A METHODOLOGY FOR EVALUATING STEEP SLOPES AND ERODIBLE SOILS ADJACENT TO WATERCOURSES AND WETLANDS

ROSWELL
GEORGIA
SINCE 1854

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Contents

Introduction

It has been determined by the Mayor and Council that water resources and the protection of those water resources are essential to the health, safety and general welfare of the citizens of Roswell and that measures to protect water resources from contamination due to inappropriate use or over-development of land are in the best interest of the citizens. Water resources which include both surface water and groundwater can be affected by contamination and pollution from stormwater runoff and additional protection measures have been determined to be necessary to protect its drinking water supply for Roswell residents and other residents downstream from water courses flowing within the municipal limits of the City of Roswell. Grading contributes large amounts of contaminants to water bodies via storm water runoff. Therefore, to accomplish the foregoing the Mayor and Council of the City of Roswell, pursuant to their authority, have adopted the steep slopes and erodible soils evaluation.

Applicability

Development plans must conform to topography and soil type so as to create the lowest practical erosion potential. No land disturbing activities shall occur on any slope in excess of 25% within 500 feet of any state waters without the submittal of a Steep Slope and Erodible Soils Evaluation. This section shall be in addition to other buffer requirements and shall not exempt any sites from any other requirements of the City of Roswell. This section shall also apply to filling activities that occur within 500 feet of a "state waters", as defined herein, when any part of that fill slope exceeds 25%.

Evaluation Report

A. The evaluation report shall be submitted for review to the Engineering Division Manager of the Community Development Department. This report shall include, as a minimum, the following:

   a. A plan, at a scale not smaller than 1" = 100', that shows:

      1. Existing topography with contour intervals no greater than five (5) feet,
      2. Mapped soils as shown in soil surveys,
      3. Field delineated, marked and surveyed streams and wetlands,
      4. Existing vegetation,
      5. Existing sub drainage areas of the site, and
      6. Slopes in each sub drainage area segmented into sections of slopes less than or equal to ten (10) percent; eleven (11) to nineteen (19) percent; and greater than or equal to twenty (20) percent;

   b. All slope analysis data forms;

   c. A summary of findings including information pertinent to the evaluation of the site; and

   a. A mitigation plan that describes the proposed additional protective measures for those areas where development is

allowed with restrictions.

B. The site shall be evaluated by assessing each segment of each subdrainage area using the evaluation criteria in Table 1. Each segment shall be given a score for slope, slope length, soil erodibility, vegetative cover, and sediment delivery. A total score shall be assigned for each segment. A segment of a subdrainage area with a total score of thirty-five (35) or greater shall be designated as part of the buffer and no development shall be approved in that segment. A segment with a total score of twenty-five (25) or thirty (30) shall require the application of additional protective measures as required by the Engineering Division Manager of the Community Development Department; however, development shall not be prohibited and that area shall not be part of the buffer. A segment with a score of twenty (20) or less shall be developed with standard protective measures and that area shall not be required to be part of the buffer.

Table I: Evaluation Criteria for Steep Slopes and Erodible Soils

Factor	**Scores**		
	High (10)	**Medium (5)**	**Low (0)**
Slope (S)	S>20%	10%<S<20%	S<10%
Slope Length (SL)	SL>200'	50'<SL<200'	SL<50'
Soil Erodibility (K)	K>0.32	0.24<K<0.32	K<0.24
Vegetative Cover (1)	Bare soil, fallow land, Active pasture in fair crops, active pasture in poor condition, orchard-tree farm in poor condition.	Active pasture in good condition, brush-weeds in poor condition, orchard-tree farm in fair Condition, woods in poor condition	condition, undisturbed meadow, brush-weeds in fair condition, orchard-tree farm in good condition, woods in fair condition
Sediment Delivery	Adjacent to watercourses or wetlands (<100' buffer)	Adjacent to watercourses or wetlands (100'-300' buffer)	Not adjacent to watercourses or wetlands (>300' buffer)

(1) Poor Condition: < 50% ground cover
Fair Conditions: 50% to 75% ground cover
Good condition: > 75% ground cover

5. Exemptions to this section shall be as follows:

No application for a development permit shall be approved and no permit shall be issued for any land disturbing activity inconsistent with this section, unless:

(a) The Engineering Division Manager, or in his absence the Zoning Director, after consulting with the director of Public Works/Environmental, or his designee authorizes land disturbance for the construction of: a stream crossing by a drive-way, transportation route, or utility line parallel to a stream but not closer than 25 feet from a

stream bank unless due to natural conditions in an area, such construction would be less harmful to the environment than if it were located outside the protection area; or

