Reach 3c (Church Street to CR 12 South Street)

Reach 3c consists of approximately 1.3 miles of stream channel, located between the Church Street bridge and the bridge at County Route 12 (South Street). The reach is located in Valley Zone 3 **(Figure V-11)** and has an average valley slope of 0.7%. The valley morphology is characterized as a wide "U" shaped valley, with evidence of lateral and terminal moraines, well defined floodplains, and alluvial terraces. The drainage area of reach 3c ranges from 28.7 mi^2 at the upper end of the reach, to 40.6 mi^2 at the lower end of the reach. Three small, unnamed tributaries enter the Batavia Kill in this reach. The reach is characterized by B and C stream types, with varying degrees of entrenchment throughout and stream type being influenced by the adjacent high terrace and road fills.

Stream Morphology/Stability

The Phase I Inventory & Assessment of reach 3c indicated that the reach was characterized as relatively stable, with minor localized erosion of the streambanks noted. The inventory found that the reach exhibited an average of 2.1ft^2 of exposed streambank per linear foot of stream bank length, with 18% of the total length experiencing some form of bank instability. Bank instability problems are localized and do not appear to represent broader scale stream channel instability in the reach. The majority of the exposed streambanks observed were basically low in height, and characterized by slumped vegetation along the toe of the bank, with partially vegetated upper banks. The Phase I Inventory team noted that much of the erosion was fresh, and was most likely associated with the January 1996 flood event. The 1997 inventory also indicated that the reach has experienced fairly extensive channel modifications over the years, with rock rip-rap bank stabilization found in several locations within the hamlet, and along Route 23 West of the hamlet.

Figure VI-34: Severe streambank erosion along NYS 23 below GNH Lumber after 1961 flood.

To evaluate stability of the channel's planform in reach 3c, the GCSWCD examined a series of aerial photographs taken between 1959 and 2000. The historical photographs were assembled and compared to evaluate channel planform changes, as well as to inventory any potential channel modifications that may have occurred. While the channel planform in the lower half of the reach has remained fairly consistent over the 40 years of photographic record, the upper section of the reach between South Street and GNH Lumber **(Figure VI-35)** was shown to have been more active. The aerial photographs

indicate that the reach was once split into two channels behind GNH lumber, with only a single channel present in 2000.

Figure VI-35: Aerial view of western end of Windham hamlet, 1959 left, 1980 center, 2000 right. Note double channel to the left side of photos.

The owners of GNH provided the GCSWCD with drawings dating from the mid 1960s showing plans to dredge the single channel, which cut off a large meander right behind GNH Lumber. As the channel is located in this area, the GCSWCD assumed that this work had been done, though that could not be directly confirmed. The GCSWCD did not note any active headcuts in the reach, and the erosion of the streambanks does not appear to indicate any active adjustment in planform. It is possible that the channel has already responded to this channelization.

In the area near GNH Lumber, and running downstream along NYS Route 23, the stream has experienced significant erosion in the past. New York State Route 23 was washed out in a major flood in 1961, and has required repairs to the rip rap adjacent to the roadway in 1996 and 1999. A long section of reach 3c between GNH Lumber and Theo's Restaurant

has significant rip rap. The rip rap is fairly stable, along the road and appears to have been installed many years ago, and has become overgrown with vegetation. In the area near GNH lumber, the stream starts to become more entrenched, with the channel trapped between the high terrace and floodplain fill where the lumber yard is located, and State Route 23. The lower reach is characterized by a relatively stable C channel as the floodplain widens and the stream is less entrenched.

After the Phase I Inventory and Assessment, the GCSWCD did not install monitoring cross sections in reach 3c. At the time, the reach appeared fairly stable and monitoring was determined to be a lower priority than other, more active reaches in the watershed. As time and resources allow in Phase II, the GCSWCD will continue to visually monitor the reach, and will add monitoring cross sections as necessary to refine stream classification and determine if the stability is self-sustaining (natural). The GCSWCD strongly recommends that priority be given to working with the GNH owners to seek effective flood mitigation solutions.

