ALLIGATOR CREEK
SEDIMENT MANAGEMENT PLAN
FINAL REPORT

Prepared for the:
Sarasota County Water Resources



Berryman & Henigar

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Submittal Statement

The Sediment Management Plan for the Alligator Creek Watershed has been prepared by ReNae S. Nowicki, M.E.M. and Mirko I. Soko, P.E. of Berryman & Henigar, Inc. (B&H), a Bureau Veritas Company, following accepted professional practices.

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1. Introduction

1.1 Introduction and Project Objectives

Sarasota County has identified the reach of Alligator Creek west of US 41 as having excess sediment deposition in the creek channel. The County may investigate the feasibility of dredging the Creek, but would like to first identify potential sources of sedimentation and potential methods of reducing the rate of sediment loading into the Creek. A reduction of sediment loading would decrease the frequency of maintenance dredging required to maintain navigability and good circulation in the channel.

To this end, the County contracted Berryman & Henigar (B&H), a Bureau Veritas Company, to conduct a study to determine the efficiency and feasibility of installing a series of sediment transport controls at strategic points upstream (east) of US 41 for the purpose of trapping sediment prior to deposition in the lower creek reach. Initially the focus of the investigation was on installing weirs in creek tributaries to retain sediments. After consultation with the County, as described below, a wider variety of alternative treatments were evaluated and are herein described. Major tasks for this work included:

- Collection and review of existing data
- Characterization of the watershed
- Review of existing hydrologic/hydraulic model
- Identification of problem areas and sources of sediment loading
- Quantification of sediment loading rates
- Identification of alternative sediment control treatments
- Presentation of recommended treatments
- Identification of potential permitting compliance issues
- Prioritization of stream channels for treatment
- Estimation of generalized/conceptual level costs for treatments

1.2 Watershed Description and Background

The Alligator Creek Watershed covers approximately 11 square miles and is located south and east of the City of Venice in Sarasota County (Figure 1). The creek discharges into the Intercoastal Waterway (ICW) at the north end of Lemon Bay, a Florida Aquatic Preserve, which is part of the Charlotte Harbor Estuary. Typical of other coastal areas in this County, the watershed is characterized by low topographic relief and sandy soils (Figure 2). The predominant land uses in the watershed are single-family medium and high density residential with smaller portions of open land, commercial, and institutional land uses. The watershed is generally urbanized, with upland and developed land use/land cover encompassing 83% of the watershed, while wetland and surface waters encompass the remaining 17% (Figure 3). The lower and middle reaches of Alligator Creek have been previously dredged for navigation and drainage purposes (Parsons, 2002). Despite the urbanization of the lower and middle reaches, large areas of the historic creek floodplain in the upper reach remain undeveloped, most notably in the Alligator Creek Conservation Area upstream and just downstream of Venice East Boulevard.

2. Data Collection and Review

B&H reviewed and synthesized applicable existing data and studies to obtain a thorough understanding of the watershed area, including:

- Aerial imagery
- County GIS coverages
- NRCS Soil Survey

- USDA Natural Resources and Environment Website
- Florida Natural Area Inventory (FNAI) Database
- Alligator Creek Flood Protection Improvement Plan (Parsons, 2002)
- Nonpoint Source Pollutant Loading Study of Lemon Bay (ERD, 2003)
- Available sediment analysis information (PBS&J, 2003)

The previous information was supplemented by field reconnaissance and discussions with County staff and other knowledgeable individuals. Results of the field work are summarized in the Section 3.

3. Field Investigations

B&H engineers and ecologists conducted visual field investigations of each of the six creek system subwatersheds between May and November of 2005 to characterize existing structural and ecological conditions and to assess the degree of sediment exported from each system to Alligator Creek, as described in Section 3.1. The initial investigations focused on the identification of potential weir locations in systems with high sediment export potential and possible impacts to the aquatic environments that might result from weir placement. Qualitative assessments of likely community structure (especially sensitive or protected flora and fauna) were also undertaken to assist in the selected design feasibility assessment. Results from the floral and faunal assessments are described in Sections 3.2 and 3.3. No sampling of water, sediment, or biota occurred.

Based upon the considerable erosion identified along the banks of most of the systems during the initial investigation, and the potential for upstream flooding that would likely result from weir placement, subsequent field investigations focused on bank stabilization opportunities rather than weir placement. Photo-documentation of each of the systems, including instances of wildlife utilization, is presented in Section 16. Potential sediment control treatment options and recommendations for improvement for each system are presented in Sections 9 and 10, respectively. It is important to note that the level of erosivity of the systems was highly variable and conditions were noted to have changed between field visits as a result of storm events. As such, the characterizations of the conditions in each system and recommendations for improvements pertain to conditions noted on or before the November 5th, 2005 field event. Any changes to systems occurring after this date are not reflected in this report.

3.1 System Conditions

System conditions during the May-November field investigations indicated varying degrees of erosion along banks of the five tributary areas (Systems 1-5) and Alligator Creek (System 6). Each system was characterized as having *minimal*, *moderate*, or *severe* bank erosion, suggesting minimal, moderate, or severe sediment export potential (respectively) into Alligator Creek. Because the degree of erosion and potential treatment options were variable within most systems, individual sub-system segments were identified and numbered in increasing order from downstream to upstream for convenience (Figure 4). The degree of erosion determined for each segment in the Proejct Study Area is presented in Figure 5 and further characterized in the following sub-sections.

