	1593.51	1598.66		1599.03	0.005191	4.90	164.32	62.56	0.39
Liddle Brook	Reach-1	72	10-year	288.00	1592.93	1595.11	1594.98	1595.99	0.030408	7.55	38.17	18.14	0.92
Liddle Brook	Reach-1	72	25-year	388.00	1592.93	1595.44	1595.42	1596.64	0.035465	8.79	44.12	18.27	1.00
Liddle Brook	Reach-1	72	50-year	476.00	1592.93	1595.78	1595.78	1597.17	0.035641	9.44	50.43	18.41	1.01
Liddle Brook	Reach-1	72	100-year	565.00	1592.93	1596.09	1596.09	1597.66	0.036279	10.05	56.22	18.53	1.02
Liddle Brook	Reach-1	72	500-year	792.00	1592.93	1597.32	1597.32	1598.41	0.019581	8.86	131.67	70.67	0.76
Liddle Brook	Reach-1	5	10-year	288.00	1592.07	1594.53		1594.91	0.012653	4.96	58.12	29.52	0.62
Liddle Brook	Reach-1	5	25-year	388.00	1592.07	1595.09		1595.50	0.010855	5.15	75.40	31.88	0.59

HEC-RAS Plan: TK ww + LB ww Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Liddle Brook	Reach-1	5	50-year	476.00	1592.07	1595.41		1595.89	0.011331	5.55	85.74	33.21	0.61
Liddle Brook	Reach-1	5	100-year	565.00	1592.07	1595.66		1596.22	0.012250	6.00	94.15	34.26	0.64
Liddle Brook	Reach-1	5	500-year	792.00	1592.07	1596.92		1597.32	0.006006	5.28	204.08	111.04	0.47