Riparian Vegetation

The riparian zone in reach 3c is in fair to good condition through most of the reach. The south side of the stream is still dominated by the steep terrace in the upper reach, which is well vegetated, and transitions to flatter floodplain fills that have some, but poorer buffers. On the north side, the riparian buffer is narrow, and in some reaches basically nonexistent. As noted in Reach 3a and Reach 3b, the riparian vegetation and wooded uplands is critical to the stability of the high terrace that runs along half of the reach. The riparian corridor consists of both hardwoods and conifers, with some non-native species located in areas where the stream runs through the hamlet. The riparian buffer is wider and clearly more effective on the steeper slopes.

The streambanks and lower areas in the channel are generally dominated by grasses and forbes, with willow and various understory trees/shrubs also present. The reach has significant populations of Japanese knotweed behind GNH, as well as the bottom of the reach. Generally the riparian zones through reach 3c are narrow in the area behind the hamlet's residences and along the open field above South Street. In some areas, such as at GNH lumber and along sections of NYS Route 23, the riparian buffer is practically nonexistent.

Water Quality

Similar to reach 3b, water quality impacts in reach 3c are primarily related to on-site wastewater and stormwater. The Phase I Inventory and Assessment did not indicate the presence of any glacial clay exposures, but based on observations in other areas of the watershed the GCSWCD suspects clay layers are only a short distance below the streambed. All existing on-site septic systems in this reach will be discontinued upon

completion of the Windham waste water treatment system, which will effectively mitigate any existing or potential water quality threat. In regard to stormwater, reach 3c receives significant runoff from both the local roads in the hamlet as well as NYS Route 23. The building and parking at Windham Mountain Ski Area are also located in reach 3c. While no direct stormwater impacts have been noted during the project period, the Town of Windham, NYSDOT, the GCSWCD and Windham Mountain Ski Area are currently planning stormwater retrofit projects that will have a direct benefit to water quality in the reach.

In 2003, the section of NYS Route 23 that passes through this reach will be completely rebuilt in conjunction with the Windham sewer project. The NYSDOT funded project will include a number of stormwater treatment features, including sediment basins. At the time of this SMP, the GCSWCD is working with NYCDEP and Windham Mountain Ski Area to investigate the development of a state of the art stormwater treatment system. While still in the conceptual planning stages, the project would effectively mitigate the single largest area of impervious surface in the Batavia Kill watershed. It is the intention of the GCSWCD to develop a project that will qualify for CWC stormwater retrofit program funding. A number of other projects planned by the GCSWCD will also have benefits to water quality.

Infrastructure

Infrastructure located within reach 3c includes bridges at the top and bottom of the reach, a section of NYS Route 23, and a water withdrawal point for Windham Mountain Ski Area. Located near the center of reach 3c is the water withdrawal point for the Ski Windham snow making operation. The pump house for the water withdrawal is located on the south bank of reach 3c, directly adjacent to the stream and utilizes a sub-surface intake to the pumps **(Figure VI-37b photo H)**.

In 2002, Windham Mountain Ski Area constructed a large pond closer to the ski center that will reduce the need for withdrawals directly from the stream. Rock revetment installed to protect the pump house foundation has modified the channel cross sectional area, resulting in a point of localized entrenchment. Future work in this area should be conducted so as to prevent any further entrenchment of the stream channel. The presence of the subsurface water intake pipes will provide a good indicator if stream channel degradation starts to occur in this section of the reach.

In regard to transportation infrastructure, the two bridges at both ends of the reach are owned by Greene County. Both the Church Street (top) and South Street (bottom) bridges do not appear to have a negative impact on stream stability. At the Church Street bridge, the abutments and bridge approach are characterized by floodplain fill that does slightly entrench the stream channel as it passes the bridge, but the hydraulic opening of the bridge appears to be adequate for passing the bankfull flow **(Figure VI-37a photo D)**. There is no evidence that the bridge has reduced sediment transport capacity, and the channel appears to be well vegetated and stable.

At the bottom of reach 3c, the South Street bridge does not appear to have any negative impact on stream stability. The bridge is longer than the Church Street bridge, and while there is some floodplain fill associated with the roadway approaches, the bridge's long span provides a hydraulic opening that has allowed for development of a stable channel under the bridge **(Figure VI-37b photo E)**. In both cases, the bridges in reach 3c contain center piers located within the active stream channel. While there is currently no scour problem noted, the bridges should be inspected frequently. As bridge piers can result in the buildup of debris piles that reduce bridge capacity and redirect stream velocities toward the streambanks, the bridges should be inspected frequently and debris removed as appropriate.