(b) The Engineering Division Manager with the approval of the Mayor and City Council finds and determines that the proposed work will not impair the quality, vitality and stability of the protection area and will not destroy more than a minimum amount of the riparian cover within the parcel; or

(c) The Engineering Division Manager with the approval of the Mayor and City Council authorizes redevelopment of a tract or parcel where an equivalent amount of clearance and improvement are located thereon; or, where the opinion of the Engineering Division Manager after consulting with the Director of Public Works/Environmental or his designee is that the proposed work will not impair the quality, vitality and stability of the protection area; or

(d) A structure is being repaired or rebuilt after being damaged by fire or other disaster and the Engineering Division Manager determines that reasonable efforts to protect the adjacent stream have been taken; or

(e) The Engineering Division Manager with the approval of the Mayor and City Council grants a variance from the requirements of this ordinance because exceptional circumstances exist such that a strict adherence to the provisions of this ordinance would result in unnecessary hardship and/or would not further the intent of the ordinance; or

(f) The Engineering Division Manager, or in his absence the Zoning Director, after consulting with the director of Public Works/Environmental or his designee authorizes an exception to these rules to allow construction of a detention, retention or sediment control pond, facility or storm drainage structure within a required buffer, setback or protection area where it is deemed to be in the best interest of the water resources system.

Plan Preparation

The plan should be prepared for use in the forest buffer analysis as outlined below:

A. Divide the site into existing subdrainage areas.

B. Segment slopes along a stream valley by differentiating areas with slope gradients of <=10%, 11-19%, and >=20%. Significant changes in soil erodibility, vegetative cover, and proximity to the resource will require additional segmentation during the evaluation process.

C. Plot cross-sections at various points along the slope to be evaluated. A cross-section is developed by tracing a flow path from the crest of the slope to the edge of the wetland, or top of the streambank where no wetland exists, along a line perpendicular to the contours of the slope. The number of cross-sections necessary to analyze a particular slope depends on the degree of confidence the evaluator has that the cross-sections plotted accurately characterize the slope. Generally, a slope with a uniform shape along its face can be

characterized with a few well-chosen cross-sections. A slope with an irregular shape will require more cross-sections.

Step1: Measure and record the following data for each segment along a cross section. Cross sections should be segmented by areas of significant change. Segment lengths should not be less than 25 feet. Segments less than 25 feet would not constitute a significant change.

Slope: the average percent slope in that segment

Slope Length: the cumulative slope length, measured from the crest of the slope to the downslope point of the segment being evaluated.

Soil Erodibility: the K factor assigned to the soil type in that segment

Vegetative Cover: the vegetative type and hydrologic condition for the segment immediately downslope of the area to be disturbed. It is assumed that the segment being evaluated will be cleared and graded; therefore, this factor is a measure of the type and quality of the vegetation downslope from the disturbed area.

Sediment Delivery: the distance from the bottom of the segment being evaluated to the resource (i.e., edge of wetland or top of streambank)

Step 2: Compare the measured values to the range of values given for each factor in Table 1. Assign the appropriate category (i.e., high, medium, or low) for each factor. Record this data on the worksheet. Within a segment, if two sets of values exist for a particular factor, and those values belong to different categories(high, medium, or low), this is an indication that the segment should be divided into two separate segments.

Step 3: Record the score associated with the category for each factor (i.e. 10, 5, or 0 from Table 1) on the Evaluation Form.

Step 4: Determine the total score for the segment by summing the factor scores.