3.1.1 System 1

This two-segment, highly eroded system begins at Briarwood Road, traverses south along the eastern boundary of the Venice Gardens residential area and then discharges south into Alligator Creek. Banks along both segments are characterized by severely sloughing slopes and sediment deposition along the ditch bottom (Photos 1, 2, and 3). In addition, nuisance and exotic vegetation are overgrown, especially in the 1st (downstream) segment. Undercutting of the receiving banks of Alligator Creek at the point of discharge is also evident (Photo 4).

3.1.2 System 2

This four-segment system begins at South Tamiami Trail just west of Jacaranda Boulevard and discharges north into Alligator Creek at Woodmere Park. Erosion was minimal in 1st , 2nd , and 3rd segments; the 4th segment was not evaluated. The 3rd segment is a relatively shallow, grassy wet swale that traverses the eastern edge of the Woodmere Park West residential area and ends at Woodmere Boulevard. Nuisance aquatic vegetation, particularly hydrilla (*Hydrilla verticillata*), was noted in this segment during the May and November field events (Photos 5 and 6). During the 2005 wet season, hydrilla and other aquatic species washed into and plugged a culvert under Woodmere Boulevard, resulting in multiple instances of flooding during storm events (personal communication with Sam Heyes, July 27, 2005). The 2nd segment is a County mitigation area located between Woodmere Boulevard and the Woodmere Park foot bridge. The entire segment was dense with nuisance and exotic vegetation, particularly primrose willow (*Ludwigia peruviana*) (Photo 7). Although not present during the initial field investigations, scour at the upstream end of this segment (i.e., culvert beneath Woodmere Boulevard) and sediment deposition at the downstream end were noted during the November field investigation (Photo 8). The 1st (downstream) segment—the only relatively natural stream reach found within the Project Study Area—begins at the foot bridge, traverses an area of cabbage palms (*Sabal palmetto*), and discharges into Alligator Creek. This segment has shallow, meandering banks lined with mature Brazilian pepper (*Schinus terebinthifolius*) and a clear, flowing aquatic environment (Photos 9 and 10). Although soils were exposed along these banks, erosion within this segment was minimal.

3.1.3 System 3

This highly eroded single-segment system starts at Pineview Drive and traverses north along the western boundary of the Venice East residential area and the eastern boundary of a County conservation area. Sloughing of slopes was noted along the sparsely vegetated western banks, despite the presence of stabilization materials (Photo 11). Undercutting of banks opposite these stabilized areas suggests that stream flow is deflected from the western banks to the eastern banks, resulting in their erosion (Photo 12). During the initial field investigations, a sediment delta was observed at the downstream end of the system, suggesting considerable sediment deposition in Alligator Creek (Photo 13). This delta was observed to be more developed during the November field assessment (Photo 14).

3.1.4 System 4

This three-segment system begins at South Tamiami Trail just east of Venice East Boulevard and discharges north into Alligator Creek near the County Water Treatment Plant. The 3rd (upstream) segment, which ends at Paddington Street, is characterized by steep, sandy, sparsely vegetated slopes. Sloughing and sediment deposition were noted in multiple locations along this highly eroded segment (Photos 15 and 16). The 2nd segment occurs between Paddington Street and Dorchester Road. Banks along this segment were also steep and sandy, but vegetative cover was variable, and previously installed stabilization materials were observed in some locations (Photo 17). Erosion was considered moderate in this segment. The 1st (downstream) segment begins at Dorchester Road, traverses the western edge of the County water treatment plant, and discharges north into Alligator Creek (System 6). This segment was characterized by steep, grassy slopes and a slightly nutrient-rich aquatic environment (Photos 18 and 19). Although erosion within this segment was relatively minimal, undercutting along the northern bank of Alligator Creek and sediment deposition along the southern bank were noted during the May-November field events (Photo 20).

3.1.5 System 5

This two-segment, highly eroded feature starts at Beach Drive and discharges south into Alligator Creek. The 2nd (upstream) segment, which ends at Baffin Road, was characterized by steep slopes with dense herbaceous cover, particularly along the eastern bank. Severe sloughing along the western bank and sediment deposition along the ditch bottom were noted during the May-November field events (Photos 21 and 22). County personnel indicated that the sloughing of the banks resulted from direct stormwater runoff from Siesta Drive, and that ditch armoring was installed in some areas to prevent future sloughing (personal communication with Sam Heyes, July 27, 2005). An investigation of these armored areas revealed no sloughing. The 1st (downstream) segment extends south from a 9 foot by 14 foot culvert beneath Baffin Road to Alligator Creek (Photo 23). Side slopes were steep and densely vegetated in this segment and sloughing was severe along both banks, with considerable sediment deposition noted along the stream channel bottom (Photos 24 and 25).

3.1.6 System 6, Alligator Creek

System 6 (Alligator Creek), once a natural flowing system, is defined by three channelized segments. The 3rd (upstream) segment begins at System 4 near the County water treatment plant and ends at System 2, just downstream of Jacaranda Boulevard. Erosion along this segment was relatively minimal and occurred occasionally along the steep, sandy southern bank (Photo 25). Erosion also occurred along the northern bank in areas undercut by high velocity flow from Systems 2, 3, and 4 (Photos 26 and 27). Presence of the invasive aquatic vegetation species, hydrilla, during the initial field investigations suggested a nutrient-rich aquatic environment in this segment (Photos 27 and 28). Improved water clarity and a reduction in hydrilla was noted, however, during the November field event.

The 2nd segment begins at System 2 and ends downstream of System 1, where the water chemistry grades from fresh to brackish. Erosion in this segment was moderate and occurred primarily as sloughing along the steep, sandy, sparsely vegetated southern bank (Photo 29), though evidence of a washout along the top of the southern bank at System 2 was noted during an October field investigation (Photo 30). During a subsequent field visit on October 25, 2005 (after Hurricane Wilma), it was noted that County personnel had replaced an undersized culvert with larger culverts at this location to prevent future breaches of this kind. Additional erosion in the Creek also was noted at the receiving end of System 1, where banks were undercut and sediment deposited from high velocity waters entering the Creek. A small delta also was observed in this area during the May-November field investigations.