Habitat

As noted earlier, the GCSWCD did not conduct a specific assessment of fisheries habitat on the Batavia Kill. Based on the initial Phase I Inventory and Assessment, as well as continued observations of the stream, the habitat would appear to be in fair condition. Similar to reach 3b, this section of the Batavia Kill is also characterized primarily by long riffles, with pools being found infrequently. The pool structure in the stream channel appears to be primarily associated with local scour forces. Stream cover is fair to good.

Flooding Issues

Management concerns related to flooding in this reach include the erosion hazard to infrastructure, as well as flood inundation threats to private property. The Windham-Ashland-Jewett School property borders the channel as well as numerous private residences and businesses. Of specific interest is the recurring flooding problem associated with the GNH Lumber facility located on the west edge of the hamlet. As noted earlier, GNH has experienced significant problems with flooding in 1987, 1996 1999 and even earlier. In both 1996 and 1999, the flooding damage was primarily associated with the loss of building supply materials that were located in the lumber yard. Wood, roofing, pipe and other materials were washed downstream by the flood waters, and later found widely dispersed on the floodplain for miles below the site.

The GNH facility is located within the Batavia Kill's active floodplain, greatly increasing its risk of flooding. GNH has attempted to secure an adjacent property that would allow for construction of a storage area above the floodplain elevation, but has reported to the GCSWCD that the landowners have been unwilling to sell. In 1996, the GCSWCD undertook a preliminary assessment of the property to determine eligibility for relocation funds under the FEMA Hazard Mitigation Grant Program. At that time, the GCSWCD found that the high cost of relocation could not meet the cost/benefit requirements for funding.

In 2001, GNH initiated activities to reduce their losses during flood events. A new storage shed was designed with future flooding in mind, with floatable materials placed on a rack system that is elevated above the flood elevation. Additionally, the building was designed to handle short term inundation by flood waters.

Other issues related to flooding in this reach include the recurring flooding of NYS Route 23, just west of GNH Lumber, and the threat of erosional damage to the bridges. West of GNH Lumber, the roadway has been washed out several times, and in the larger floods such as 1996 and 1999, the moderate entrenchment in the reach has resulted in the stream flooding the roadway. Earlier floods in the 1950's and 1960's resulted in significant infrastructure damage, with both bridges in reach 3c experiencing total loss. As shown in **Figure VI-36**, the stream channel migrated around the bridge abutments causing them to fail. Since the time of these floods, the Batavia Kill Watershed District flood control structures gave been constructed, and it is unlikely that future flood will result in such extensive damage to the bridges.

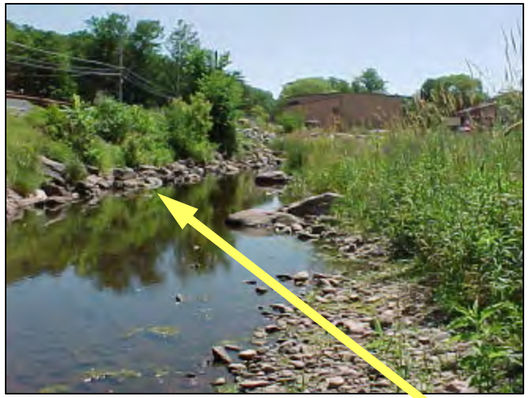
Figure VI-36: 1961 flood damage to Church Street bridge located in Reach 3c.

Reach 3c Summary

In general, the reach exhibits fairly good stability. While entrenchment is an issue through most of the reach, it does not seem to be causing major instability at this time. The reach is extremely sensitive to changes in grade, and any activities in the stream corridor must be done so as to avoid further entrenchment. A recurring flooding problem in the area of GNH Lumber requires further investigation to determine if the flooding can be mitigated. Reach 3c has a fair to poor riparian condition, and would benefit from additional plantings as well as management of invasive species populations. There are several opportunities of protecting water quality with stormwater retrofit projects, and the recent acquisition of a large parcel by NYCDEP on the lower, south side of the stream may present opportunities of floodplain and riparian buffer improvements.

Table VI-10: Management Recommendations Reach 3c.