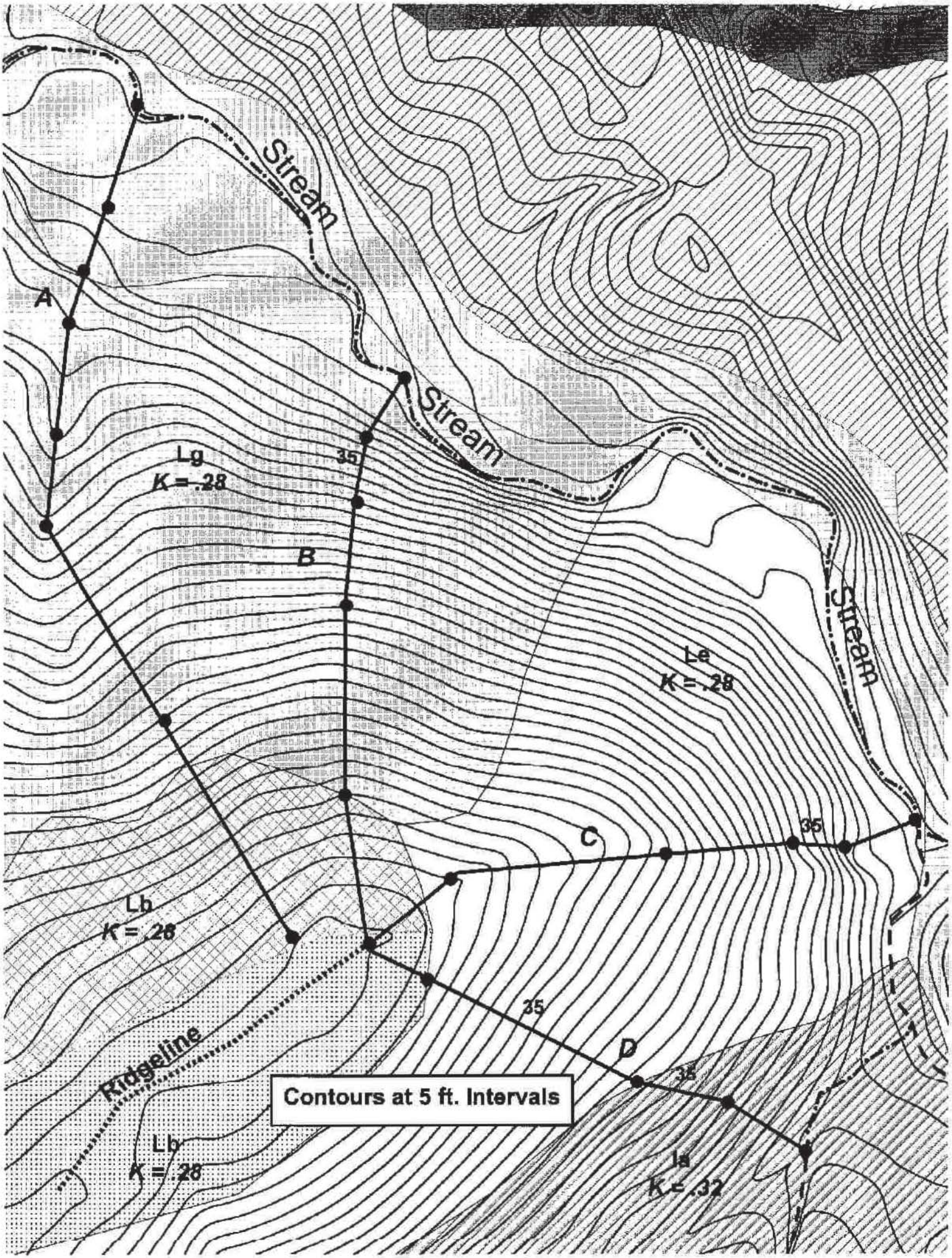
Step 5: Based on the total score for the segment, determine whether that segment of the slope would have a high, moderate, or low potential for impacting the resource if it were developed as in Table 1.

This procedure should be repeated until all the segments on each cross-sections have been evaluated. A segment of a subdrainage area with a total score of 35 or greater shall be designated as part of the stream buffer and no development shall be approved in that segment. A segment with a total score of 25 or 30 shall require the application of additional protective measures. However, development shall not be prohibited and that area shall not be part of the stream buffer. A segment with a score of 20 or less shall be developed with standard protective measures.

Once the site has been evaluated, it is then possible to design a development that avoids disturbance of those areas with a high potential for impacts. If the development is designed without consideration of these and other environmental constraints, delays in processing and plan revisions will result.

Appendix A.

Example with Soils, Topo, Cross-Sections, and Buffers


Stream
Stream
Stream
A
B
C
D
35
35
35
35
Lg
K = .28
Le
K = .28
Lb
K = .28
Lb
K = .28
la
K = .32
Ridgeline
Contours at 5 ft. Intervals


50' Impervious Setback
100' Stream Buffer
Stream
A
100' Stream Buffer
50' Impervious Setback
50' Impervious Setback
100' Stream Buffer
Stream
35
B
Stream
C
Ridgeline
Contours at 5 ft. Intervals

Appendix B.