The 1st segment, defined by brackish water chemistry and a northern bank lined by mangroves and Brazilian pepper trees (many dead), ends just west of US41 at System 5 (Photos 31 and 32). Erosion in this segment was severe and occurred primarily along the southern bank where slopes remained steep, sandy, and sparsely vegetated (Photo 33). Also noted was an area west of System 1, where surface water from a wetland just south of the Creek breached its bank and flowed into the Creek, washing away the top of the Creek bank in the process (Photo 34).

3.2 Protected Flora

No protected flora were encountered at any of the systems during any of the May to November 2005 field investigations.

3.3 Wildlife Utilization

Incidental wildlife occurrences were documented at each of the systems during select May-November field investigations. Specifically, observations of vertebrate wildlife, or species-specific evidence of their presence (e.g., scat, calls, tracks, or other signs) within or adjacent to each system were documented. Special emphasis was given to species listed by the Florida Fish and Wildlife Conservation Commission (FFWCC) and United States Fish and Wildlife Services (USFWS) as Endangered, Threatened, or Species of Special Concern, and to those species listed as Critically Imperiled, Imperiled, or Rare, Restricted or Otherwise Vulnerable to Extinction by the Florida Natural Areas Inventory (FNAI). Wildlife occurences documented during these events included: various songbirds, wading birds, small fish, turtles and the American alligator. Table 1 (Section 15) identifies these species specifically, along with their wetland dependency and State and Federal listing/protection status.

Of the 16 species identified during the qualititative assessments, ten (primarily wading birds) are considered wetland dependent (i.e., those species so closely associated with wetlands that the existence of individuals is threatened if wetland function is absent or if there is a significant degradation of a wetland function) and were observed foraging within the systems, though mostly within Alligator Creek itself. These species included: anhinga, great blue heron, great egret, little blue heron, snowy egret, swallow tailed kite, tricolored heron, yellow-crowned night heron, apple snail (shell), and the American alligator (sunning along the bank of Alligator Creek). Three of these bird species (little blue heron, snowy egret, and tricolored heron) and one reptile (American alligator) are considered Species of Special Concern at the state level. The American alligator is also considered Threatened at the federal level, and the snowy egret is considered Rare by the FNAI. The swallow tailed kite, not a federal or state listed species, is considered Imperiled by the FNAI. The swallow tailed kite was observed traveling over Alligator Creek during the May field event.

4. Hydrologic and Hydraulic Model Review

The County's existing hydrologic/hydraulic model (AdICPR) was reviewed and assessed for its completeness and usefulness for this project. It was assumed that the model was complete, adequately calibrated, and that only minimal adjustments (e.g., adjustment to internal subbasin boundaries and reaches depending on weir placement) were to be required. It was also assumed that the model had been successfully run for the 100-year design storms under existing conditions. No updates to the existing model were anticipated (e.g., land use, hydrography, etc.).

The AdICPR model (Version 3.0 for the Lemon Bay [LBM_Apr04_update]) utilized the SCS runoff curve number and unit hydrograph method for the hydrologic analysis and included other watersheds outside of the study area. The model was re-run for existing conditions to replicate the 100-year model results reported in the Alligator Creek Flood Protection Improvement Plan (Parsons, 2002). The resultant modeled flood water levels were slightly higher that those reported by Parsons (2002) (Table 2). The County was contacted to investigate the differences, and an assumption was made that the slight increases were due to the changes made during the model updates.

An additional change was made to this model as the channel representing System 2 was directly connected to the main channel of the creek. As-built data provided by the County for the two culverts installed downstream of System 2 were incorporated to the existing and proposed models (Table 2). The new water levels were used as the existing conditions benchmark for the predictive modeling described in Section 6.

5. Weir Placement Alternative Treatment Selection Workshop

B&H conducted a meeting with County staff on June 23, 2005 to describe the weir location analysis, and to present possible locations for proposed weirs. The original focus of the study was to identify potential locations for sediment trapping weirs within the upstream Alligator Creek basin, on systems discharging to the main channel. It was anticipated that weirs would be located at locations such as stormwater or abandoned wastewater treatment pond outfalls, canal discharges, or other strategic locations not in the main creek channel.

Based on the review of the data collected, conversations with County staff, initial modeling efforts, and the observations made during the initial field investigations, it was determined that some of the original conditions and assumptions had changed, as follows:

- Wastewater ponds within the watershed are now used for reclaimed water storage and are not available for other uses.

- Sediment transport was found to originate from steep side banks along the tributaries and in some locations of the main channel.
- Weir placement may not be possible without adverse upstream impacts, as described below.
- A system outside the original Project Study Area was a major source of sedimentation (System 5).

B&H staff recommended the County change the original focus of the study to include alternative bank stabilization treatments and to expand the Project Study Area to include the system west of US41 (System 5). B&H provided meeting minutes of the workshop (Appendix A) and the PowerPoint presentation of the proceedings and results. A subsequent field inspection was conducted on July 27, 2005, with County and B&H staff visiting selected systems.

6. Predictive Modeling with Weirs and Evaluation of other Treatments

Based on the original Project Scope of Work , the County's Ad-ICPR model was used to simulate "project conditions" with potential weirs included at the systems selected by B&H and the County under Task 5. The project condition modeling was originally envisioned to be run iteratively to determine optimal weir height and final placement to maximize sediment removal and minimize hydrologic alterations.