Reach 3c: Church Street to South Street.	
Intervention Level	Preservation/Full Restoration (GNH site)
Stream Morphology	While stream channel morphology currently exhibits good stability, management activities must prevent any further entrenchment of the channel. Further floodplain fills should be prohibited. Near GNH lumber, additional analysis should be undertaken to investigate the impact of past channelization and evaluate the potential to mitigate the flooding problems associated with GNH and Route 23. Local landowners should observe their streambanks for instability, and mitigate local erosion as it is noted.
Riparian Buffers	Riparian condition is fair to poor. Invasive species (knotweed) control is required, and buffers should be improved. Removal of vegetation on the steep slopes associated with the high terrace should be prevented. See General Recommendations
Water Quality	The GCSWCD should continue to work with the Town of Windham, NYSDOT and local landowners to investigate stormwater projects that can improve or protect water quality. The GCSWCD is currently evaluating a proposal to develop a Stormwater treatment system that will address impervious surfaces at Windham Mountain Ski Area and have benefits to water quality.
Infrastructure	1. Future bridge repair/replacement should be done so as to prevent further floodplain encroachment, and entrenchment of the stream channel. 2. Any bridge maintenance associated with gravel removal near the bridge, or anywhere in reach 3c should only be done in extreme cases, and must address stability of the stream slope. Gravel removal operations that result in bed slope changes must be avoided at all costs as they will result in headcuts that would further entrench the reach. 3. Bridge structures should be observed on a regular basis for scour at the bridge center pier or buildup of woody debris.
Habitat	See General Recommendations
Flooding	1. Evaluate 1960's stream channel modification near GNH Lumber. Determine if channel reconstruction or other actions through this reach can mitigate or prevent the transportation corridor from being cut off in floods and the lumber yard from flooding at a reasonable cost. 2. Work with Town of Windham to evaluate status of existing development in the floodplain. Assess threat to public/private property within the reach when more detailed flood maps become available. 3. See general recommendations
Further Assessment	1. Install cross sections, undertake level III/IV assessment of the middle and lower reach. Continue visual inspections of overall reach health.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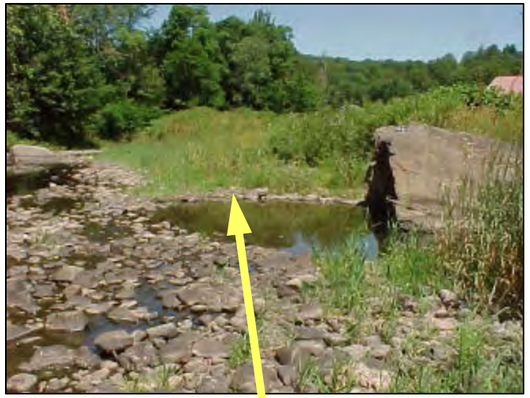
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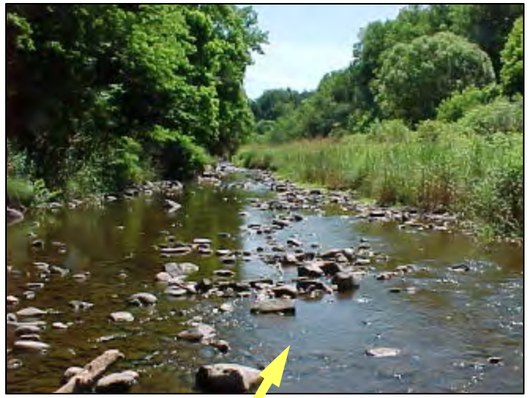
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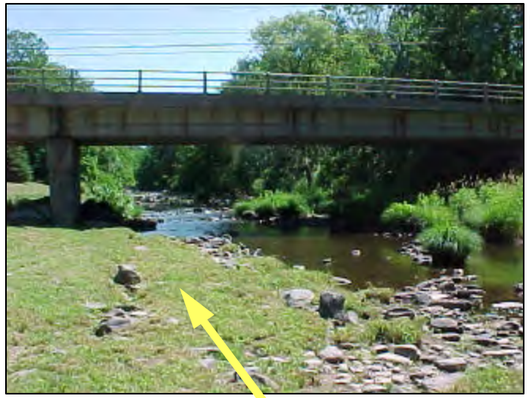
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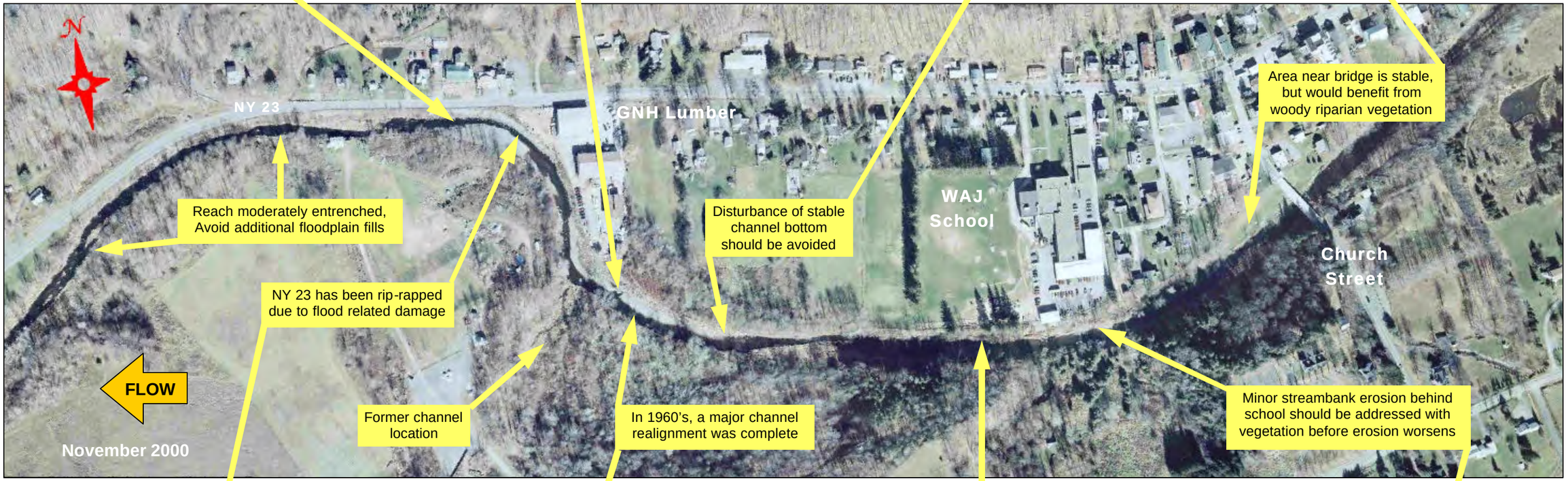

