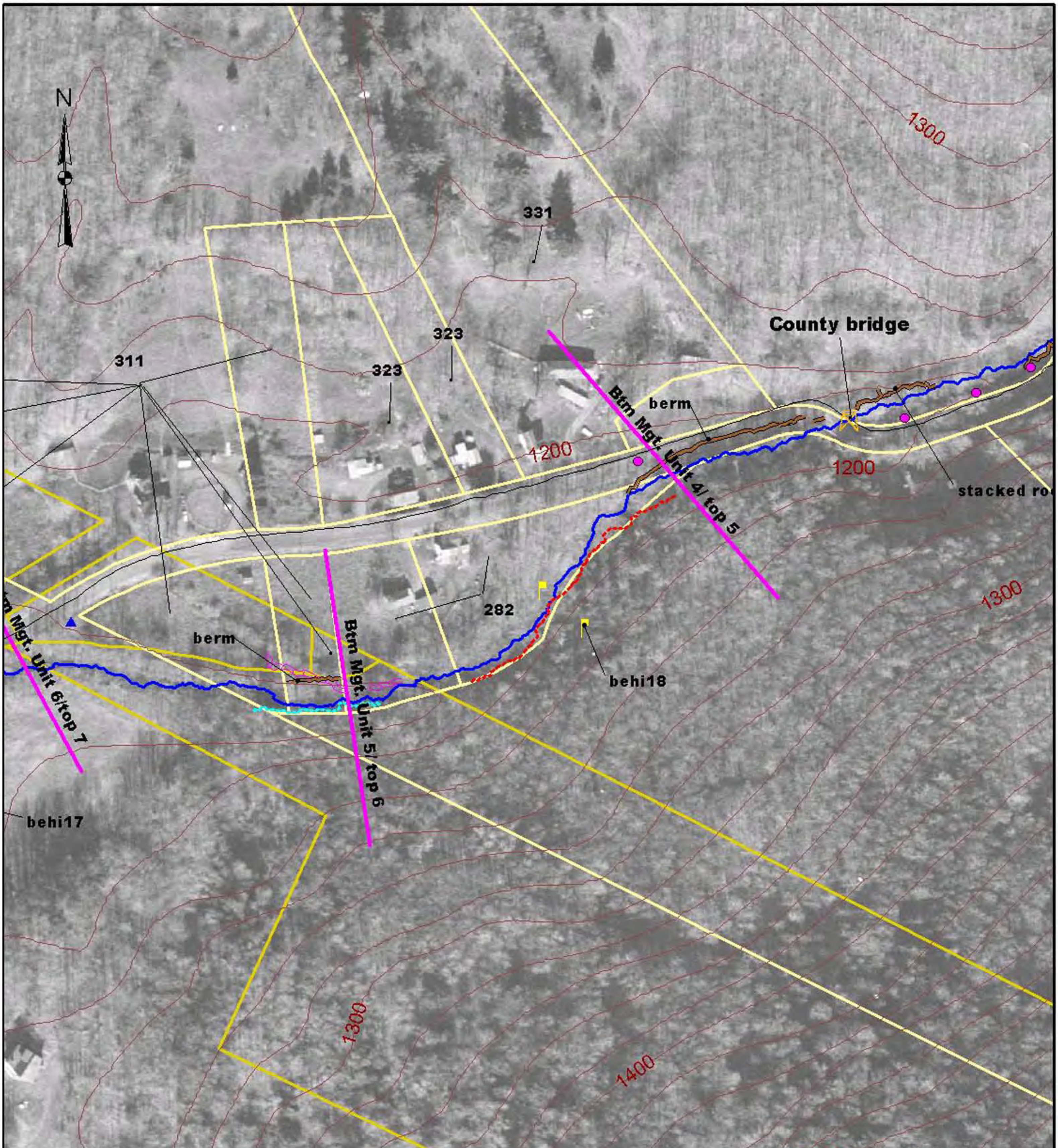

Broadstreet Hollow Management Unit 5

GIS Parcel, Contour and Wetland coverages are edited and provided by NYC DEP, 2000, UTM NAD 27, Zone 18 North, meters. Aerial Photography provided by UCSWCD & NYC DEP November 2001.
All other coverages were developed using GPS in the UTM, Zone 18 North projection, NADCON (Conus), datum. GPS data collected 2001, by UCSWCD & NYC DEP SMP.

Note: G.I.S. data are approximate according to their scale and resolution. Data may be subject to error and are not a substitute for on-site inspection or survey. Parcel coverages are based on Ulster County Real Property tax maps 2000 and may not reflect actual surveyed property boundaries.

