SITE 25

Index Sheet No.: 26  
Raw Data Name: BD 58

Estimated Construction Cost: $84,500
Geomorphologic Analysis and Identification of Potential Sites for Stormwater BMPs
Orange County, North Carolina

SITE 25, 26 and 27

Legend
- Ambient Monitoring
- Benthic Monitoring
- Fish Sampling
- Municipal Boundary

Orange County Roads
Subwatersheds
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Stream, unknown flow

WATERSHED VIEW

CHAPEL HILL
CARRBORO

Incorporated into Vicinity Map

Date: 3/1/2001
Bioclassification: Poor

Date: 3/11/1998
Bioclassification: Fair

¹
Project Description

Cole Springs Branch

<table>
<thead>
<tr>
<th>Site 25</th>
<th>Drainage Area (acres)</th>
<th>Impervious Area (acres)</th>
<th>% Impervious</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>161.6</td>
<td>33.2</td>
<td>20.5%</td>
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</tbody>
</table>

Tributary

<table>
<thead>
<tr>
<th>Site 25</th>
<th>Drainage Area (acres)</th>
<th>Impervious Area (acres)</th>
<th>% Impervious</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15.0</td>
<td>4.8</td>
<td>32.0%</td>
</tr>
</tbody>
</table>

Location

Site 25 is located approximately 800 feet southeast of the intersection of Martin Luther King Jr. Blvd. and Estes Dr. The site is south of a YMCA facility, on a tributary to a perennial stream, Cole Springs Branch.

Problem Description

The perennial stream along which Site 25 is located, Cole Springs Branch, exhibits severe incision and erosion for most of its course from it’s headwaters to where it flows into Bolin Creek. The causes of this widespread degradation are apparent when examining the watershed of the stream, which consists of vast areas of impervious surface, including portions of Horace Williams Airport, the UNC facilities management complex, and high density residential developments. The crossing of Martin Luther King Jr. Blvd. also seems to have adversely affected the stream, as the accumulated and concentrated flow of most of the watersheds imperviousness is discharged after passing under that road.

While the riparian corridor of the stream after passing under Martin Luther King Jr. Blvd is largely intact, many small tributaries, most of which discharge from residential storm sewer systems, continue to flow into Cole Springs Branch before it meets Bolin Creek downstream. The combined problems of peak flow and pollutant input from all of these small drainages likely compounds the degradation already being caused by the accumulated flow and pollutants from upstream of Martin Luther King Jr. Blvd. The majority of the these ephemeral swales show signs of scour and debris packing that would not normally be associated with un-stressed ephemeral channels.

Site 25 is situated on one of these small drainages, and it’s watershed consists of the impervious areas of a YMCA and office park facility, as well as residential areas.

Proposed Solution

Site 25 is located at the bottom of what was observed to be an ephemeral drainage, consisting of an incised channel. Two BMPs could possibly be constructed here. A bio-retention area could be placed in-line with the ephemeral channel just before it flows into Cole Springs Branch. Just downstream, a small stormwater wetland could be constructed as an off-line BMP where there is a flat, wide area in the valley of Cole Springs Branch. Off-line retention is needed throughout the watershed of Cole Springs Branch, both to attenuate peak flows and provide pollutant treatment. Base flow augmentation of the Cole Springs Branch could also result from this practice.
The bio-retention area is recommended as an in-line structure here, because of its ability to treat small drainage areas, the fact that it needs minimum area to construct it, and because it can function on steep slopes (NCDWQ, 2007). A bio-retention area would not likely be appropriate in the floodplain of Cole Springs Branch as an offline BMP, as it requires a minimum depth of 2 feet between the water table and the bottom of the retention area, which is a situation which is not often present in a floodplain (NCDWQ, 2007). Instead, a stormwater wetland would be more appropriate. Flow diversion into the wetland would be provided by a flow-splitting structure containing a vane or weir, placed in Cole Springs Branch. This is a common way to “harvest” storm flows without impeding the base flows of the stream in any way. Such a structure would allow a designed volume of flow to enter into the wetland, while allowing any flow above that volume to continue downstream. If properly placed and designed, a grade control or cross vane can serve this same purpose while acting a grade control for the stream.

Pollutant loads of the contributing drainage area, as well as potential reductions, have been estimated and are displayed in Table 25.1.

Table 25.1

<table>
<thead>
<tr>
<th>SITE 25</th>
<th>Pollutant Load (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TN</td>
</tr>
<tr>
<td>EXISTING CONDITION</td>
<td>16.41</td>
</tr>
<tr>
<td>BIORETENTION TREATMENT</td>
<td>35.00%</td>
</tr>
<tr>
<td>NET REDUCTION</td>
<td>5.74</td>
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<tr>
<td>FUTURE CONDITION</td>
<td>10.66</td>
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**Constraints**

Most of the site consists of a mature hardwood forest, and therefore tree removal will be necessary at this site for both BMPs.

The site is located on two privately owned properties. Access to the site may be difficult due to the steep terrain and wooded condition of the site.

**Alternatives**

No alternatives are proposed for this site.

**Cost-Estimate Breakdown**

Table 25.2 shows a conceptual itemized cost estimate for Site 25. These costs represent construction and maintenance costs only. The cost for stormwater wetlands is derived from an equation developed by Brown and Schueler (1997). The cost for the bioretention area is derived from a cost per cubic foot treated for bioretention areas as reported by Schueler, et. al. (2007).
Table 25.2

<table>
<thead>
<tr>
<th>Pay Item Description</th>
<th>Estimated Quantity</th>
<th>Unit</th>
<th>Unit Bid Price</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio-Retention Area</td>
<td>4602.00 CF</td>
<td></td>
<td>12.62</td>
<td>$58,077</td>
</tr>
<tr>
<td>Stormwater Wetland</td>
<td>5547.0 CF</td>
<td></td>
<td>Equation Derived</td>
<td>$12,399</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total $70,476</td>
</tr>
<tr>
<td>Mobilization (5%)</td>
<td>1.00 LS</td>
<td></td>
<td></td>
<td>$3,524</td>
</tr>
<tr>
<td>Contingencies (15%)</td>
<td>1.00 LS</td>
<td></td>
<td></td>
<td>$10,571</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total + Mobilization and Contingencies $84,571</td>
</tr>
</tbody>
</table>

**Maintenance Costs**

| Maintenance (5% of base construction cost of BMP) | 1.0 Year | $4,229 |
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CONCEPTUAL PLAN VIEW
BOLIN CREEK WATERSHED
Geomorphic Analysis and Potential Site Identification For
Stormwater Structures and Retrofits

Legend
- Stormwater Lines
- Impervious Surfaces
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Stream, unknown flow
- Contours

1 inch equals 150 feet