Soil Erodibility (K) Values

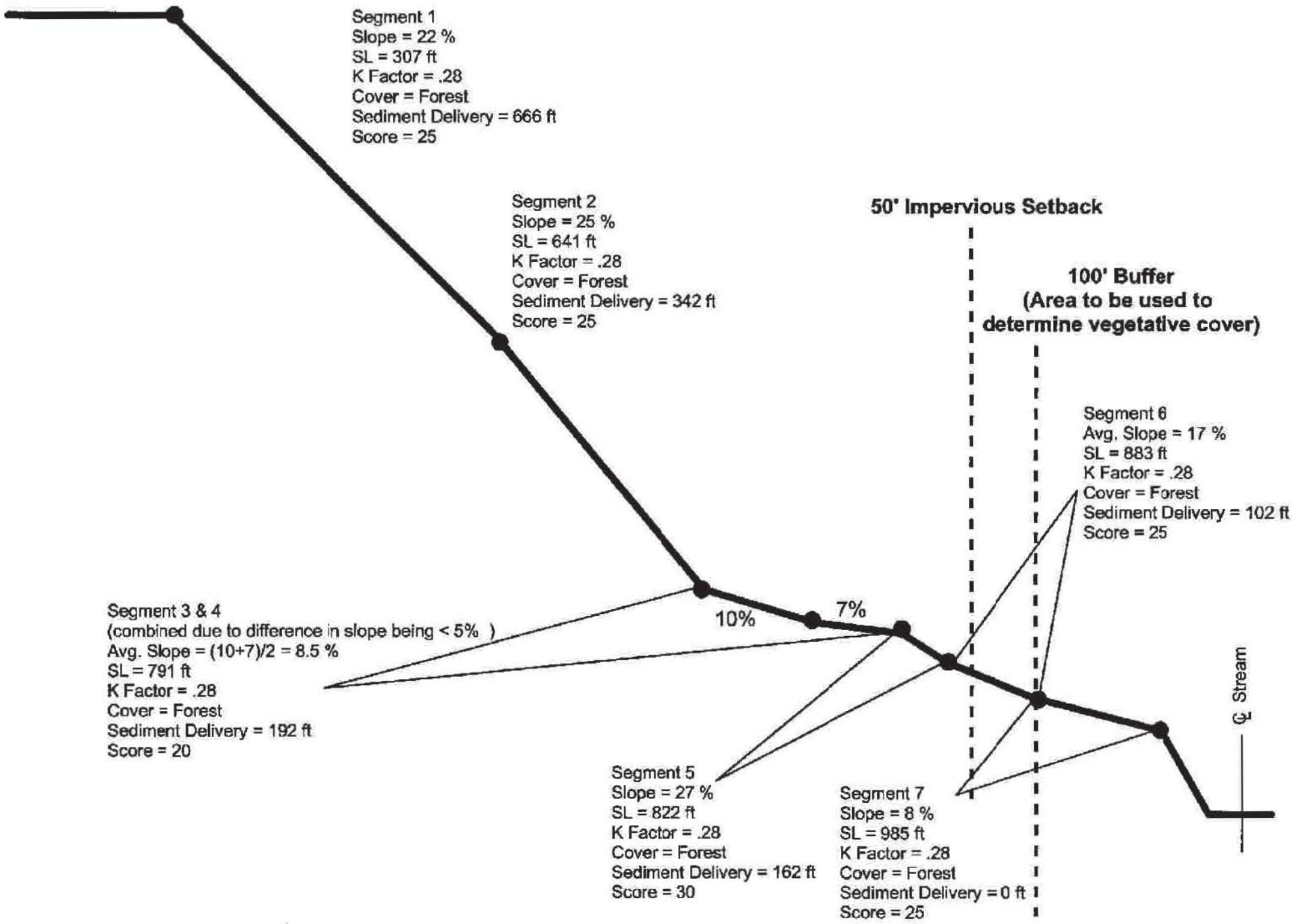
SOIL TYPE	SOIL NAME	K FACTOR
Aa	Altavista	0.24
Ab	Altavista	0.24
Ag	Appling	0.24
Ak	Appling	0.24
Ao	Augusta	0.24
Ba	Buncombe	0.10
Ca	Cecil	0.28
Cb	Cecil	0.28
Cd	Cecil	0.28
Ce	Cecil	0.28
Cf	Cecil	0.28
Cg	Cecil	0.28
Ch	Cecil	0.28
Ck	Cecil	0.28
Cl	Cecil	0.28
Cm	Cecil	0.28
Cn	Chewacla	0.32
Cp	Congaree	0.37
Da	Davidson	0.28
Db	Davidson	0.28
Dc	Davidson	0.28
Ga	Grover	0.32
Gb	Grover	0.32
Gc	Gullied Land	0.28
Ha	Helana	0.28
Hb	Hiwassee	0.28
Hc	Hiwassee	0.28
Hc	Hiwassee	0.28
Hd	Hiwassea	0.28
Ia	Iredell	0.32
La	Lloyd	0.28
Lb	Lloyd	0.28
Lc	Lloyd	0.28
Ld	Lloyd	0.28
Le	Lloyd	0.28
Lg	Lloyd	0.28
Lh	Lloyd	0.28
Lk	Lloyd	0.28
Lm	Lloyd	0.28
Lo	Cecil	0.28
Lx	Louisa	0.28