6.1 Methodology

The original purpose of the modeling was two-fold. The first purpose was to assess the effectiveness of the weirs in allowing the sediment to settle out of the water column and accumulate behind the weir, reducing deposition in the main channel. This would have been accomplished by determining the mean water velocity of tributary stream flow under existing conditions and comparing that to the flow rate and velocity under project conditions. The second purpose of the modeling was to evaluate the potential impact of the weirs on water levels upstream and downstream of the weirs, as any hydrologic alterations with potential adverse increases in water levels for the 100-year storms would require an Environmental Resource Permit (ERP) from the Southwest Florida Water Management District (District).

The existing conditions model was modified to include 1-foot high weirs at all tributary systems described in Section 3, except in System 2 where weir placement was determined to be inappropriate. The intent of the weir evaluation was to minimize sediment deposition into Alligator Creek while maintaining peak design storm water levels within existing top of channel banks. It was noted that peak stages had exceeded the elevations of the top of banks, however, creating "glass walls" and false stages. In an effort to reduce the peak stage, the floodplain and limits of the existing channels were evaluated.

The proposed conditions model with 1-foot weir was revised and its cross-sections were expanded to represent larger floodplains around the tributary systems. As a result of the model revisions, the peak stages were reduced within the systems, but still exceeded the tops of banks at some of the systems. As a result, in some locations, the construction of weirs was determined to likely result in adverse impacts to upstream water levels.

In lieu of further weir modeling, bank stabilization methods and other treatments were evaluated to determine the potential for reducing sediment loading into Alligator Creek. Proposed cross-sections were created to reflect the proposed treatments described in Section 10. Further modeling was completed to evaluate the effectiveness of channel bottom widening and reduction of side slopes from 2:1 to 4:1 and alternative bank stabilization treatments. Manning's N values were revised for systems 1 – 5 to reflect the proposed bank stabilization treatments.

6.2 Results

The results of the existing and proposed conditions model runs are provided in Table 3. When 1 foot weirs were placed at systems 1, 3, 4 and 5, the peak stages for the selected systems exceeded the existing and expanded cross-section top-of-banks. Due to the anticipated negative effects upstream, placement of weirs within the system channels was not recommended. The results of the modeling completed to evaluate the effectiveness of channel bottom widening, reduction of side slopes, and alternative bank stabilization treatments show a decrease on the peak stages for all systems but system 1 and 5. Although these peak stages are slightly higher than existing stages they are well below the top-of banks.

7. Assessment of Sediment Removal Rates

B&H was tasked to estimate the sediment loading rates of tributary systems to Alligator Creek. Quantifying loading rates would help estimate the net effectiveness of the weirs or other treatments with respect to preventing sediment from reaching the downstream creek reach. The results of the modeling were to be used to help estimate the load reduction potentially caused by the weirs in pounds per year. These estimates would help the County determine a reasonable maintenance schedule for accumulated sediment removal upstream of the weirs. A variety of empirical methods also exist to estimate loading rates, as summarized below.

7.1 Analytical and Empirical Methods

The Universal Soil Loss equation, empirical relationships, and comparable analytical methods were reviewed in order to evaluate their applicability to estimating sediment loads in the subject tributaries under existing conditions.

7.1.1 Universal Soil Loss Equation

The Universal Soil Loss Equation is the most widely used erosion equation and was developed primarily for agricultural applications. The soil loss (E) is a function of the erosivity index (R), a soil erodibility factor (K), the topographic factor (T) which depends on the field length (L) and slope (S), a crop management factor (C), and conservation practice factor (P) as follows:

$$E = RKTCP$$

The erosivity index (R) can be obtained by summing individual products of the kinetic energy of rainfall (hundreds of ft-tons/acre) and the maximum 30-min rainfall intensity (in./hr) for all important storms in a year. The soil erodibility factor (K) is the average soil loss (tons/acre/unit of the rainfall factor R) from a specific soil in cultivated continuous fallow with the arbitrary standard values of the plot length and the slope. The topographic factor (T) is a function of the slope (%) and the overland stormwater flow length (ft) which should be less than 400 ft. The crop management factor (C) is a ratio of soil quantities eroded from land with crops that eroded from clean-tilled fallow under the same slope and rainfall conditions. The conservation practice factor (P) is related to the support practice and the land slope. Predicted E values represent average, time-invariant estimates even though actual E values would vary seasonally and from year to year being contingent on the number, size, and timing of erosive rainstorms and other weather conditions, as well as land cover conditions. Because the Universal Soil Loss Equation is generally applied to agricultural areas, it is not the most appropriate method to use for this urban application.

7.1.2 Empirical Methods

Empirical equations, which are similar to the universal soil loss equation, exist for estimating volumes and rates of soil loss. Some of these equations where reviewed for the applicability and are briefly presented below.

The Musgrave Equation is as follows.

$$E = F\left(\frac{R}{100}\right)\left(\frac{S}{10}\right)^{1.35}\left(\frac{L}{72.6}\right)^{0.35}\left(\frac{P_{30}}{1.25}\right)^{1.75}$$

where:

E = probable soil loss (tons/ac/yr)
F = soil erodibility factor
R = cover factor
S = slope (%)
L = length (ft)
P_{30} = 2-yr, 30-min rainfall intensity (in./30 min.)

