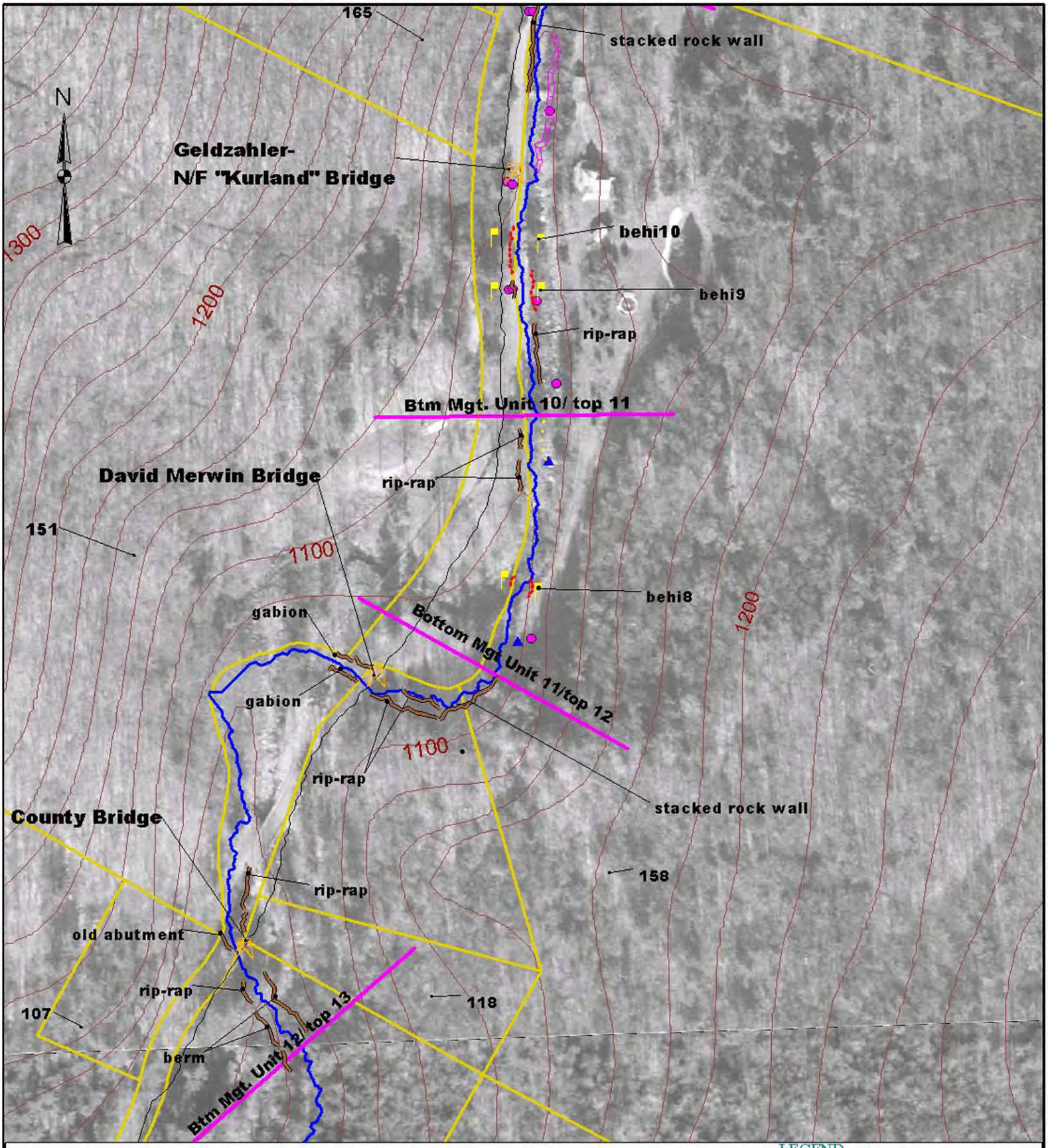

GIS Parcel, Contour and Wetland coverages are edited and provided by NYC DEP, 2000, UTM NAD 27, Zone 18 North, meters. Aerial Photography provided by UCSWCD & NYC DEP November 2001. All other coverages were developed using GPS in the UTM, Zone 18 North projection, NAD CON (Conus), datum. GPS data collected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

Broadstreet Hollow Management Unit 11

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 11

General Description:

Management Unit 11 (MU11) is located in Ulster County, NY, upstream from the David Merwin Bridge. Most of this short unit is not visible from Broadstreet Hollow Road. MU11 begins at the top with a small side stream, or tributary, opposite the road, where the stream and road are close together (Photo1). MU11 extends approximately 430 feet downstream, away from the road, ending at another tributary near the top of a long stacked rock wall on the bend about 200 feet above the David Merwin Bridge (Photo 2).