Comprehensive Flood Mitigation - Tremper Kill 100-Year Storm



Comprehensive Flood Mitigation - Tremper Kill

HEC-RAS Plan: Hybrid Detention Locations: User Defined

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk middle	Reach-1	41995	10-year	618.17	1649.40	1658.86		1658.94	0.000376	2.34	367.84	72.69	0.14
Tk middle	Reach-1	41995	25-year	806.81	1649.40	1659.65		1659.75	0.000450	2.72	425.38	73.34	0.16
Tk middle	Reach-1	41995	50-year	977.50	1649.40	1660.31		1660.43	0.000504	3.01	473.56	73.88	0.17
Tk middle	Reach-1	41995	100-year	1144.85	1649.40	1660.88		1661.02	0.000555	3.27	515.87	74.36	0.18
Tk middle	Reach-1	41995	500-year	1588.20	1649.40	1662.13		1662.33	0.000688	3.93	609.66	75.39	0.20
Tk middle	Reach-1	41497	10-year	618.17	1642.25	1658.89		1658.90	0.000016	0.59	1570.59	147.65	0.03
Tk middle	Reach-1	41497	25-year	806.81	1642.25	1659.69		1659.69	0.000022	0.72	1688.57	148.82	0.03
Tk middle	Reach-1	41497	50-year	977.50	1642.25	1660.35		1660.36	0.000027	0.83	1787.26	149.79	0.04
Tk middle	Reach-1	41497	100-year	1144.85	1642.25	1660.93		1660.94	0.000032	0.93	1874.04	150.64	0.04
Tk middle	Reach-1	41497	500-year	1588.20	1642.25	1662.20		1662.21	0.000046	1.17	2066.78	152.50	0.05
Tk middle	Reach-1	41367	10-year	618.17	1652.32	1658.59		1658.86	0.002868	4.20	168.52	80.06	0.34
Tk middle	Reach-1	41367	25-year	806.81	1652.32	1659.34		1659.65	0.002791	4.57	233.07	87.06	0.34
Tk middle	Reach-1	41367	50-year	977.50	1652.32	1659.98		1660.31	0.002680	4.82	289.89	95.75	0.34
Tk middle	Reach-1	41367	100-year	1144.85	1652.32	1660.53		1660.89	0.002596	5.03	344.27	97.84	0.34
Tk middle	Reach-1	41367	500-year	1588.20	1652.32	1661.74		1662.16	0.002572	5.59	462.14	97.84	0.35
Tk middle	Reach-1	41242	10-year	618.17	1652.62	1656.56	1656.56	1657.95	0.023786	9.81	83.07	37.88	0.97
Tk middle	Reach-1	41242	25-year	806.81	1652.62	1657.13	1657.13	1658.74	0.022687	10.69	103.69	52.67	0.97
Tk middle	Reach-1	41242	50-year	977.50	1652.62	1657.57	1657.57	1659.41	0.022511	11.46	120.76	59.12	0.99
Tk middle	Reach-1	41242	100-year	1144.85	1652.62	1658.08	1658.08	1660.01	0.020575	11.83	143.20	76.43	0.96
Tk middle	Reach-1	41242	500-year	1588.20	1652.62	1659.45	1659.45	1661.35	0.015151	12.04	240.33	159.54	0.86
Tk middle	Reach-1	41210	10-year	618.17	1652.11	1656.75	1654.83	1657.08	0.003717	4.63	133.57	59.53	0.40
Tk middle	Reach-1	41210	25-year	806.81	1652.11	1657.39	1655.26	1657.82	0.003947	5.24	153.91	65.90	0.42
Tk middle	Reach-1	41210	50-year	977.50	1652.11	1657.94	1655.65	1658.45	0.004040	5.70	171.50	72.69	0.43
Tk middle	Reach-1	41210	100-year	1144.85	1652.11	1658.45	1655.98	1659.03	0.004100	6.10	187.71	88.84	0.44
Tk middle	Reach-1	41210	500-year	1588.20	1652.11	1659.69	1656.81	1660.45	0.004179	6.99	227.15	120.17	0.46
Tk middle	Reach-1	41170		Bridge									
Tk middle	Reach-1	41135	10-year	618.17	1651.65	1655.20	1655.05	1656.23	0.022441	8.14	75.99	60.13	0.91
Tk middle	Reach-1	41135	25-year	806.81	1651.65	1655.91	1655.50	1656.97	0.016715	8.28	97.39	90.31	0.81
Tk middle	Reach-1	41135	50-year	977.50	1651.65	1656.51	1655.87	1657.62	0.013846	8.45	115.63	105.97	0.76
Tk middle	Reach-1	41135	100-year	1144.85	1651.65	1656.99	1656.24	1658.19	0.012787	8.79	130.20	117.89	0.75
Tk middle	Reach-1	41135	500-year	1588.20	1651.65	1658.15	1657.11	1659.58	0.011110	9.61	165.28	130.93	0.73
Tk Lower	Tk Lower	41106	10-year	686.37	1651.19	1655.06	1653.99	1655.65	0.007945	6.24	124.96	60.57	0.58
Tk Lower	Tk Lower	41106	25-year	900.61	1651.19	1655.79	1654.48	1656.48	0.007315	6.76	156.93	69.51	0.57
Tk Lower	Tk Lower	41106	50-year	1093.50	1651.19	1656.42	1654.90	1657.17	0.006799	7.12	185.82	75.35	0.56
Tk Lower	Tk Lower	41106	100-year	1284.85	1651.19	1656.91	1655.31	1657.75	0.006793	7.58	209.25	81.07	0.57
Tk Lower	Tk Lower	41106	500-year	1787.20	1651.19	1658.09	1656.22	1659.15	0.006657	8.54	269.02	94.96	0.58
Tk Lower	Tk Lower	41100	10-year	710.17	1648.76	1653.66	1653.54	1654.98	0.026540	9.23	76.98	51.52	0.94
Tk Lower	Tk Lower	41100	25-year	927.81	1648.76	1654.15	1654.15	1655.80	0.028788	10.29	90.19	56.57	1.00
Tk Lower	Tk Lower	41100	50-year	1137.50	1648.76	1654.68	1654.68	1656.51	0.028225	10.85	104.85	60.54	1.00
Tk Lower	Tk Lower	41100	100-year	1324.85	1648.76	1655.11	1655.11	1657.09	0.027813	11.28	117.44	63.68	1.00
Tk Lower	Tk Lower	41100	500-year	1838.20	1648.76	1656.18	1656.18	1658.49	0.026634	12.19	150.77	74.17	1.00
Tk Lower	Tk Lower	41080	10-year	710.17	1649.40	1653.09	1653.09	1654.44	0.026817	9.33	78.63	31.18	0.99
Tk Lower	Tk Lower	41080	25-year	927.81	1649.40	1653.63	1653.63	1655.22	0.025055	10.16	95.81	32.52	0.98
Tk Lower	Tk Lower	41080	50-year	1137.50	1649.40	1654.11	1654.11	1655.90	0.023851	10.84	111.55	33.70	0.98
Tk Lower	Tk Lower	41080	100-year	1324.85	1649.40	1654.51	1654.51	1656.48	0.022972	11.37	125.21	34.69	0.98
Tk Lower	Tk Lower	41080	500-year	1838.20	1649.40	1655.48	1655.48	1657.90	0.021519	12.66	160.30	37.11	0.98
Tk Lower	Tk Lower	40662	10-year	710.17	1642.25	1648.19		1648.43	0.002727	3.96	179.34	38.91	0.33
Tk Lower	Tk Lower	40662	25-year	927.81	1642.25	1648.48		1648.85	0.003855	4.86	190.98	41.21	0.39
Tk Lower	Tk Lower	40662	50-year	1137.50	1642.25	1648.90		1649.37	0.004480	5.48	209.13	49.98	0.42
Tk Lower	Tk Lower	40662	100-year	1324.85	1642.25	1649.21		1649.77	0.005057	6.01	228.70	76.46	0.45
Tk Lower	Tk Lower	40662	500-year	1838.20	1642.25	1649.97		1650.74	0.006190	7.14	305.89	125.64	0.51
Tk Lower	Tk Lower	40428	10-year	710.17	1641.79	1645.46	1645.46	1646.82	0.029280	9.36	75.84	71.85	1.00
Tk Lower	Tk Lower	40428	25-year	927.81	1641.79	1646.33	1646.33	1647.20	0.015460	7.98	181.86	135.35	0.75
Tk Lower	Tk Lower	40428	50-year	1137.50	1641.79	1646.66	1646.66	1647.56	0.015160	8.39	228.27	147.61	0.76
Tk Lower	Tk Lower	40428	100-year	1324.85	1641.79	1646.91	1646.91	1647.84	0.014967	8.70	266.04	158.70	0.76
Tk Lower	Tk Lower	40428	500-year	1838.20	1641.79	1647.42	1647.42	1648.50	0.016204	9.79	348.30	165.84	0.81
Tk Lower	Tk Lower	40382	10-year	710.17	1635.54	1642.63	1639.76	1642.94	0.003445	4.46	159.22	31.93	0.35
Tk Lower	Tk Lower	40382	25-year	927.81	1635.54	1643.52	1640.34	1643.90	0.003610	4.93	188.34	33.60	0.37
Tk Lower	Tk Lower	40382	50-year	1137.50	1635.54	1644.30	1640.83	1644.74	0.003524	5.31	215.22	40.54	0.37
Tk Lower	Tk Lower	40382	100-year	1324.85	1635.54	1644.96	1641.27	1645.44	0.003400	5.56	258.58	95.02	0.37
Tk Lower	Tk Lower	40382	500-year	1838.20	1635.54	1646.65	1642.31	1647.10	0.002665	5.68	469.01	145.69	0.34
Tk Lower	Tk Lower	40336		Bridge									
Tk Lower	Tk Lower	40303	10-year	710.17	1635.51	1641.94	1639.10	1642.24	0.003300	4.41	161.15	32.15	0.35
Tk Lower	Tk Lower	40303	25-year	927.81	1635.51	1642.66	1639.63	1643.05	0.003825	5.02	184.76	33.43	0.38
Tk Lower	Tk Lower	40303	50-year	1137.50	1635.51	1643.29	1640.14	1643.77	0.004107	5.52	206.17	47.48	0.40
Tk Lower	Tk Lower	40303	100-year	1324.85	1635.51	1643.82	1640.52	1644.35	0.004134	5.85	254.70	127.55	0.40
Tk Lower	Tk Lower	40303	500-year	1838.20	1635.51	1645.34	1641.57	1645.78	0.003001	5.73	513.57	184.55	0.35