Beer, Farnham, and Heinemann (1966) developed the following equation based on an empirical analysis of data from western Iowa.

$$E = 0.392 \times 10^{-6} KPRR_c S^{1.35} L^{0.35}$$

where:

E = average annual soil loss (in./yr)
K = soil erodibility
R = rainfall
P = factor of conservation practice
R_c = cover factor
S = slope of plot (%)
L = length of plot (ft)

Flemming made use of data from over 250 catchments around the world to derive the following equation for mean annual suspended load Q_s (tons) as a function of mean annual discharge Q (cfs) for various covers:

$$Q_s = aQ^n$$

in which a and n are constants and depend on vegetal cover.

Evans, Scheeder and Lehning (2003) describe the lateral erosion rate as the product of the lateral erosion potential and the average stream flow.

$$LER = aQ^{0.6}$$

where:

LER = lateral erosion rate (meters/month)
Q = stream flow (cu meters/sec)
a = erosion potential factor

This lateral erosion rate empirical equation, presented by Evans et al 2003, was selected among these equations because it most closely represented the stream channel erosion that was found in the field. The following section explains how this equation was used to estimate sediment loading rates.

7.2 Predictive Stream Channel Erosion Spreadsheet

A predictive stream channel erosion spreadsheet-based model was generated to quantify sediment loading rates discharged to the creek. Based upon the considerable erosion identified along the banks of most of the systems during the field investigations and the lack of indentification of any major source of overland surface erosion, the Universal Soil Loss Equation was not selected to estimate loading rates. In its place B&H selected a combination of two models—one to estimate the overland loads based on annual pollutant loading unit rates and another to estimate channel loads.

The overland loads analysis used a spreadsheet-based model with loading estimates based on the following: District land use/land cover (FLUCCS) GIS data, drainage basin boundaries obtained from Sarasota County, stormwater treatment efficiency rates for Best Management Practices (BMPs) (ASCE, 2001), and annual pollutant loading unit rates (ERD, 1994). The channel loads analysis was based on the lateral erosion estimation by Evans (Evans et al, 2003).

The results of these two models are presented separately—the analysis based on overland loads is presented in Table 4, and the analysis based on stream channel loads is presented in Table 5. The combined summary results of the modeling for these potential loads are presented in pounds per year in Table 6.

8. Workshop for Presentation of Modeling Results

The modeling results were presented to the County at a workshop held on September 7, 2005. Alternative sediment load reduction recommendations were also presented and discussed. As a result, in some locations, the construction of weirs was determined to likely result in adverse impacts to upstream water levels. In lieu of further weir modeling, bank stabilization methods and other treatments were evaluated to determine the potential for reducing sediment loading into Alligator Creek.

9. Bank Stabilization and other Treatments

Based on comments received during the September 7, 2005 workshop, further analyses of sediment control options were evaluated and are presented below.

9.1 Slope Reduction

Recommended side slopes for open channels are based on the depth of the channel, expected stream flow velocities, and soil type. For sandy soils, the recommended side slope for shallow channels (i.e., up to 4 feet deep) is not steeper than 2:1. Recommended side slopes for deep channels (i.e., over 4 feet deep), are 4:1 or shallower (Etchevery, 1931). Most of the channels in the Project Study Area are considered deep channels. Slope reduction typically requires the excavation of soils. For a reach of stream with banks five feet high, approximately one cubic yard of soil removal is required for each liner foot of streambank treatment. Slope reduction is limited, however, by available right-of-way. For systems in the Project Study Area, slope reductions were not proposed in locations that would require additional right-of-way outside of the existing berm widths. It also is important to note that reduction of slopes may result in the reduction of berm widths for maintenance vehicles.

9.2 Bottom Widening

Bottom or "channel" widening provides additional cross-sectional area to an existing stream flow path. This additional cross-sectional area reduces stream flow velocities, which in turn reduces the erodibility of the system. Bottom widening may also require additional land outside the existing channel and is recommended only for sites with existing rights-of-way. Similar to slope reduction, bottom widening may result in the reduction of berm width for maintenance vehicles. In some areas, bottom widening could provide opportunities for sediment sinks as a result of the velocity reduction. These areas would be especially beneficial if existing access were available for the removal of the trapped sediments. For an average stream reach with banks five feet high, approximately 95 cubic yards of material would need to be removed for each 100 linear feet of channel.

9.3 Stream Realignment

Stream realignment requires the removal of fill material to the level of the seasonal high groundwater. This treatment is an option only where the available right-of-way is wide enough. The benefits of stream realignment include restoration of a more natural shape to a previously straightened stream reach, reduction of channel velocities, and increased biological filtration and sediment removal in areas where wetland plants are installed.

9.4 Bank Stabilization

The potential bank stabilization techniques applicable to systems in the Project Study Area include erosion control blankets, gabions, and other stabilization measures. Erosion control blankets are geotextile fabric made of either natural or man-made material and are used to provide temporary soil stabilization and cover for root germination. Erosion control blankets are manufactured in many forms. Blankets commonly used for stream restoration are made from coir (coconut) fiber or straw mat. The advantage of coir fiber over straw mat is that it is longer lasting (approximately 2 years), yet biodegradable. Similar blankets are also made out of wood fiber (curlex); however, some of the wood fiber products are not fully biodegradable because they utilize a nylon mesh to hold the fibers in place. This nylon mesh presents a hazard to wildlife and is therefore not recommended. Gabions are flexible woven-wire or plastic baskets composed of two to six rectangular cells filled with stone. They can be used on steep banks or where flow or bed conditions are such that riprap will not suffice. Disturbance of areas where gabions are to be placed should be undertaken only when final preparation and placement of the gabions can immediately follow the initial disturbance. In addition to erosion control blankets and gabions, there are several types of geotextiles that can be utilized for bank stabilization.