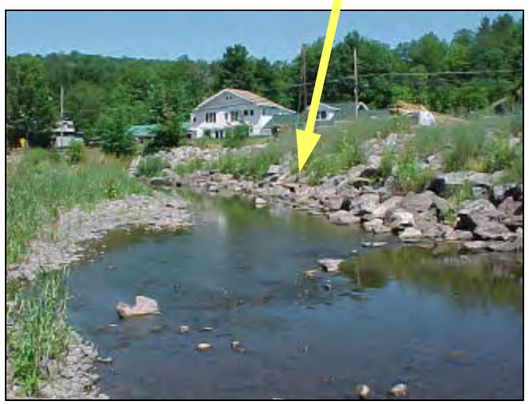
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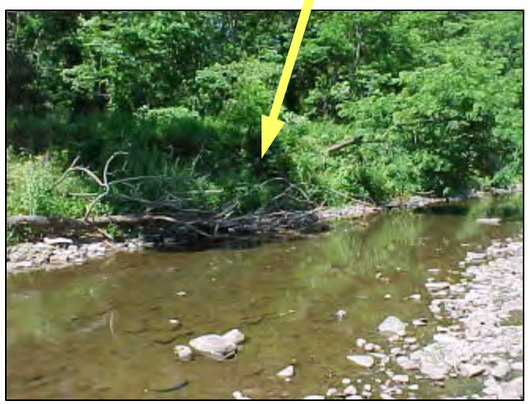
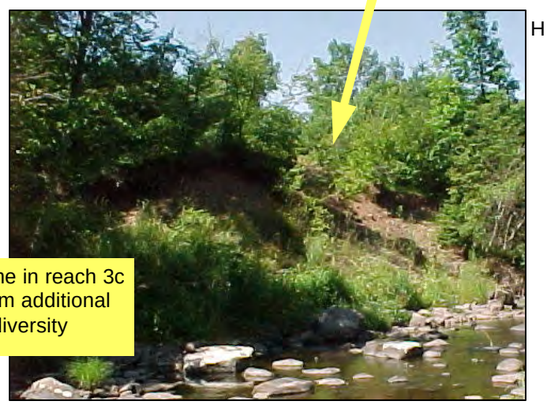