SOIL TYPE	SOIL NAME	K FACTOR
Lxa	Louisa	0.28
Lxb	Louisa	0.28
Lxc	Louisa	0.28
Ly	Louisburg	0.24
Lya	Louisburg	0.24
Lyb	Louisburg	0.24
Mb	Madison	0.32
Mc	Madison	0.32
Md	Madison	0.32
Me	Madison	0.32
Mf	Madison	0.32
Mg	Madison	0.32
Mh	Madison	0.32
Mk	Madison	0.32
Ml	Madison	0.32
Mm	Madison	0.32
Mn	Madison	0.32
Mo	Madison	0.32
Mp	Madison	0.32
Mr	Madison	0.32
Ms	Mecklenburg	0.32
Mt	Mecklenburg	0.32
Mu	Mixed alluvium	0.10
Mv	Mixed alluvium	0.24
Mw	Mixed alluvium	0.32
Mx	Molena	0.17
My	Molena	0.17
Ra	Riverwash	0.10
Sa	Seneca	0.24
Sb	Seneca	0.24
Sc	Starr	0.24
Sd	Starr	0.24
Se	Stony land rolling	0.32
Sf	Stony land hilly	0.32
Sg	Stony land steep	0.32
Wb	Wehadkee	0.32
Wc	Wickham	0.24
Wd	Wickham	0.24

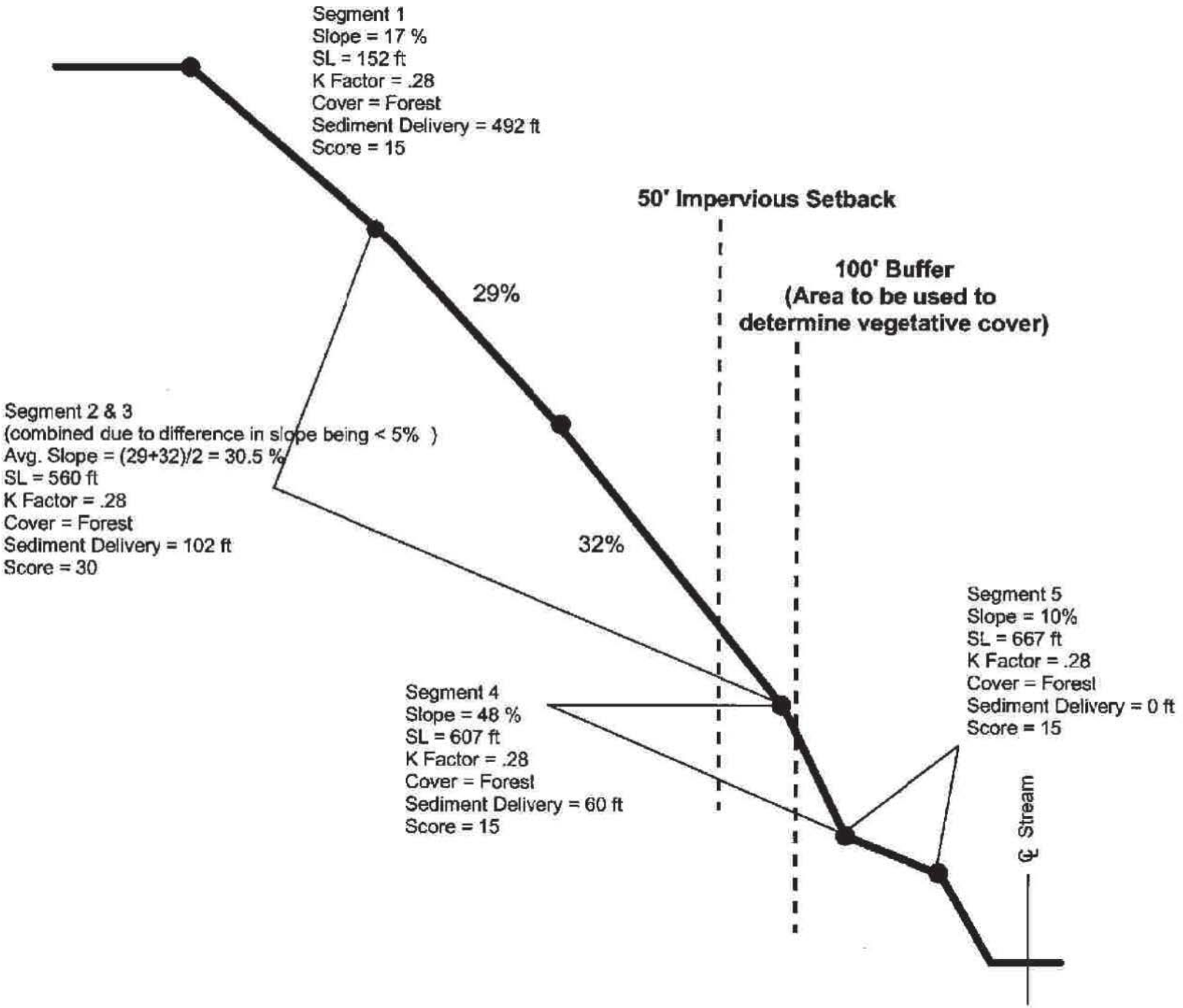
Appendix C.