HEC-RAS Plan: Hybrid Detention Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	40237	10-year	710.17	1635.93	1641.53	1639.73	1641.95	0.004846	5.22	139.18	96.79	0.44
Tk Lower	Tk Lower	40237	25-year	927.81	1635.93	1642.19	1640.24	1642.72	0.005116	5.89	162.36	124.73	0.47
Tk Lower	Tk Lower	40237	50-year	1137.50	1635.93	1642.77	1640.68	1643.41	0.005269	6.44	183.49	169.20	0.48
Tk Lower	Tk Lower	40237	100-year	1324.85	1635.93	1643.24	1641.06	1643.97	0.005426	6.90	200.72	173.11	0.50
Tk Lower	Tk Lower	40237	500-year	1838.20	1635.93	1644.36	1641.99	1645.35	0.005847	8.03	242.98	180.90	0.53
Tk Lower	Tk Lower	40196	10-year	710.17	1633.78	1641.56	1637.73	1641.73	0.001349	3.35	228.28	151.15	0.24
Tk Lower	Tk Lower	40196	25-year	927.81	1633.78	1642.23	1638.24	1642.46	0.001606	3.92	258.83	159.95	0.27
Tk Lower	Tk Lower	40196	50-year	1137.50	1633.78	1642.83	1638.69	1643.12	0.001802	4.40	286.61	167.80	0.28
Tk Lower	Tk Lower	40196	100-year	1324.85	1633.78	1643.31	1639.05	1643.65	0.001966	4.79	309.27	174.10	0.30
Tk Lower	Tk Lower	40196	500-year	1838.20	1633.78	1644.46	1639.97	1644.96	0.002359	5.74	364.79	184.91	0.34
Tk Lower	Tk Lower	40151		Bridge									
Tk Lower	Tk Lower	40111	10-year	710.17	1633.65	1637.69	1637.69	1638.85	0.030936	8.64	82.22	35.88	1.01
Tk Lower	Tk Lower	40111	25-year	927.81	1633.65	1638.17	1638.17	1639.52	0.029269	9.30	99.76	46.40	1.00
Tk Lower	Tk Lower	40111	50-year	1137.50	1633.65	1638.60	1638.60	1640.10	0.027029	9.82	116.93	82.11	0.98
Tk Lower	Tk Lower	40111	100-year	1324.85	1633.65	1638.98	1638.98	1640.57	0.024802	10.15	134.02	93.36	0.96
Tk Lower	Tk Lower	40111	500-year	1838.20	1633.65	1639.79	1639.79	1641.75	0.023317	11.31	171.02	119.69	0.96
Tk Lower	Tk Lower	40047	10-year	710.17	1631.79	1636.17	1635.12	1636.69	0.009347	5.76	123.20	40.56	0.58
Tk Lower	Tk Lower	40047	25-year	927.81	1631.79	1636.76	1635.60	1637.37	0.009430	6.27	147.97	43.02	0.60
Tk Lower	Tk Lower	40047	50-year	1137.50	1631.79	1637.23	1636.03	1637.94	0.009373	6.74	173.66	71.42	0.61
Tk Lower	Tk Lower	40047	100-year	1324.85	1631.79	1637.60	1636.36	1638.37	0.009264	7.11	201.93	85.57	0.61
Tk Lower	Tk Lower	40047	500-year	1838.20	1631.79	1638.46	1637.32	1639.36	0.008808	7.85	290.05	131.30	0.61
Tk Lower	Tk Lower	39767	10-year	710.17	1629.09	1633.92	1632.63	1634.36	0.007299	5.35	132.80	40.09	0.52
Tk Lower	Tk Lower	39767	25-year	927.81	1629.09	1634.54	1633.09	1635.08	0.007038	5.88	159.00	48.09	0.52
Tk Lower	Tk Lower	39767	50-year	1137.50	1629.09	1635.10	1633.50	1635.71	0.006698	6.26	194.49	78.87	0.52
Tk Lower	Tk Lower	39767	100-year	1324.85	1629.09	1635.54	1633.83	1636.19	0.006423	6.53	231.12	82.95	0.52
Tk Lower	Tk Lower	39767	500-year	1838.20	1629.09	1636.29	1634.70	1637.13	0.007155	7.57	318.91	179.13	0.56
Tk Lower	Tk Lower	39518	10-year	710.17	1626.68	1630.69	1630.25	1631.58	0.018211	7.56	93.88	33.56	0.80
Tk Lower	Tk Lower	39518	25-year	927.81	1626.68	1631.17	1630.79	1632.27	0.019628	8.40	110.49	35.52	0.84
Tk Lower	Tk Lower	39518	50-year	1137.50	1626.68	1631.48	1631.25	1632.84	0.022141	9.34	121.82	38.01	0.90
Tk Lower	Tk Lower	39518	100-year	1324.85	1626.68	1631.73	1631.61	1633.32	0.023706	10.13	131.60	42.14	0.94
Tk Lower	Tk Lower	39518	500-year	1838.20	1626.68	1632.93	1632.93	1634.47	0.016210	10.16	208.52	102.97	0.82
Tk Lower	Tk Lower	39267	10-year	710.17	1622.32	1626.14	1625.80	1626.93	0.018701	7.15	100.36	51.30	0.80
Tk Lower	Tk Lower	39267	25-year	927.81	1622.32	1626.56	1626.34	1627.50	0.018192	7.84	128.75	83.09	0.81
Tk Lower	Tk Lower	39267	50-year	1137.50	1622.32	1626.93	1626.93	1627.91	0.016904	8.18	161.88	92.50	0.80
Tk Lower	Tk Lower	39267	100-year	1324.85	1622.32	1627.17	1627.17	1628.22	0.016777	8.55	184.78	92.68	0.81
Tk Lower	Tk Lower	39267	500-year	1838.20	1622.32	1627.76	1627.76	1628.96	0.016617	9.43	240.37	107.95	0.82
Tk Lower	Tk Lower	38971	10-year	710.17	1617.20	1622.01	1620.18	1622.13	0.001917	3.22	318.47	297.49	0.28
Tk Lower	Tk Lower	38971	25-year	927.81	1617.20	1622.34	1620.30	1622.48	0.002208	3.64	367.68	319.40	0.30
Tk Lower	Tk Lower	38971	50-year	1137.50	1617.20	1622.79	1620.30	1622.94	0.002037	3.73	435.81	325.25	0.30
Tk Lower	Tk Lower	38971	100-year	1324.85	1617.20	1623.14	1621.36	1623.29	0.002021	3.89	488.14	331.99	0.30
Tk Lower	Tk Lower	38971	500-year	1838.20	1617.20	1624.38	1621.88	1624.52	0.001460	3.81	686.81	360.58	0.26
Tk Lower	Tk Lower	38901	10-year	710.17	1615.56	1621.55	1619.28	1621.88	0.003728	4.87	229.04	169.95	0.37
Tk Lower	Tk Lower	38901	25-year	927.81	1615.56	1621.56	1620.02	1622.12	0.006313	6.35	230.18	171.81	0.49
Tk Lower	Tk Lower	38901	50-year	1137.50	1615.56	1621.80	1620.69	1622.53	0.007883	7.30	263.36	208.88	0.55
Tk Lower	Tk Lower	38901	100-year	1324.85	1615.56	1621.81	1620.87	1622.78	0.010556	8.47	265.52	209.96	0.64
Tk Lower	Tk Lower	38901	500-year	1838.20	1615.56	1623.90	1622.38	1624.29	0.003736	6.24	632.14	388.59	0.40
Tk Lower	Tk Lower	38846		Bridge									
Tk Lower	Tk Lower	38818	10-year	710.17	1615.10	1619.37	1618.58	1620.13	0.013018	7.11	116.38	53.44	0.65
Tk Lower	Tk Lower	38818	25-year	927.81	1615.10	1619.90	1619.21	1620.82	0.013501	7.92	167.05	161.26	0.68
Tk Lower	Tk Lower	38818	50-year	1137.50	1615.10	1620.75	1620.30	1621.32	0.007779	6.79	342.46	288.80	0.53
Tk Lower	Tk Lower	38818	100-year	1324.85	1615.10	1621.09	1620.64	1621.62	0.007181	6.81	423.94	333.58	0.52
Tk Lower	Tk Lower	38818	500-year	1838.20	1615.10	1622.03	1621.17	1622.45	0.005495	6.63	690.53	484.78	0.46
Tk Lower	Tk Lower	38749	10-year	710.17	1612.55	1619.19	1615.95	1619.50	0.003367	4.43	160.40	81.50	0.36
Tk Lower	Tk Lower	38749	25-year	927.81	1612.55	1619.67	1616.58	1620.09	0.004273	5.23	183.00	126.04	0.41
Tk Lower	Tk Lower	38749	50-year	1137.50	1612.55	1620.48	1617.30	1620.89	0.003546	5.26	253.63	195.54	0.38
Tk Lower	Tk Lower	38749	100-year	1324.85	1612.55	1620.78	1617.83	1621.22	0.003798	5.63	302.58	278.58	0.40
Tk Lower	Tk Lower	38749	500-year	1838.20	1612.55	1621.77	1618.93	1622.15	0.003140	5.65	554.86	416.64	0.37
Tk Lower	Tk Lower	38683		Bridge									
Tk Lower	Tk Lower	38674	10-year	710.17	1612.05	1617.17	1615.45	1617.52	0.005455	4.79	148.14	41.88	0.45
Tk Lower	Tk Lower	38674	25-year	927.81	1612.05	1617.92	1615.95	1618.33	0.005277	5.15	180.28	44.00	0.45
Tk Lower	Tk Lower	38674	50-year	1137.50	1612.05	1618.59	1616.38	1619.03	0.004916	5.39	224.94	385.73	0.44
Tk Lower	Tk Lower	38674	100-year	1324.85	1612.05	1619.16	1616.75	1619.58	0.004231	5.35	332.51	501.99	0.41
Tk Lower	Tk Lower	38674	500-year	1838.20	1612.05	1620.17	1617.57	1620.53	0.003378	5.31	586.56	553.47	0.37
Tk Lower	Tk Lower	38580	10-year	710.17	1610.59	1614.83	1614.83	1616.21	0.029378	9.45	75.28	28.14	1.01
Tk Lower	Tk Lower	38580	25-year	927.81	1610.59	1615.39	1615.39	1617.01	0.026724	10.22	91.62	29.52	0.99