9.5 Nuisance & Exotic Species Removal

Although a variety of nuisance and exotic species occur in the Project Study Area, recommendations for this project are primarily directed at site-specific removal of Brazilian pepper and *Hydrilla* from along streambanks and within channels, respectively. Because these species (and potential others) are quick-growing, they tend to produce large amounts of vegetation which can restrict or divert flow and create upstream flooding conditions. Brazilian pepper, which generally out-competes all other plants along the streambank, grows until it becomes a large shrub or tree, leaving the understory void of vegetation. This void can result in erosion and sediment loading to downstream systems. Removal of Brazilian pepper (followed by revegetation with desirable species) can assist in stabilizing eroding banks and minimizing detrital loading into a system.

Removal of Brazilian pepper can occur via three methods: herbicide application; cutting of the plant and herbicide application; or excavation of the entire plant. Herbicide application is a long-term program, but has the lowest immediate costs. An advantage to this approach is that while the plant dies, it continues to stabilize the bank. This method requires follow-up removal of the dead biomass and eventual revegetation with desirable species. The second method involves cutting the plant and applying herbicide to the stump. This is a labor intensive method because most of the plant's biomass is water. Also, because the seed source in the soil is not removed, follow-up herbicide application is required for the stump and any new sprouts that develop. Revegetation with desirable species also is necessary within one month of cutting. Complete excavation of the Brazilian pepper is the most effective removal method because the root mass, seed source, and allelopathic substrate are all removed. When Brazilian pepper is removed in locations of wetland restoration, the ground surface elevation is lowered, thus eliminating the opportunity for future growth. Additional bank stabilization methods including revegetation with desirable species also would be required.

Removal of other nuisance and invasive species such as *Hydrilla*, *Commelina, Ludwigia,* and *Typha* require less intensive efforts and have the same effect of providing establishment opportunities for desirable vegetation. Revegetation with desirable species is generally necessary, however, to prevent sediment loss from exposed soils into adjacent channels and downstream systems. Regular maintenance (e.g., mowing and manual removal of aquatic species) also is necessary to prevent detrital matter from clogging drainage structures.

9.6 Bank Revegetation

Bank revegetation, both alone and in combination with other bank stabilization techniques, can serve as a reliable sediment control option. Plants provide erosion protection to stream banks by absorbing stream flow energy and reducing velocity, binding soil in place with a root mat, and covering the soil surface when high flows would otherwise wash it away. In addition to reducing side slope erosion, vegetation also provides habitat for fish and wildlife, is aesthetically pleasing, costs less than other treatments, and often requires only minimal maintenance. Bank revegetation is most successful when the selected vegetative cover consists of natural plant communities that are native to the site or region. Once native regionally occurring species are selected, they must be placed in the appropriate hydrogeomorphological zone to ensure proper establishment. Plants placed in the *hydric* zone must be able to tolerate permanently flooded conditions and should generally be slow growing to minimize detrital export. Examples of plants suited for placement in the hydric zone include: herbaceous species such as bulrush (*Scirpus* spp.), pickerelweed (*Pontederia cordata*), or bulltongue arrowhead (*Sagittaria lancifolia*); shrubby species such as buttonbush (*Cephalanthus occidentalis*); and tree species such as cypress (*Taxodium* spp.) or pop ash (*Fraxinus caroliniana).* Examples of vegetation best suited to protect the *mesic* zone, which tends to flood for only half the year, include: herbaceous species such as rushes (*Juncus* spp.) or sand cordgrass (*Spartina bakeri*); shrubby species such as Virginia willow (*Itea virginica*) or dahoon holly (*Ilex cassine*); and tree species such as sweet gum (*Liquidambar styraciflua*) or red maple (*Acer rubrum*). Plants placed in the *xeric* zone need to tolerate flooding only during periods of average high water. Specific examples of xeric vegetative cover include: herbaceous species such as bahiagrass (*Paspalum notatum*) or fakahatcheegrass (*Tripsacum dactyloides)*; shrubby species such as wax myrtle (*Myrica cerifera*) or gallberry (*Ilex glabra*); and tree species such as laurel oak (*Quercus laurifolia*). Depending upon the type of system to be stabilized, not all vegetative strata (i.e., herbaceous, shrub, and tree) need to be represented in the revegetation plan. In general, herbaceous species are appropriate for planting in all systems, while shrub and tree species are generally reserved for natural systems requiring light or temperature control or to meet objectives beyond sediment control.

9.7 System Monitoring & Maintenance

Regularly scheduled system monitoring and maintenance to ensure successful bank stabilization and minimize nuisance and exotic species establishment is the final recommended sediment control treatment option. While the maintenance required for each segment is variable and depends upon the treatment(s) which precede it (e.g., bank stabilization type, vegetative species planted, etc.), segments within all systems will require some kind of maintenance to ensure the effectiveness of preceding treatment(s). Whether or not additional treatment(s) are implemented, however, standard maintenance tasks are suggested, including: mowing of native vegetation, removal of nuisance and exotic vegetation, collection of trash and debris (especially at outfalls), etc.. Banks stabilized through installation of materials such as erosion control matting or gabion baskets should be inspected on a quarterly basis to assure the treatment is effective or some unanticipated effect has not occurred. In addition to the primary objective of sediment load reduction—both within the system and to downstream receptors—regularly scheduled maintenance will improve the aesthetic quality of a system (i.e., for nearby residents or visitors) and will improve hydrologic flow and storage which may limit or prevent flooding during future storm events.