Cross-Section Analysis

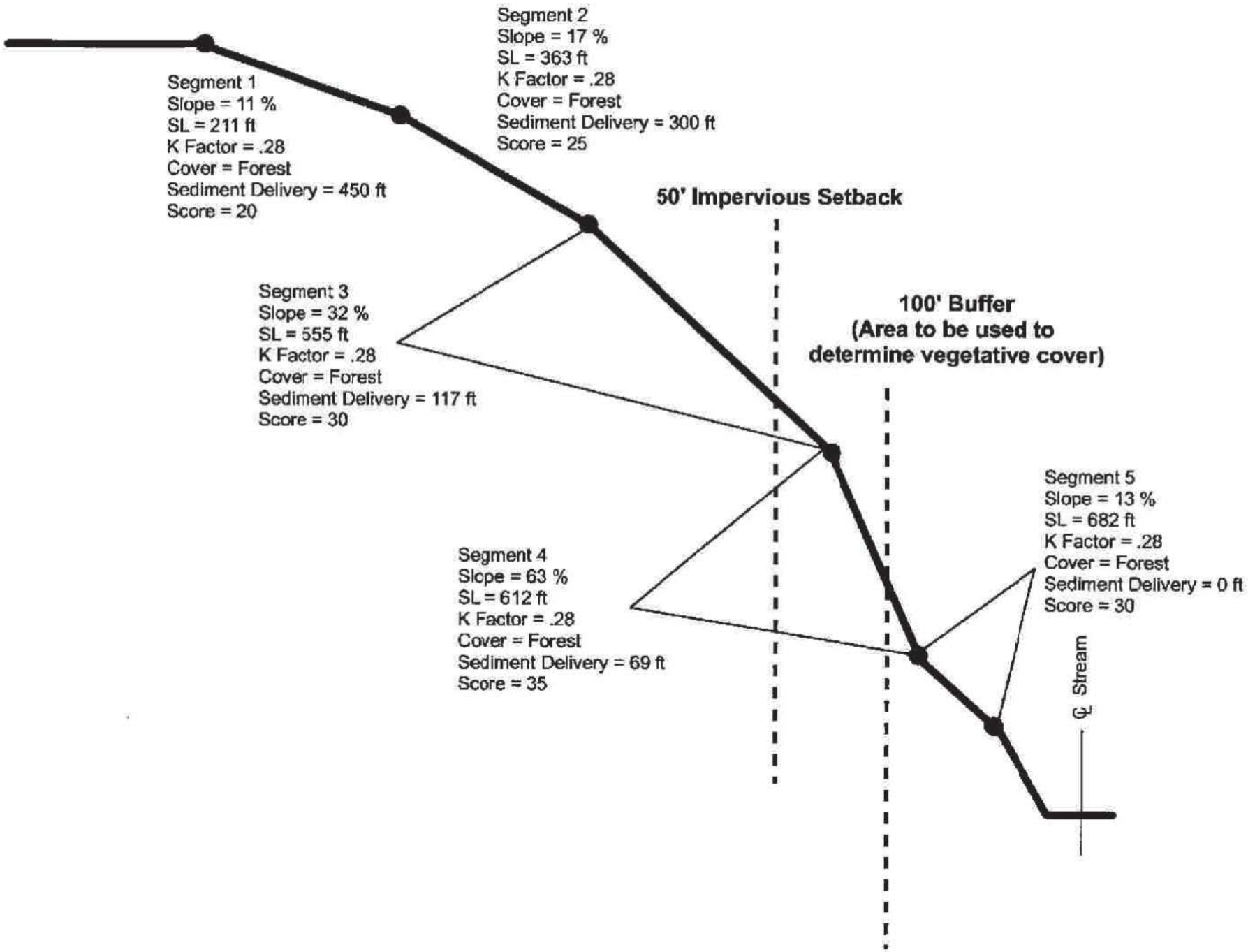
CROSS-SECTION A



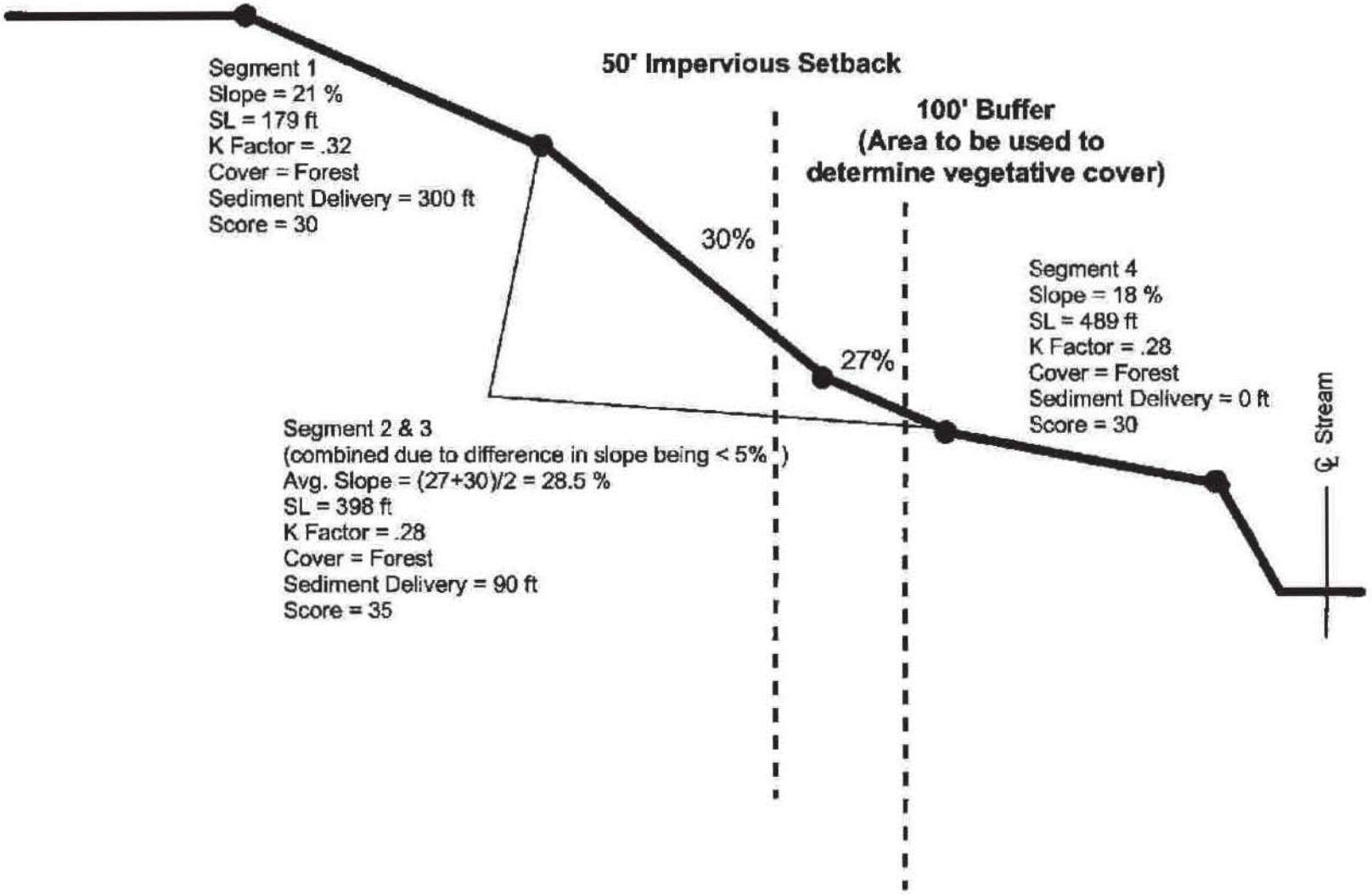
CROSS-SECTION B



CROSS-SECTION C



CROSS-SECTION D



Appendix D.

Evaluation Forms

EVALUATION OF STEEP SLOPES AND ERODIBLE SOILS
CITY OF ROSWELL, GEORGIA

CROSS-SECTION : ____A____

SEGMENT:	1		2	
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope	22%	10	25%	10
Slope Length (feet)	307	10	641	10
K Factor	0.28	5	0.28	5
Cover	Forest	0	Forest	0
Sediment Delivery	666	0	342	0
TOTAL SCORE		25		25

SEGMENT:	3 & 4		5	
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope	9%	0	27%	10
Slope Length (feet)	791	10	822	10
K Factor	0.28	5	0.28	5
Cover	Forest	0	Forest	0
Sediment Delivery	192	5	162	5
TOTAL SCORE		20		30

SEGMENT:	6		7	
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope	17%	5	8%	0
Slope Length (feet)	883	10	985	10
K Factor	0.28	5	0.28	5
Cover	Forest	0	Forest	0
Sediment Delivery	102	5	0	10
TOTAL SCORE		25		25