F


G

Riparian buffer zone in reach 3c would benefit from additional Width And diversity


H

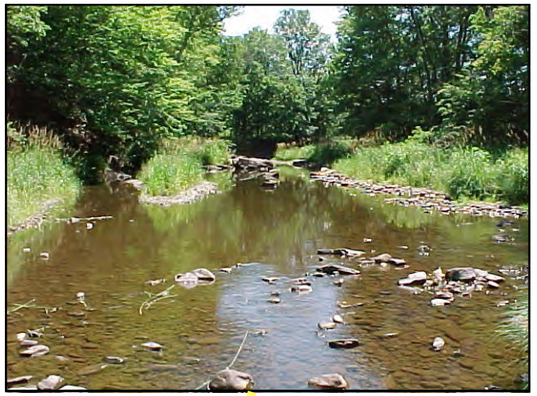
Batavia Kill Stream Management Plan

Figure VI-37a Reach 3c-Upper


A


B


C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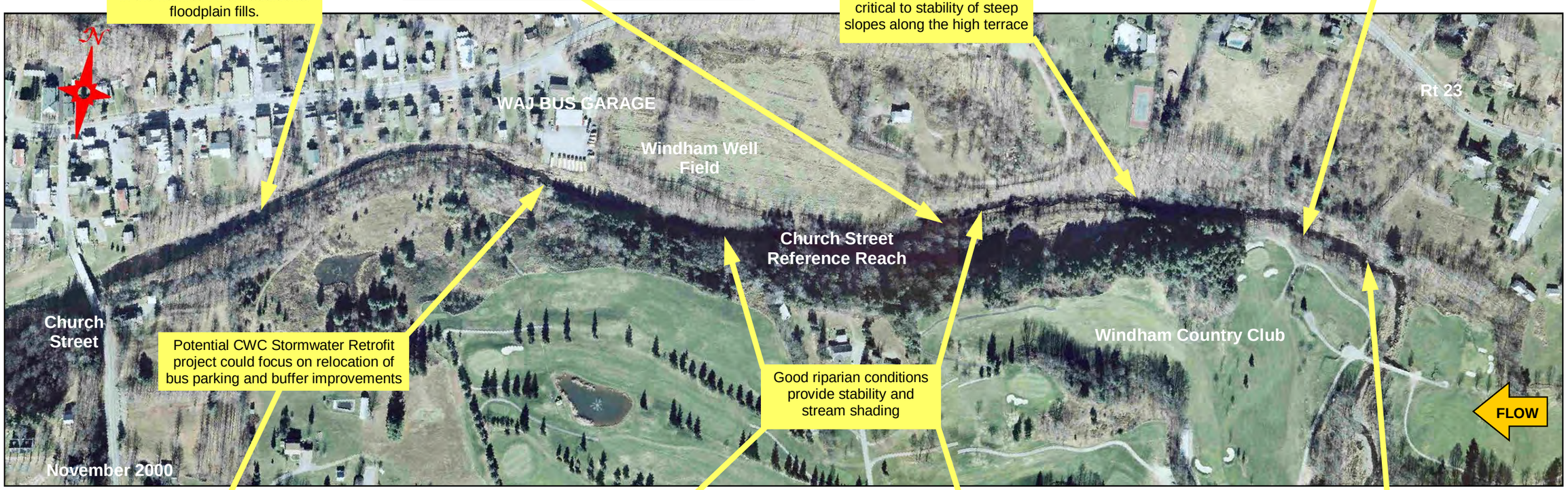
Reach is moderately entrenched in the hamlet. Avoid additional floodplain fills.

Dense forest vegetation is critical to stability of steep slopes along the high terrace



Potential CWC Stormwater Retrofit project could focus on relocation of bus parking and buffer improvements

Good riparian conditions provide stability and stream shading


E


F


G


H

A well armored stream bottom is critical to stability. Disturbance must be avoided

Figure: VI-33b Reach 3b-Lower