Contour Interval 20 feet

50 0 50 100 150 200 Feet

Scale 1:2,400

LEGEND

- 247 Street Address/911 code
- Greene parcels
- Ulster parcels
- Land fills
- Managment units
- Stream Center (Thalweg)
- Culvert
- Wetland
- Clay exposure
- Revetment
- Eroding bank
- Tributary
- Behi pin
- Bridge
- Broadstreet Hollow Road
- Knotweed

Broadstreet Hollow Management Unit 5

General Description:

Management Unit 5 (MU5) is 670 feet long, located in Greene County, NY[1&2]. The top of MU5 is approximately 300 feet downstream from County Bridge 3201220, where the stream moves farther away from the road into the valley wall hillslope on the left bank (Photo 1). MU5 extends downstream to the approximate Greene/Ulster County line. The closeness of the valley wall to the left of the stream characterizes MU5. The stream is in fairly good condition or *stable*, with no streamside development on either bank (Photo 2).

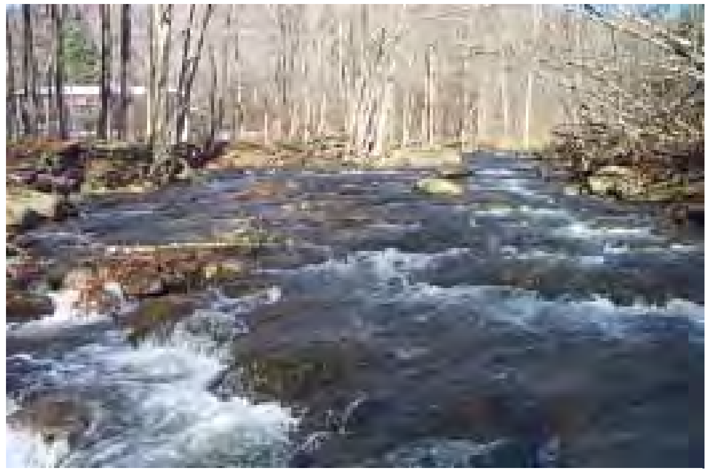

Photo 1. Looking upstream near the top of MU5, Broadstreet Hollow Road at the left, valley wall hillslope at the right.

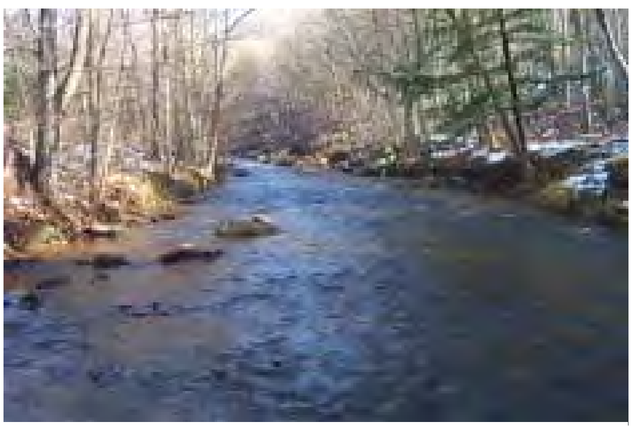

Photo 2. Looking upstream at the bottom of MU5, cobble berm at the left, valley widens on the right at the bottom of the unit.

The structural shape, or *morphology*, of the stream (i.e., slope, width and depth) is fairly uniform in this unit, with few individual *reaches* having distinct morphologic character, or *stream type*[5]. Though the valley in MU5 isn't particularly narrow compared with other units, the stream runs directly along the valley wall on the left (looking downstream), cutting down through an extensive exposure of glacial lake clay along this hillslope, and producing a predominantly *entrenched* stream shape (Photo 3). Typically stable stream types associated with this type of valley are relatively narrow and fairly steep, primarily with *riffles* and *pools* interspersed with some small waterfalls ("steps"), and stream banks formed into low benches, or *discontinuous floodplains*, that function as small overflow areas during floods. MU5 lacks these discontinuous floodplains completely on the valley wall hillslope, and appears to have cut into its bed too far to build many of these features on the right bank.

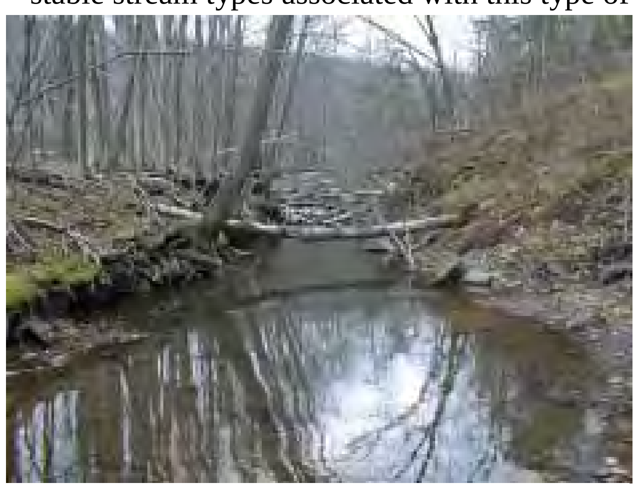

Photo 3. Looking upstream at eroding bank at monitoring cross-section 18, slumping clay bank at right, undercut trees at left.