HEC-RAS Plan: Hybrid Detention Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tk Lower	Tk Lower	38580	50-year	1137.50	1610.59	1615.87	1615.87	1617.72	0.025542	10.93	105.99	30.68	0.99
Tk Lower	Tk Lower	38580	100-year	1324.85	1610.59	1616.30	1616.30	1618.31	0.024099	11.41	119.99	99.57	0.98
Tk Lower	Tk Lower	38580	500-year	1838.20	1610.59	1617.85	1617.85	1619.55	0.014344	10.84	239.30	317.56	0.80
Tk Lower	Tk Lower	38201	10-year	710.17	1603.60	1608.67	1607.06	1609.12	0.006486	5.36	132.46	35.03	0.49
Tk Lower	Tk Lower	38201	25-year	927.81	1603.60	1609.34	1607.58	1609.89	0.006698	5.94	156.30	39.07	0.50
Tk Lower	Tk Lower	38201	50-year	1137.50	1603.60	1609.82	1608.00	1610.48	0.007017	6.53	182.46	75.10	0.53
Tk Lower	Tk Lower	38201	100-year	1324.85	1603.60	1610.05	1608.41	1610.85	0.008097	7.23	201.47	96.27	0.57
Tk Lower	Tk Lower	38201	500-year	1838.20	1603.60	1610.86	1609.36	1611.88	0.008686	8.28	296.81	189.48	0.60
Tk Lower	Tk Lower	37955	10-year	710.17	1599.53	1606.34	1604.56	1607.17	0.009504	7.51	108.48	64.10	0.55
Tk Lower	Tk Lower	37955	25-year	927.81	1599.53	1606.87	1605.46	1607.82	0.010365	8.31	175.18	104.35	0.58
Tk Lower	Tk Lower	37955	50-year	1137.50	1599.53	1607.40	1606.14	1608.38	0.010321	8.74	235.57	129.93	0.59
Tk Lower	Tk Lower	37955	100-year	1324.85	1599.53	1608.11	1606.60	1608.87	0.007916	8.17	333.55	143.34	0.52
Tk Lower	Tk Lower	37955	500-year	1838.20	1599.53	1609.30	1608.24	1609.94	0.006422	8.11	502.17	190.80	0.48
Tk Lower	Tk Lower	37897	10-year	710.17	1599.41	1606.24	1603.12	1606.60	0.003837	4.84	151.84	55.26	0.36
Tk Lower	Tk Lower	37897	25-year	927.81	1599.41	1606.72	1603.75	1607.20	0.004724	5.65	195.55	62.41	0.40
Tk Lower	Tk Lower	37897	50-year	1137.50	1599.41	1607.17	1604.31	1607.75	0.005387	6.33	224.61	83.52	0.43
Tk Lower	Tk Lower	37897	100-year	1324.85	1599.41	1607.85	1604.78	1608.42	0.004866	6.41	297.84	150.06	0.42
Tk Lower	Tk Lower	37897	500-year	1838.20	1599.41	1609.03	1606.06	1609.60	0.004458	6.77	493.21	174.91	0.41
Tk Lower	Tk Lower	37826		Bridge									
Tk Lower	Tk Lower	37806	10-year	710.17	1598.88	1604.15	1602.67	1604.58	0.006081	5.26	136.18	37.67	0.48
Tk Lower	Tk Lower	37806	25-year	927.81	1598.88	1605.11	1603.12	1605.57	0.004947	5.46	175.72	54.99	0.44
Tk Lower	Tk Lower	37806	50-year	1137.50	1598.88	1605.97	1603.54	1606.44	0.004071	5.55	241.56	118.95	0.41
Tk Lower	Tk Lower	37806	100-year	1324.85	1598.88	1606.76	1603.88	1607.18	0.003253	5.41	346.27	212.61	0.38
Tk Lower	Tk Lower	37806	500-year	1838.20	1598.88	1608.85	1604.72	1609.07	0.001469	4.40	856.32	246.64	0.27
Tk Lower	Tk Lower	37747	10-year	710.17	1597.86	1601.82	1601.82	1603.50	0.033417	10.40	68.25	20.05	0.99
Tk Lower	Tk Lower	37747	25-year	927.81	1597.86	1602.47	1602.47	1604.49	0.034016	11.40	81.37	20.23	1.00
Tk Lower	Tk Lower	37747	50-year	1137.50	1597.86	1603.08	1603.08	1605.36	0.033538	12.13	93.80	24.67	1.00
Tk Lower	Tk Lower	37747	100-year	1324.85	1597.86	1603.56	1603.56	1606.10	0.033457	12.79	103.64	60.05	1.00
Tk Lower	Tk Lower	37747	500-year	1838.20	1597.86	1604.82	1604.82	1607.96	0.032609	14.21	129.82	198.41	0.99
Tk Lower	Tk Lower	37601	10-year	710.17	1595.08	1600.34	1598.25	1600.39	0.000871	2.34	599.30	410.02	0.19
Tk Lower	Tk Lower	37601	25-year	927.81	1595.08	1600.68	1599.06	1600.74	0.000978	2.59	706.03	439.50	0.20
Tk Lower	Tk Lower	37601	50-year	1137.50	1595.08	1601.02	1599.30	1601.08	0.001024	2.77	817.49	468.57	0.21
Tk Lower	Tk Lower	37601	100-year	1324.85	1595.08	1601.31	1599.44	1601.38	0.001017	2.86	918.35	480.50	0.21
Tk Lower	Tk Lower	37601	500-year	1838.20	1595.08	1601.74	1599.80	1601.83	0.001305	3.41	1069.11	503.79	0.24
Tk Lower	Tk Lower	37546	10-year	710.17	1595.00	1600.19	1597.71	1600.30	0.001585	3.16	338.87	243.72	0.25
Tk Lower	Tk Lower	37546	25-year	927.81	1595.00	1600.49	1598.20	1600.63	0.001954	3.65	385.96	282.76	0.28
Tk Lower	Tk Lower	37546	50-year	1137.50	1595.00	1600.81	1598.70	1600.97	0.002121	3.95	442.44	315.67	0.29
Tk Lower	Tk Lower	37546	100-year	1324.85	1595.00	1601.08	1599.39	1601.26	0.002215	4.17	492.60	326.05	0.30
Tk Lower	Tk Lower	37546	500-year	1838.20	1595.00	1601.39	1600.02	1601.67	0.003244	5.22	548.82	336.75	0.37
Tk Lower	Tk Lower	37465		Bridge									
Tk Lower	Tk Lower	37428	10-year	710.17	1595.00	1597.53	1597.53	1598.51	0.030957	7.95	89.31	55.54	1.00
Tk Lower	Tk Lower	37428	25-year	927.81	1595.00	1597.94	1597.94	1599.08	0.030121	8.56	108.42	161.34	1.00
Tk Lower	Tk Lower	37428	50-year	1137.50	1595.00	1598.31	1598.31	1599.56	0.029112	9.00	126.43	247.17	1.00
Tk Lower	Tk Lower	37428	100-year	1324.85	1595.00	1598.61	1598.61	1599.96	0.028331	9.33	142.05	299.23	1.00
Tk Lower	Tk Lower	37428	500-year	1838.20	1595.00	1599.80	1599.12	1599.93	0.003274	3.87	797.71	563.44	0.35
Tk Lower	Tk Lower	37389	10-year	750.17	1591.39	1596.94	1596.02	1597.54	0.010110	6.23	126.85	170.92	0.67
Tk Lower	Tk Lower	37389	25-year	987.81	1591.39	1597.49	1596.65	1598.12	0.010397	6.51	188.51	235.52	0.67
Tk Lower	Tk Lower	37389	50-year	1197.50	1591.39	1597.81	1597.37	1598.50	0.011038	6.87	232.23	314.65	0.69
Tk Lower	Tk Lower	37389	100-year	1404.85	1591.39	1598.05	1597.71	1598.80	0.011823	7.29	273.07	369.34	0.70
Tk Lower	Tk Lower	37389	500-year	1958.20	1591.39	1598.57	1598.38	1599.47	0.013177	8.22	377.65	477.90	0.74
Tk Lower	Tk Lower	36935	10-year	750.17	1588.53	1592.35	1592.17	1593.09	0.022895	6.93	111.59	73.87	0.85
Tk Lower	Tk Lower	36935	25-year	987.81	1588.53	1592.89	1592.58	1593.65	0.017589	7.06	158.20	89.50	0.77
Tk Lower	Tk Lower	36935	50-year	1197.50	1588.53	1593.44	1592.91	1594.14	0.012995	6.85	207.60	89.50	0.68
Tk Lower	Tk Lower	36935	100-year	1404.85	1588.53	1594.00	1593.17	1594.64	0.009956	6.65	260.62	107.93	0.61
Tk Lower	Tk Lower	36935	500-year	1958.20	1588.53	1595.16	1593.80	1595.77	0.007203	6.68	394.23	193.50	0.53
Tk Lower	Tk Lower	36867	10-year	750.17	1585.63	1591.19	1589.06	1591.53	0.001832	4.70	164.60	39.76	0.40
Tk Lower	Tk Lower	36867	25-year	987.81	1585.63	1592.02	1589.61	1592.43	0.001841	5.19	199.99	54.35	0.41
Tk Lower	Tk Lower	36867	50-year	1197.50	1585.63	1592.66	1590.03	1593.12	0.001817	5.49	235.28	55.33	0.41
Tk Lower	Tk Lower	36867	100-year	1404.85	1585.63	1593.42	1590.39	1593.89	0.001623	5.57	278.01	60.42	0.40
Tk Lower	Tk Lower	36867	500-year	1958.20	1585.63	1594.45	1591.32	1595.07	0.001792	6.50	387.19	320.68	0.43
Tk Lower	Tk Lower	36805		Bridge									
Tk Lower	Tk Lower	36737	10-year	750.17	1581.36	1586.98		1587.38	0.002786	5.08	147.73	38.97	0.46
Tk Lower	Tk Lower	36737	25-year	987.81	1581.36	1587.69		1588.18	0.002831	5.62	180.58	51.16	0.47
Tk Lower	Tk Lower	36737	50-year	1197.50	1581.36	1588.38		1588.91	0.002629	5.86	217.85	56.56	0.46
Tk Lower	Tk Lower	36737	100-year	1404.85	1581.36	1588.71		1589.35	0.002934	6.43	236.98	57.18	0.49
Tk Lower	Tk Lower	36737	500-year	1958.20	1581.36	1589.11		1590.17	0.004517	8.32	259.94	57.91	0.61