10. Recommended Bank Stabilization Treatments

As documented in Section 3, most of the systems investigated in this assessment are linear, channelized tributaries with steep sandy banks and variable vegetative cover. Banks along many segments within these systems showed signs of moderate to severe erosion, due largely to the steepness of the slopes (4:1 or greater in most cases) and non-cohesive, sandy soils. While the initial purpose of this assessment focused on identifying locations for sediment control weirs, early field investigations and hydraulic modeling suggested a more preventative approach to sediment control than weir placement. The following subsections discuss segment-specific combinations of conceptual-level bank treatments for the reduction and management of sediment export to Alligator Creek. Because of the similarity of bank characteristics within a given segment (i.e., similar slope, soil composition, etc.), suggested treatments are intended to apply to the entire length of both banks, unless otherwise indicated. Site-specific confirmation of the applicable area for treatment will be determined during the preliminary design phase. Segment-specific cross-sectional diagrams for Systems 1 through 6 are presented in Figures 6 through 11, respectively.

10.1 System 1

Banks along this highly eroded feature are characterized by severely sloughing slopes, sediment deposition—both within the system and into Alligator Creek—and overgrowth by nuisance and exotic vegetation (most notably in the 1st [downstream] segment). Recommended sediment control improvements to the 1st segment include:

- reduction of slopes from 2:1 to 4:1,
- bottom widening along the eastern bank,
- nuisance and exotic species removal (where species remain following slope reduction and bottom widening),
- bank stabilization via erosion control blankets,
- revegetation of banks with desirable herbaceous species, and
- regularly scheduled maintenance.

Due to the narrow right-of-ways on either side of the 2nd segment, neither reduction of bank slopes nor bottom widening are feasible. Recommended sediment control improvements to the 2nd (upstream) segment are therefore limited to:

- nuisance and exotic species removal,
- bank stabilization (e.g., erosion control blankets where slopes are 4:1;gabions where slopes are 2:1),
- revegetation with desirable herbaceous species, and
- regularly scheduled maintenance.

10.2 System 2

This three-segment feature is characterized by relatively shallow banks with minimal signs of erosion. Although segments in this system appear to contribute less sediment into Alligator Creek than other systems, ditch bank improvements would protect exposed soils and maintain good drainage characteristics in the system. Recommended sediment control improvements to the 1st (downstream) segment include:

- nuisance and exotic species removal (primarily Brazilian pepper excavation),
- streambank realignment,

- revegetation with native herbaceous, shrub, and tree species, and
- regularly scheduled maintenance.

The recommendations provided above would not only limit sediment loading by protecting exposed soils along the banks, but also would improve storage and flow and restore the natural floral community, which may present an opportunity for future mitigation credits. Wetland plants could be installed within the areas of excavation and would provide a mechanism for sediment trapping. A naturally-shaped channel would be created within the excavated area to provide a stream path during the dry season. Mitigation credit could be obtained for the additional wetland acreage created.

Recommended improvements for the 2nd segment would further improve storage and flow and include:

- bottom widening along the eastern bank,
- nuisance and exotic species removal,
- bank stabilization via erosion control blankets,
- revegetation of banks with native herbaceous and shrub species, and
- regularly scheduled maintenance.

Because the 2nd segment is a County mitigation area, proposed improvements would need to be coordinated with mitigation management personnel to ensure conformance to any County or mitigation specific requirements.

No sediment control treatments are recommended for the 3rd segment other than regularly scheduled maintenance.

10.3 System 3

This single-segment, highly eroded system is characterized by sloughing slopes and pronounced sediment deposition—both along the ditch bottom and into Alligator Creek. Recommended sediment control improvements include:

- ditch bottom widening along the western bank,
- reduction of slopes from 2:1 to 4:1,
- bank stabilization via erosion control blankets,
- revegetation of banks with desirable herbaceous species, and
- regularly scheduled maintenance.

10.4 System 4

Erosion along this three-segment feature is minimal at the downstream end near the County water treatment plant, high at the upstream end near South Tamiami Trail, and moderate in between these segments. Right-of-way is available between the eastern bank of the 1st (downstream) segment and the western boundary of the County Water Treatment Plant. As such, recommended sediment control improvements to the 1st segment include:

- bottom widening along the eastern bank,
- reduction of slopes from 2:1 to 4:1,
- bank stabilization via erosion control blankets,
- revegetation of banks with herbaceous species, and
- regularly scheduled maintenance.

The 2nd (interior) and 3rd (upstream) segments would both benefit from slope reduction and/or bottom widening, but lack of right-of-way renders these sediment control techniques infeasible. Therefore, recommended sediment control improvements to the 2nd and 3rd segments include:

- bank stabilization via erosion control blankets,
- revegetation with native herbaceous species, and
- regularly scheduled maintenance.

10.5 System 5

This two-segment, highly eroded feature is characterized by severe sloughing along the western banks of both segments and considerable sediment deposition along the channel bottom. Little right-of-way exists outside of the 1st (downstream) segment, so improvements are limited to following:

- bank stabilization via gabions
- revegetation of banks with desirable herbaceous species, and
- regularly scheduled maintenance.

Sloughing of slopes along the 2nd (upstream) segment is the result of direct stormwater runoff from Siesta Drive. Because this segment occurs narrowly within a residential area to the east and Siesta Drive to the west, bottom widening or slope reduction is not possible. Consequently, recommendations for this segment include:

- construction of a curb along Siesta Drive to divert stormwater runoff away from the system,
- bank stabilization via gabions,
- revegetation of banks with desirable herbaceous species, and
- regularly scheduled maintenance.

10.6 System 6, Alligator Creek

Erosion in this three-segment channelized system is severe in the 1st (downstream) segment, moderate in the 2nd segment, and minimal in the 3rd (upstream) segment. The southern banks of this altered system are characterized by steep, sandy slopes and variable herbaceous cover. Erosion along the southern banks includes: intermittent sloughing, undercutting from high velocity waters at intersections with other systems, and collapse of bank tops from surface water overflows into the Creek. Recommended improvements to the southern banks of all segments include:

- reduction of slopes from 2:1 to 4:1,
- bank stabilization via erosion control blankets,
- revegetation of banks with desirable herbaceous, and
- regularly scheduled maintenance.