I. Flooding and Erosion Threats

A. Infrastructure and Private Property

There are three known property owners for four parcels in MU5, which contain or are bounded by the stream[2].

Broadstreet Hollow Road is composed of oiled crushed stone in this unit. The centerline distance from the deepest part of the stream channel, or *thalweg*, ranges from 50 feet in the upper portion of the Unit to 260 feet in the lower part of the Unit. There is one culvert near the top of MU5 on the right bank (Photo 4). Flow conditions under high or low flow are unknown, though the culvert is more than half filled with sediment and debris at the outlet and should be replaced and upgraded in size. However, the outlet did not appear unstable at the time of the survey in 2001. Inlet conditions were not documented as part of the survey in 2001.

Photo 4. Corrugated metal culvert, right bank, stream out of the frame to the right.

B. History of Stream Work

Although there are generally no hardened or stabilized banks within MU5, a pushed up mound of earth and rock, or *berm*, along the road extends approximately 65 feet (5% of the stream bank length) into the top of MU5 from MU4, as the stream curves away from the road into the valley wall on the opposite side (Photo 5)[3]. This berm appears to have been constructed along the roadway to protect the road either from flood inundation or washout.

Unfortunately, berms such as these generally do not offer much protection from flooding, and can cause stream entrenchment and higher local flood *stage* (height of water surface) by preventing floodwaters from flowing over the floodplain, cutting off an important function of these flat areas.

Photo 5. Looking upstream at right bank cobble berm at the top of MU5, stream to the right, flow from left to right, Broadstreet Hollow Road at left out of the frame.

Floodplains function to reduce flood velocity, increase absorption of floodwaters, encourage deposition of silt and fine sediments (keeping them from being washed further downstream) and decrease flood stage in downstream areas. The majority of Broadstreet Hollow stream floodplains consist of small, low, discontinuous floodplain benches that perform the important floodplain functions in small mountain streams. As the road and stream move farther apart in the top portion of MU5, an area of floodplain bench could be returned to the stream by removing some of the berm material, providing an important section of floodplain function and potentially reducing some pressure on the opposite bank[3]. Because this berm is well vegetated and the section in MU5 is short, berm removal or reconfiguration should only be considered in the context of stream management in MU4.

Because the stream is a considerable distance from the road and houses in most of MU5, the majority of the banks have not been altered for protection of infrastructure or homes.

C. Exposed Banks

Stream assessment in 2001 showed 470 feet, or 35%, of the stream bank in MU5 is actively eroding. This erosion occurs in one continuous piece along the valley wall hillslope on the left bank, starting at the top of the unit (Photo 6, and see Photo 3 above). A representative location was chosen and permanently marked, or *monumented*, for future monitoring (designated as "monitoring cross-section 18") to determine erosion rates and priority for potential restoration[3]. This site has been assessed and ranked based on calculation of a *Bank Erodibility Hazard Index* (BEHI) using data collected at the time of the stream assessment survey in 2001[4].

Photo 6. Eroding left bank at valley wall hillside, monitoring cross-section 18 (flow from left to right).

Mature trees sliding down the hillslope and failure scarps (large cracks in the hillside created as blocks of land slide downhill) show multiple *rotational failures* and bank *slumping*. This failure mechanism is fueled by stream erosion at the bottom, or *toe*, of the slope, continually delivering soil, rocks and vegetation into the stream and preventing an adjustment of the stream channel to a stable shape[4].

II. Water Quality

A. Sediment

In addition to approximately 470 feet of exposed clay along the left bank where the stream runs directly against the valley wall (Photo 7), an additional 20 feet (2%) of bank at the bottom of the unit has exposed clay in the bank and bed (Photo 8)[4]. Nearly 40% of the stream bank length in MU5 contains exposed fine sediments (*silt* and *clay*) in the banks and bed that may cause increased *turbidity* during high flow.