SEGMENT:				
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope				
Slope Length (feet)				
K Factor				
Cover				
Sediment Delivery				
TOTAL SCORE				

EVALUATION OF STEEP SLOPES AND ERODIBLE SOILS
CITY OF ROSWELL, GEORGIA

CROSS-SECTION : ____B____

SEGMENT:	1		2 & 3	
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope	17%	5	31%	10
Slope Length (feet)	152	5	560	10
K Factor	0.28	5	0.28	5
Cover	Forest	0	Forest	0
Sediment Delivery	492	0	102	5
TOTAL SCORE		15		30

SEGMENT:	4		5	
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope	48%	10	10%	0
Slope Length (feet)	607	10	667	10
K Factor	0.28	5	0.28	5
Cover	Forest	0	Forest	0
Sediment Delivery	60	10	0	10
TOTAL SCORE		35		25

SEGMENT:				
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope				
Slope Length (feet)				
K Factor				
Cover				
Sediment Delivery				
TOTAL SCORE				

SEGMENT:				
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope				
Slope Length (feet)				
K Factor				
Cover				
Sediment Delivery				
TOTAL SCORE				

EVALUATION OF STEEP SLOPES AND ERODIBLE SOILS
CITY OF ROSWELL, GEORGIA

CROSS-SECTION : ____C____

SEGMENT:	1		2	
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope	11%	5	17%	5
Slope Length (feet)	211	10	363	10
K Factor	0.28	5	0.28	5
Cover	Forest	0	Forest	0
Sediment Delivery	450	0	300	5
TOTAL SCORE		20		25

SEGMENT:	3		4	
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope	32%	10	63%	10
Slope Length (feet)	555	10	612	10
K Factor	0.28	5	0.28	5
Cover	Forest	0	Forest	0
Sediment Delivery	117	5	69	10
TOTAL SCORE		30		35

SEGMENT:	5			
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope	13%	5		
Slope Length (feet)	682	10		
K Factor	0.28	5		
Cover	Forest	0		
Sediment Delivery	0	10		
TOTAL SCORE		30		

SEGMENT:				
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope				
Slope Length (feet)				
K Factor				
Cover				
Sediment Delivery				
TOTAL SCORE				

EVALUATION OF STEEP SLOPES AND ERODIBLE SOILS
CITY OF ROSWELL, GEORGIA

CROSS-SECTION : ____D____

SEGMENT:	1		2 & 3	
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope	21%	10	29%	10
Slope Length (feet)	179	5	398	10
K Factor	0.32	10	0.28	5
Cover	Forest	0	Forest	0
Sediment Delivery	300	5	90	10
TOTAL SCORE		30		35

SEGMENT:	4			
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope	18%	5		
Slope Length (feet)	489	10		
K Factor	0.28	5		
Cover	Forest	0		
Sediment Delivery	0	10		
TOTAL SCORE		30		

SEGMENT:				
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope				
Slope Length (feet)				
K Factor				
Cover				
Sediment Delivery				
TOTAL SCORE				

SEGMENT:				
FACTOR:	VALUE	SCORE	VALUE	SCORE
Slope				
Slope Length (feet)				
K Factor				
Cover				
Sediment Delivery				
TOTAL SCORE				

Appendix E.

Frequently Asked Questions

FREQUENTLY ASKED QUESTIONS:

When is it okay to combine two segments?

If two segments have similar slope percentages, within 5 %, and similar soil types it is then okay to combine the segments into one.

How do I determine slope length?

The slope length is cumulative and measured from the downslope point of your segment to the ridgeline.

How do I determine the soil type on my development?

On the internet go to www.roswellgov.com click on Departments then GIS Mapping then click on GIS Maps. Click on the GIS INTERACTIVE MAPPING LINK. Then click on the Soils Tab. If you then zoom in to the area in question and click on the identify tool you will be able to see the soil type on the development and the K Factor relating to that type.

What if the ridgeline is more than 500 feet from the stream?

The analysis will be limited to that area within 500 feet of the stream; however, the slope length should be measured from the ridgeline.

How do I know how to segment my cross section?

Cross sections should be segmented in areas of significant change (topographic, soil type, etc.). No segment should be less than 25 feet in length.

What happens if a segment gets a score of 25 or 30?

If a segment gets a score of 25 or 30 the application may include additional protective measure, but development is not prohibited and those segments are not part of the stream buffer. These additional measures are increased buffer widths, additional erosion and sediment control measures, or reduced density within the buffer and will be evaluated on a case-by-case basis.

How do I determine the vegetative cover?

The vegetative cover is determined by looking at the undisturbed area downslope of the area to be disturbed.