HEC-RAS Plan: Hybrid Detention Locations: User Defined (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Tk Lower	Tk Lower	36658	10-year	750.17	1581.36	1585.92	1585.49	1586.87	0.018549	7.80	96.19	32.80	0.80
Tk Lower	Tk Lower	36658	25-year	987.81	1581.36	1586.57	1586.04	1587.66	0.017479	8.40	117.58	33.69	0.79
Tk Lower	Tk Lower	36658	50-year	1197.50	1581.36	1587.49	1586.46	1588.47	0.012380	7.96	158.75	91.61	0.68
Tk Lower	Tk Lower	36658	100-year	1404.85	1581.36	1587.96	1586.88	1588.91	0.011417	8.04	214.12	148.05	0.66
Tk Lower	Tk Lower	36658	500-year	1958.20	1581.36	1588.80	1588.60	1589.60	0.009040	7.96	362.18	197.59	0.60

APPENDIX C

Benefit-Cost Analysis Summary

Project Summary:

Project Number:

Disaster #:

Program:

Agency: B&L

Analyst:

Point of Contact:

Phone Number:

Address: New York

Email:

Comments:

Structure Summary For:

ACS, Andes, New York, , Delaware

Structure Type: Building

Historic Building: No

Contact:

Benefits: \$540,086

Costs: \$858,000

BCR: 0.63

Mitigation	Hazard	BCR	Benefits	Costs
TBD	Damage-Frequency Assessment	0.63	\$540,086	\$858,000

03 Nov 2017

Project: **ACS Wall - Tremperkill**

Pg 2 of 6

Total Benefits: **\$540,086**

Total Costs: **\$858,000**

BCR: **0.63**

Project Number:

Disaster #:

Program:

Agency: **B&L**

State: **New York**

Point of Contact:

Analyst:

Structure and Mitigation Details For: ACS, Andes, New York, , Delaware

Benefits: \$540,086

Costs: \$858,000

BCR: .63

Hazard: **Damage-Frequency Assessment - TBD**

Mitigation Option:

Latitude:

Longitude:

Project Useful Life: 75

Mitigation Information

Basis of Damages: Historical Damages

Number of Estimated Damage Events: 1

Number of Events with Know Recurrence
Intervals:

Utilities

Type of Service: Wastewater

Other:

Number of Customers: Served: 350

Value per Unit of Service: 45.00

Total Value of Service per Day: \$15,750

Facility Description:

03 Nov 2017

Project: **ACS Wall - Tremperkill**

Pg 3 of 6

Total Benefits: **\$540,086**

Total Costs: **\$858,000**

BCR: **0.63**

Project Number:

Disaster #:

Program:

Agency: **B&L**

State: **New York**

Point of Contact:

Analyst:

Building

Service Types Provided by Facility:

Service Name	Annual Budget (\$)
Education	\$4,170,000

03 Nov 2017

Project: **ACS Wall - Tremperkill**

Pg 4 of 6

Total Benefits: **\$540,086**Total Costs: **\$858,000**BCR: **0.63**

Project Number:

Disaster #:

Program:

Agency: **B&L**State: **New York**

Point of Contact:

Analyst:

Historic Damages Before and After Mitigation

Analysis Year: 2017

Analysis Duration:

Utilities (\$/day): \$15,750.00

Year Built:

User Input Analysis Duration:

Buildings (\$/day): \$11,424.66

Roads/Bridges (\$/day):

Damages Before Mitigation

Damage Year:

RI: 10.00

Are Damages In Current Dollars? Yes

Buildings (Days): 14.0

Utilities (Days): 14.0

Roads (Days): 0.0

Total	\$380,445
Total Inflated	

Damages After Mitigation**Volunteers Cost**

Number of Volunteers Required:

Cost of Volunteers Time (\$/Hour/Person):

Per-Person Cost of Lodging for a Volunteer:

Number of Hours Volunteered/Person:

Number of Days Lodging/Volunteer:

Cost of Volunteers:

Summary Of BenefitsExpected Annual Damages Before
MitigationExpected Annual Damages After
MitigationExpected Avoided Damages After
Mitigation (Benefits)

Annual: \$38,044	Annual: \$0	Annual: \$38,044
Present Value: \$540,086	Present Value: \$0	Present Value: \$540,086

Mitigation Benefits: \$540,086

Mitigation Costs: \$858,000

Benefits Minus Costs: (\$317,914)

Benefit-Cost Ratio: 0.63

03 Nov 2017

Project: **ACS Wall - Tremperkill**

Pg 5 of 6

Total Benefits: **\$540,086**

Total Costs: **\$858,000**

BCR: **0.63**

Project Number:

Disaster #:

Program:

Agency: **B&L**

State: **New York**

Point of Contact:

Analyst:

Cost Estimate

Project Useful Life (years):	75	Construction Type:	
Mitigation Project Cost:	\$858,000	Detailed Scope of Work:	Yes
Annual Project Maintenance Cost:	\$0	Detailed Estimate for Entire Project:	Yes
Final Mitigation Project Cost:	\$858,000	Years of Maintenance:	75
Cost Basis Year:		Present Worth of Annual Maintenance Costs:	\$0
Construction Start Year:		Estimate Reflects Current Prices:	Yes
Construction End Year:		Project Escalation:	

03 Nov 2017

Project: **ACS Wall - Tremperkill**

Pg 6 of 6

Total Benefits: **\$540,086** Total Costs: **\$858,000**

BCR:

0.63

Project Number: Disaster #: Program: Agency: **B&L**

State: **New York** Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments
-------	-------------	-------------

Project Summary:

Project Number:

Disaster #:

Program:

Agency:

Analyst:

Point of Contact:

Phone Number:

Address:

Email:

Comments:

Structure Summary For:

Residential, 270 Main St, Andes, New York, , Delaware

Structure Type: Building

Historic Building: No

Contact:

Benefits: \$86,229

Costs: \$720,000

BCR: 0.12

Mitigation	Hazard	BCR	Benefits	Costs
TBD	Damage-Frequency Assessment	0.12	\$86,229	\$720,000

Total Benefits: \$86,229

Total Costs: **\$720,000**

BCR:	0.12
------	-------------

Project Number:

Disaster #:

Program:

Agency:

State:

Point of Contact:

Analyst:

Structure and Mitigation Details For:

Residential, 270 Main St, Andes, New York, , Delaware

Benefits: \$86,229

Costs: \$720,000

BCR: .12

Hazard: **Damage-Frequency Assessment - TBD**

Mitigation Option:

Latitude:

Longitude:

Project Useful Life: 75

Mitigation Information

Basis of Damages: Historical Damages

Number of Estimated Damage Events: 3

Number of Events with Know Recurrence Intervals:

03 Nov 2017

Project: **Floodplain Conveyance**

Pg 3 of 7

Total Benefits: **\$86,229**

Total Costs: **\$720,000**

BCR: **0.12**

Project Number:

Disaster #:

Program:

Agency:

State:

Point of Contact:

Analyst:

Roads And Bridges

Estimated Number of One-Way
Traffic Trips Per Day: 500

Additional Time per One-Way Trip: 0:20

Number of Additional Miles: 14.0

Federal Rate: 0.575

Economic Loss Per Day of
Loss of Function: \$8,963

Facility Description:

Building

Fire Station:

Number of People Served by this Fire Station: 500

Type of Area Served by this Fire Station: Rural

Distance in miles between this fire station and the fire station
that would provide fire protection for the geographical area
normally served by this fire station: 14.00

Fire Station Provide Emergency Medical Services (EMS)? Yes

Distance in miles between this fire station and the fire station
that would provide EMS for the geographical area normally
served by this fire station? 14.00

03 Nov 2017

Project: **Floodplain Conveyance**

Pg 4 of 7

Total Benefits: **\$86,229**Total Costs: **\$720,000**BCR: **0.12**

Project Number:

Disaster #:

Program:

Agency:

State:

Point of Contact:

Analyst:

Historic Damages Before and After Mitigation

Analysis Year: 2017

Analysis Duration:

Utilities (\$/day):

Year Built:

User Input Analysis Duration:

Buildings (\$/day): \$1,011.27

Roads/Bridges (\$/day): \$8,963.33

Damages Before Mitigation

Damage Year:

RI: 50.00

Are Damages In Current Dollars? Yes

Buildings (Days): 2.0

Utilities (Days): 0.0

Roads (Days): 2.0

Damages-1	\$75,000
Total	\$94,949
Total Inflated	

Damages After Mitigation

RI: 50.00

Are Damages In Current Dollars? Yes

Buildings (Days): 0.0

Utilities (Days): 0.0

Roads (Days): 0.0

Total	\$0

Volunteers Cost

Number of Volunteers Required:

Cost of Volunteers Time (\$/Hour/Person):

Per-Person Cost of Lodging for a Volunteer:

Number of Hours Volunteered/Person:

Number of Days Lodging/Volunteer:

Cost of Volunteers:

RI: 100.00

Are Damages In Current Dollars? Yes

Buildings (Days): 0.0

Utilities (Days): 0.0

Roads (Days): 0.0

Total	\$0

03 Nov 2017

Project: **Floodplain Conveyance**

Pg 5 of 7

Total Benefits: **\$86,229**Total Costs: **\$720,000**BCR: **0.12**

Project Number:

Disaster #:

Program:

Agency:

State:

Point of Contact:

Analyst:

Damage Year:

RI: 100.00

Are Damages In Current Dollars? Yes

Buildings (Days): 4.0

Utilities (Days): 0.0

Roads (Days): 4.0

Damages-1	\$100,000
Total	\$139,898
Total Inflated	

Volunteers Cost

Number of Volunteers Required:

Cost of Volunteers Time (\$/Hour/Person):

Per-Person Cost of Lodging for a Volunteer:

Number of Hours Volunteered/Person:

Number of Days Lodging/Volunteer:

Cost of Volunteers:

Damage Year:

RI: 15.00

Are Damages In Current Dollars? Yes

Buildings (Days): 1.0

Utilities (Days): 0.0

Roads (Days): 1.0

Damages-1	\$50,000
Total	\$59,975
Total Inflated	

Volunteers Cost

Number of Volunteers Required:

Cost of Volunteers Time (\$/Hour/Person):

Per-Person Cost of Lodging for a Volunteer:

Number of Hours Volunteered/Person:

Number of Days Lodging/Volunteer:

Cost of Volunteers:

Summary Of BenefitsExpected Annual Damages Before
MitigationExpected Annual Damages After
MitigationExpected Avoided Damages After
Mitigation (Benefits)

--	--	--

03 Nov 2017

Project: **Floodplain Conveyance**

Pg 6 of 7

Total Benefits: **\$86,229**Total Costs: **\$720,000**BCR: **0.12**

Project Number:

Disaster #:

Program:

Agency:

State:

Point of Contact:

Analyst:

Annual: \$6,074

Present Value: \$86,229

Annual: \$0

Present Value: \$0

Annual: \$6,074

Present Value: \$86,229

Mitigation Benefits: \$86,229

Mitigation Costs: \$720,000

Benefits Minus Costs: (\$633,771)

Benefit-Cost Ratio: 0.12

Cost Estimate

Project Useful Life (years): 75

Construction Type:

Mitigation Project Cost: \$720,000

Detailed Scope of Work: Yes

Annual Project Maintenance Cost: \$0

Detailed Estimate for Entire Project: Yes

Final Mitigation Project Cost: \$720,000

Years of Maintenance: 75

Cost Basis Year:

Present Worth of Annual Maintenance Costs: \$0

Construction Start Year:

Estimate Reflects Current Prices: Yes

Construction End Year:

Project Escalation:

03 Nov 2017

Project: **Floodplain Conveyance**

Pg 7 of 7

Total Benefits: **\$86,229** Total Costs: **\$720,000**

BCR:

0.12

Project Number: Disaster #: Program: Agency:

State: Point of Contact: Analyst:

Justification/Attachments

Field	Description	Attachments
-------	-------------	-------------

APPENDIX D

Catskill Watershed Corporation – Funding Summary

A guide to flood mitigation programs and funding sources for municipalities and property owners in the NYC West of Hudson Watershed

In response to the Tropical Storm Irene flood disaster in the Catskills, the watershed communities requested additional resources as part of the Filtration Avoidance Determination from the City of New York to mitigate flood hazards on an on-going basis. The City agreed to fund a multi-faceted program with the goals of enhancing flood resiliency in the communities and protecting water quality. In addition to the Local Flood Analysis designed to assess flood hazard threats and identify priority projects in population centers, the effort includes three programs for funding the implementation of flood mitigation projects.

These programs include:

- 1. Stream Management Implementation Program Flood Hazard Mitigation Grants (SMIP-FHM)** funded through the NYC DEP Stream Management Program and administered by its county partnering agencies to help pay for stream and floodplain projects recommended in LFAs;
- 2. Local Flood Hazard Mitigation Implementation Program (LFHMIP)** administered by the Catskill Watershed Corporation (CWC) to assist communities in implementing projects identified in LFAs; help relocate structures purchased in City-funded buyouts, elevate or floodproof eligible structures, secure oil and propane tanks and to remove stream debris after a storm;
- 3. New York City Funded Flood Buyout Program (NYCFFBO)** designed to substantially supplement FEMA's flood buy-out program by addressing at-risk properties before the next flood, either individually or as recommended by an LFA.

Additionally, the CWC has created the **Sustainable Communities Planning Program** to help municipalities update local land use laws and comprehensive plans to locate areas suitable for relocating structures acquired through FEMA or NYC buyout programs.

Stream Management Implementation Program Flood Hazard Mitigation Grants (SMIP-FHM) FHM is a funding category in the Stream Management Implementation Program for LFA communities and those participating in the New York Rising Community Reconstruction Program. Municipalities may apply to implement one or more recommendations contained in their LFA and approved by the municipal board. All projects must have modeled off-site flood reduction benefits. Eligible projects include:

- Design/construction of flood plain restoration and reconnection
- Design/construction of naturally stable stream channel dimensions and sediment transport processes
- Design/construction of public infrastructure to reduce water velocity, flowpath and/or elevation
- Correction of hydraulic constrictions

Ineligible projects include construction of flood walls, berms or levees; stream dredging; routine annual maintenance; or replacement of privately owned bridges, culverts or roads. Municipalities must apply to the Stream Management Program in their respective county. Contacts are as follows:

Schoharie Basin (Greene County) – Joel DuBois Joel@gcswcd.com

Ashokan Basin (Ulster County) – Leslie A. Zucker laz5@cornell.edu

Delaware Basin (Delaware County) – Graydon Dutcher graydon-dutcher@dcsxcd.org

Neversink/Rondout Basins – Karen Rauter krauter@rondoutneversink.org

Local Flood Hazard Mitigation Implementation Program

The Catskill Watershed Corporation (CWC) funds LFA recommended projects to prevent and mitigate flood damage in the WOH Watershed, specifically to remedy situations where an imminent and substantial danger to persons or properties exists; or to improve community-scale flood resilience while providing a water quality benefit.

Municipalities and individual property owners may apply directly to the CWC. Municipalities may apply for grants for projects identified in an LFA or NY Rising planning process.

Eligible LFA-derived projects could include:

- Alterations to public infrastructure that is expected to reduce/minimize flood damage
- Private property protection measures such as elevation or floodproofing of a structure
- Elimination of sources of manmade pollution such as the relocation or securing of fuel oil/propane tank)
- Stream related construction. (Ineligible projects include construction of flood walls, berms or levees, stream dredging or annual maintenance)
- relocation assistance for residence or business recommended by an LFA to a location within the same town

Property owners may apply for the following assistance:

- funds for relocation assistance of an anchor business or critical community facility; Anchor businesses must be located in a floodplain in a watershed hamlet where an LFA has been conducted, though their relocation does NOT have to be recommended in the LFA. They include gas stations, grocery stores, lumberyard/hardware stores, medical offices or pharmacies which, if damaged or destroyed would immediately impair the health and/or safety of a community;
- funds for relocation of critical community facilities, such as a firehouse, school, town hall, public drinking water treatment or distribution facility, or wastewater treatment plant or collection system, which if destroyed or damaged would impair the health and/or safety of a community. Facilities must have been substantially damaged by flooding. They do NOT have to be recommended by an LFA but MUST be located in an LFA community;

- funds for assistance to relocate homes and/or businesses within the same town where the NYC Funded Flood Buyout Program covers purchase of former property. (Does NOT have to be in an LFA community);
- stream debris removal after a serious flood event (does NOT have to be recommended in an LFA).