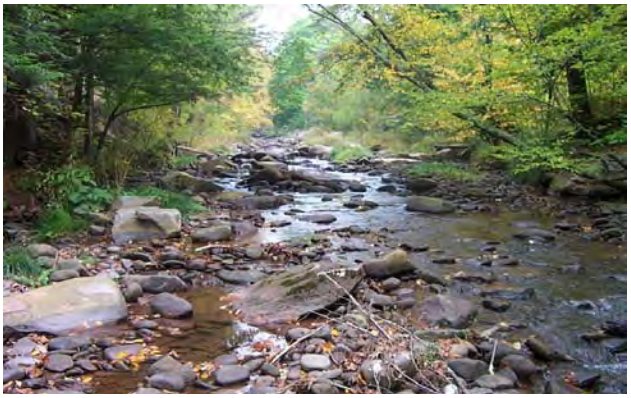

Photo 1. Looking upstream toward the top of MU11, Broadstreet Hollow Road at left in background, upstream tributary confluence at right in background.

The stream flows well away from the road through most of the unit, with no development on either bank. Though relatively short compared to other units, MU11 is a complex section of stream, containing a section of rip-rap, two side streams, or *tributaries*, a small streamside wetland, and a *glacial lake clay* exposure associated with two short lengths of eroding bank[1&2].

Photo 2. Looking upstream from the bottom of MU11, toward downstream tributary confluence at right.

The structural shape, or *morphology*, of the stream (i.e., slope, width and depth) is uniform in this unit having a distinct morphologic character, or *stream type*[5]. The valley in MU11 is somewhat narrow compared with other units, with the stream running directly along the valley wall on the left (looking downstream), producing a predominantly *entrenched* stream shape. 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. MU11 lacks these discontinuous floodplains along much of the left bank along the valley wall, but maintains a limited amount of these features on the right bank [5] (Photo 3).

Photo 3. Right bank showing low, discontinuous floodplain benches, here with mosses and some grasses. Stream flow is from right to left.

I. Flooding and Erosion Threats

A. Infrastructure and Private Property

There are two known property owners for the two parcels in MU11; the stream runs directly adjacent to the property at 158 Broadstreet Hollow Road[2]. The centerline of Broadstreet Hollow Road ranges from approximately 40 to 145 feet from the deepest part of the stream, or *thalweg*, in MU11[1&2].

B. History of Stream Work

Stream assessment survey in 2001 showed approximately 80 feet, or about 10%, of the banks in MU11 have been rip-rapped, historically with partially stacked large boulders, predominantly either *non-quarried natural boulders* from outside the stream, or local, or *native*, material from the stream channel itself [3&7] (Photo 4). This bank stability work, or *revetment*, is not recent, having large trees growing between the boulders.

Photo 4. Right bank rip-rap along Broadstreet Hollow Road. Stream flow is from right to left.

MU11 Culverts

The only culvert documented in MU11 from the stream assessment survey provides a crossing under a private road for a small tributary to the main stream (Photo 5). *Confluence* areas (where two streams join) tend to be unstable by nature's design, as the smaller stream delivers pulses of flood waters and sediment to the main stream. Though the outlet of this culvert and the main Broadstreet Hollow stream itself appears in relatively good condition, or stable, water enters the main stream from far above the stream channel. Water falling into the stream from a height above the main channel has greater erosive potential as it falls and hits the stream bank or bed below. In addition, water runs over a distance of bare rock before entering the stream, potentially heating the water and increasing stream temperature[3].

Photo 5. Left bank culvert near the bottom of MU11, providing a private road crossing for a small tributary. Main stream is behind the viewer, flow is from left to right.