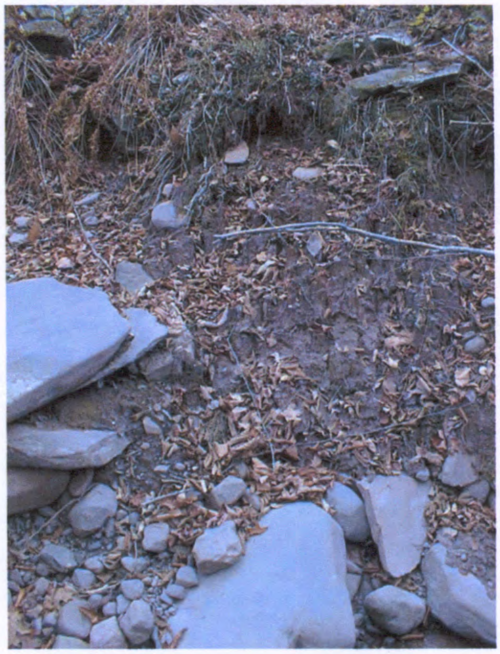

Photo 7. Close-up of eroding left bank at monitoring cross-section 18, showing glacial lake clay exposure.

Due to the inherent instability of the valley wall hillslope, the extent of the clay exposure and the generally poor quality of streamside, or riparian, vegetation due to the thin soils, the potential for large inputs of silts and clays into the stream during floods will continue to be a problem unless the reach is restored.

Structural revegetation, or *bioengineering*, should be considered in conjunction with a full-scale restoration of the stream channel morphology in this reach, to reduce ongoing erosion pressure on the valley wall hillslope. Additionally, the hillslope failure should be assessed to determine the extent of *geotechnical* failure mechanisms, as well as to advise the appropriate solution for this continued problem[8].

Photo 8. Clay exposure on the left bank, at the bottom of MU5 (flow from left to right).

Clay exposed at the stream bed at the bottom of MU5 is part of a larger exposure continuing into MU6 downstream. In general, this exposure is much less extreme, and appeared to be stable at the time of the stream assessment in 2001. This reach should be monitored visually to assess any change in stream channel condition that could result in increased bed erosion in this area.

B. Landfills/Dumping Sites

Approximately 50 feet (4%) of dumped materials, primarily large metal objects, was mapped along the right bank in MU5 in 2001 (Photo 9). This comprises approximately 4% of the bank length in this Unit. Planning efforts to organize cleanup of sites like this were initiated in 2002, and should continue, as labor and funding are available.

Photo 9. Landfill/dumping site, right bank near the bottom of MU5, composed mostly of large, old metal products.

C. Other Water Quality Issues

Investigation of other possible sources of contamination was not part of the stream assessment conducted in 2001. However, no evidence was found for *nutrient* or *pathogen* contamination in the stream (i.e., odors or discolored water). Any runoff of water from the road and/or culverts that may contain salts or other pollutants was not specifically investigated, but this is likely only influential near the top of MU5 where the road is in close proximity to the stream and the riparian area is narrow. Lack of well-vegetated riparian buffer areas could reduce the capacity of stream banks to assimilate, or slow the input of, contaminants to the stream from runoff[7].

III. Stream Ecology

A. Aquatic Habitat and Populations

No specific aquatic habitat or population monitoring was conducted in MU5 as part of the stream assessment survey in 2001. However, as part of the stream restoration demonstration project completed in MU3 in 2000, fish and aquatic insect population data have been gathered yearly since 1998 within the stable reference reach (MU1), the project site (MU3) and the control reach (MU17). These data show the Broadstreet Hollow self-supports, without stocking, populations of all three common trout species (rainbow, brook and brown) as well as a healthy and diverse community of aquatic insects[9]. The impact that stream bed and bank instability within MU5 has on these aquatic organisms or their communities is unknown.

B. Riparian Vegetation

Stream assessment conducted in 2001 did not investigate specific streamside (riparian) plant species or density, other than to note areas of insufficient or stressed vegetation that could affect stream stability, flooding or erosion threats, water quality or aquatic habitat for trout species. Based on these general observations, riparian vegetation throughout MU5 is in good condition along the right bank, but is insufficient to provide the full benefits of a healthy riparian zone on the left bank along the failing valley wall hillslope. In addition, existing riparian vegetation along the berm between the road and the stream near the top of MU5 can be stressed by ongoing road runoff and plow side-cast.

[1]Broadstreet Hollow Management Unit 5 Map
[2] Volume II Appendix 3.1.5 Management Unit 5 Workbook.
[3] Volume II Section 2.2 Watershed Management Recommendations
[4] Volume II Section 2.2.1-Monitoring Cross Section and Summary Tables
[5] Volume I Sections 3.2.1&2 Stream Processes, Morphology and Classification
[6] Volume I Section 3.5 Fisheries and Wildlife
[7] Volume I Sections 3.4 & Volume II 2.2.2 Riparian Vegetation Issues and Recommendations
[8] Volume II 2.0 Stream Stability Restoration Projects, Techniques and Contact Information & Appendices
[9] Volume I Sections 3.4 & Volume II 2.2.2 Riparian Vegetation Issues and Recommendations
[10] Section 3.2.4.2 Broadstreet Hollow Geology