NYC Funded Flood Buyout Program

This voluntary program is intended to assist property owners who were not eligible for or chose not to participate in the FEMA flood buyout program. It is intended to operate between flood events, not as an immediate response to one. Categories of eligible properties include:

1. Properties identified in community LFAs
2. Anchor businesses, Critical Community facilities and LFA-identified properties applying to the CWC for relocation assistance
3. Properties needed for a stream project
4. Erosion hazard properties
5. Inundation properties

Risk assessments and cost-benefit analysis are required for these purchases. Municipalities may choose to own and manage the properties after they are purchased and cleared of structures. Conservation easements must be given to NYS Department of Environmental Conservation, and there are limits to what may be placed on these parcels. Allowed structures are public restrooms served by public sewers or by septic systems whose leach field is located outside the 100-year floodplain; or open sided structures.

The NYCFFBO is governed by the Water Supply Permit and the Property Evaluation and Selection Process document (Process document). Communities work through Outreach and Assessment Leads appointed by the municipality to inform potential applicants about the program and evaluate the eligibility of properties based on the program criteria established in the Process document.

Sustainable Community Planning Program

This CWC program is for municipalities that have prepared LFAs. It is intended to fund revisions to local zoning codes or zoning maps or to upgrade comprehensive plans in order to identify areas within those municipalities that can serve as new locations for residences and/or businesses to be moved after purchase under the voluntary NYC Funded Flood Buyout Program. Grants of up to \$20,000 are available through this program, part of the CWC's Local Technical Assistance Program.

**CATSKIL WATERSHED CORPORATION
FLOOD HAZARD MITIGATION IMPLEMENTATION PROGRAM**

SUMMARY OF ELIGIBLE PROJECTS

In Communities that have completed an LFA

1. Relocation assistance for residence or business as recommended by an LFA
2. Alterations to public infrastructure as recommended by LFA
3. Property protection measures recommended by LFA
4. Elimination of potential sources of pollution as recommended by LFA
5. Stream related construction work recommended by LFA
6. Relocation assistance for anchor business currently in LFA study area
7. Relocation assistance for critical community facility currently in LFA study area

Throughout Entire Watershed (Not Restricted to LFA Communities)

1. Stream Debris Removal after serious storm event
2. Tank Anchoring (Oil and Propane)
3. Relocation assistance to residential or business property owners participating in City Flood Buyout Program

***See CWC Flood Hazard Mitigation Implementation Program Rules
for details on each category***

<http://cwconline.org/fhmi-program-overview/>

**FLOOD HAZARD MITIGATION IMPLEMENTATION PROGRAM
SUMMARY OF PROGRAM RULES
PROJECT FUNDING COST SHARES AND CAPS**

IN COMMUNITIES THAT HAVE COMPLETED AN LFA

RELOCATION ASSISTANCE

Business (Anchor Business or LFA Recommendation) Relocation Assistance

<i>Cost Category</i>	<i>Cost Share</i>	<i>Cap</i>
Feasibility Study, including SEQRA	Not Required	\$15,000
Soft Costs	Not Required	\$10,000
Land	Not Required	No Cap
Wastewater	25%	\$50,000

Critical Community Facility Relocation Assistance

<i>Cost Category</i>	<i>Cost Share</i>	<i>Cap</i>
Feasibility Study, including SEQRA	Not Required	\$10,000
Land	Not Required	No Cap
Wastewater	25%	\$50,000

Residential Relocation Assistance

<i>Cost Category</i>	<i>Cost Share</i>	<i>Cap</i>
Planning (for redevelopment community)	25%	\$20,000
Wastewater (per single family home)	Not Required	\$10,000 at CWC Septic Program Schedule of Values
Wastewater (per redevelopment community)	25%	\$250,000
Moving of Residence to location outside of 500 year floodplain	Not Required	\$10,000

ALTERATION OF PUBLIC INFRASTRUCTURE

<i>Cost Category</i>	<i>Cost Share</i>	<i>Cap</i>
Feasibility Study	Not Required	\$20,000
Design Costs	Not Required	10% of Construction Costs
Construction Costs	Not Required	No cap

IN COMMUNITIES THAT HAVE COMPLETED AN LFA

PROPERTY PROTECTION MEASURES (per property)

<i>Cost Category</i>	<i>Cost Share</i>	<i>Cap</i>
Feasibility Study	Not Required	\$5,000
Design Costs	Not Required	10% of Construction Costs
Construction Costs	25%	No Cap

COMMUNITY-WIDE ELIMINATION OF POTENTIAL SOURCES OF POLLUTION

<i>Cost Category</i>	<i>Cost Share</i>	<i>Cap</i>
Design Costs	25%	No Cap
Project Implementation Costs	25%	\$15,000

STREAM CONSTRUCTION

<i>Cost Category</i>	<i>Cost Share</i>	<i>Cap</i>
Design Costs	Not Required	10% of Construction Costs
Construction Costs	Not Required	No Cap

Caps and cost shares for the above can be waived by CWC Board on an individual project based upon extraordinary community or water quality benefit.

**THROUGHOUT WEST OF HUDSON WATERSHED
(NOT RESTRICTED TO LFA COMMUNITIES)**

**RELOCATION ASSISTANCE FOR CERTAIN PROPERTIES
PARTICIPATING IN CITY FLOOD BUY-OUT PROGRAM**

Business Relocation Assistance

<i>Cost Category</i>	<i>Cost Share</i>	<i>Cap</i>
Feasibility Study, including SEQRA	Not Required	\$15,000
Soft Costs	Not Required	\$10,000
Land	Not Required	No Cap
Wastewater	25%	\$50,000

Residential Relocation Assistance

<i>Cost Category</i>	<i>Cost Share</i>	<i>Cap</i>
Planning (for redevelopment community)	25%	\$20,000
Wastewater (per single family home)	Not Required	\$10,000 at CWC Septic Program Schedule of Values
Wastewater (per redevelopment community)	25%	\$250,000
Moving of Residence to location outside of 500 year floodplain	Not Required	\$10,000

**TANK-ANCHORING
OIL UP TO 330 GALLONS, PROPANE UP TO 420 GALLONS**

<i>Cost Category</i>	<i>Cost Share</i>	<i>Cap</i>
Project Implementation Costs	None	\$5,000 per property*

*All costs per CWC FHMIP Schedule of Values

STREAM DEBRIS REMOVAL AFTER A SERIOUS STORM EVENT

<i>Cost Category</i>	<i>Cost Share</i>	<i>Cap</i>
Eligible Costs will include Tipping Fees	Not Required	\$10,000*. All costs per CWC Schedule of Values

*Unless waived by CWC Board on project by project basis

(CWC Board will identify locations eligible for Stream Debris Removal grants after a serious storm event)