Where possible, culvert outlets should be reconfigured to allow water to directly enter the stream, at a low angle with vegetation, to minimize erosion. The 2001 stream assessment survey documented the current condition of this culvert as partially crushed, and should be evaluated for replacement.

C. Exposed Banks

Stream assessment conducted in 2001 showed approximately 40 feet (5%) of eroding stream bank in MU11, in two small sections on opposite banks (Photo 6 and 7). These banks have been monumented at a representative location for future monitoring (location designated as "monitoring cross-section 8") to determine erosion rate 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. Both eroding banks at monitoring cross-section 8 received a BEHI score showing moderate potential for future erosion, though the shape of the stream in this area causes stream energy to focus on the left bank, which may be even more vulnerable due to the glacial lake clay exposure in the bed and bank along the left side[4].

Photo 6. Eroding left bank with exposed glacial lake clay in the bank and bed, at monitoring cross-section 8. Stream flow is from left to right.

Photo 7. Eroding right bank at monitoring cross-section 8. Stream flow is from right to left.

II. Water Quality

A. Sediment

The stream assessment conducted in 2001 showed monitoring cross-section 8 contains a stream bed exposure of *glacial lake clay*. This clay exposure may cause increased *turbidity* in this reach from fine *sediment* (silt and clay) coming from stream bank and bed material, especially during high flow events[4].

B. Landfills/Dumping Sites

The stream assessment conducted in 2001 did not reveal any current *dumping sites* in or near the stream in MU11 that could contribute to water quality impairment from leaching of toxic materials.

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 culverts that may contain salts or other pollutants was not specifically investigated.

Compromised vegetated streamside or *riparian buffer* areas, particularly between the stream and the road at the top of MU11 (along the rip-rapped right bank), and eroding bank areas near the bottom of MU11 (at monitoring cross-section 8) could reduce the capacity of the stream banks to assimilate, or slow the input of, contaminants to the stream[7]. No culverts drain roadside ditches to the stream in MU11.

A small spring-fed tributary enters the main stream at the top of MU11 (Photo 8). The mouth of this tributary runs through a small, flat riparian *wetland* area, approximately 60 feet in length along the stream bank, before entering the main channel, so does not pose the same problems of sediment influx typical of a confluence area (Photo 9). In addition, this area may provide localized valuable wetland habitat and potential water quality improvement functions, though this was not specifically investigated as part of the stream assessment survey in 2001.

Photo 8. Small wetland tributary on left bank, near the top of MU11. Main stream is behind the viewer, flow is from left to right.

III. Stream Ecology

A. Aquatic Habitat and Populations

No specific aquatic habitat or population monitoring was conducted in MU11 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[6&9].

Photo 9. Looking upstream at small riparian wetland with tributary running to the right, and main stream to the left.

B. Riparian Vegetation

The 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, non-quantitative observations, riparian vegetation throughout MU11 appears relatively healthy. Existing riparian vegetation between the road and the stream in the rip-rapped bank area can be stressed by ongoing road runoff, plow side-cast, and maintenance of this revetment. Under-vegetated

areas in the vicinity of rip-rap and road fill sections in this reach should be augmented with a mixture of native riparian species to improve shade, cover and water temperature conditions for aquatic habitat[9], as well as to improve bank stability and reduce the need for bank stabilization work that could cause or increase stream ecosystem disturbances[3].

No *Japanese Knotweed* [7], a non-native, *invasive* plant was noted in this unit at the time of the assessment survey, though source populations of this plant have been documented upstream, increasing the potential for colonization of any disturbed or under-vegetated areas in MU11.

[1]Broadstreet Hollow Management Unit 11 Map
[2]Broadstreet Hollow Management Unit 11 Workbook.
[3] Stream Bank Stabilization Methods and Alternatives
[4]BEHI Monitoring Cross Section Workbooks and BEHI Score Summary
[5]Stream Dynamics Discussion
[6]Attachment ___: USGS
[7]Riparian Vegetation Management
[8]Stream Stability Restoration Projects, Techniques and Contact Information
[9] Habitat Requirements for Trout
[10]Broadstreet Hollow Geology