In contrast, the northern banks are lined with variable herbaceous, shrub, and tree cover (often nuisance and exotic species) and are consequentially less eroded. In the 1st segment, proliferation of Brazilian pepper has reduced water velocity, allowing sediments to settle in this area, and has narrowed the navigability of the Creek. Recommended improvements to this segment include:

- Brazilian pepper removal by herbicide application,
- mangrove restoration,
- culvert installation at the point where surface water from the wetland to the south of the Creek has breached its bank and eroded the top of the Creek, and

- regularly scheduled maintenance.

Recommended sediment control improvements to select areas along the northern banks of the 2nd and 3rd segments include:

- bank stabilization via erosion control blankets,
- revegetation of banks with herbaceous species, and
- regularly scheduled maintenance.

The suite of improvements recommended for Alligator Creek, combined with those presented for the other five systems, would reduce sediment loading in the Project Study Area by: eliminating sloughing caused by the steep banks and sandy composition; reducing undercutting of Creek banks caused by high velocity flows at discharge points, and preventing erosive surface flow over the top of the system banks. The recommended treatments could also result in aesthetic and wildlife habitat improvements, and may also present opportunities for future mitigation credits.

11. Prioritization of Drainage Segments for Treatment

As detailed in previous sections, the degree of erosion from drainage systems into Alligator Creek, and from the Creek itself, was variable. For systems in the Project Study Area, erosion tended to be greatest in segments with the steepest slopes. It was assumed that for the purpose of prioritizing segments for treatment, those segments contributing the most sediment into the Creek were those with the severest erosion, longest length, and greatest proximity to the mouth of the Creek (i.e., Project Study Area terminus). A simple mathematical approach to quantify these factors was developed and is defined next.

$$I_{\text{Segment}} = (I_{\text{Erosivity}} + I_{\text{Proximity}} + I_{\text{Length (inverse)}}) / 3$$

where: I = standardized index score for each prioritization criteria (Severity, Proximity, and Length)

The methodology required each segment to be ranked in decreasing order of erosivity, length (inverse), and proximity. For the erosivity ranking, segments with banks determined to have severe, moderate, or minimal erosion were assigned a score of 1, 2, or 3 respectively. For the length ranking, the segment with the greatest length (as calculated via GIS) was ranked first, while the segment with the least length was ranked last (i.e., inverse ranking). For the proximity ranking, segments closest to the mouth of Alligator Creek were ranked first, while those furthest from this point were ranked last. Tied values were allowed in the proximity ranking for segments with outfalls the same distance from the mouth of Alligator Creek. Index scores for each criteria were then calculated by standardizing the raw scores or rankings for each criteria to a zero-to-one scale (i.e., data rescaling) using the following formula (erosivity shown as an example):

$$I_{\text{Erosivity}} = \frac{(\text{Erosivity Value} - \text{Erosivity Minimum})}{(\text{Erosivity Maximum} - \text{Erosivity Minimum})}$$

The segment with the lowest average index (i.e., $I_{segment}$) was determined to be the highest prioritized segment for treatment(s). The individual rankings and indices, as well as the overall average index for each segment are presented in Table 7.

As indicated in Table 7, the highest prioritized segment was the upstream segment of System 5, which drains south alongside Siesta Drive in the western portion of the Project Study Area. This segment ranked first in both erosivity and length, and second in proximity to the mouth of the Creek. The second highest prioritized segment was the downstream segment of System 6 (Alligator Creek). This segment ranked first in erosivity and proximity, and third in length. The third highest prioritized segment was the upstream segment of System 1. This system also ranked first in erosivity, but ranked fifth in both proximity and length. Among the lowest ranked segments were the downstream segment of System 4, which drains north into Alligator Creek from just west of the County water treatment plant, and the downstream and interior segments of System 2, which drain north into Alligator Creek from Woodmere Park.

12. Sediment Load Reduction & Estimated Conceptual Level Costs

As described previously, sediment loading was estimated for each segment in the Project Study Area. Because most of the loading into the Creek appears to be the result of sloughing of the steep and exposed sandy banks, recommended bank stabilization treatments were proposed. If properly implemented and maintained, potential stream channel loading could be reduced by between 70 and 90%.

Conceptual level costs for treatments recommended in this Plan were estimated for each of the segments in the Project Study Area (Bruce Hasbrouck, Faller & Davis, Inc., 2006). These generalized costs were based on qualifying assumptions for a system having five foot high banks, a five foot wide channel bottom, adequate site access, and enough project size to derive some economy of scale. It is important to note, however, that these assumptions are general in nature, as segment height and width are variable. An itemization of the generalized costs for the recommended treatments (per linear foot and per segment) are provided in Appendix C. A summary of the potential sediment load reduction (presented as an 80% average of the estimated stream channel load) and total cost for each segment are presented in Table 8.

As indicated in Table 8, potential stream channel load reduction per segment varied from 1,000 to 144,000 pounds per year, while treatment costs varied from $4,000 to $1.47 million. In general, sites with the highest costs were the highest prioritized sites, and sites with lower costs were among the lower priority sites. As much as 903,000 pounds of sediment loading could be reduced per year if all of the recommended treatments were implemented and maintained for each segment. The total cost for implementation of all recommended treatments was estimated at $2.4 million.

13. Permit Compliance Issues

Potential impacts to the Project Study Area may occur from implementation of the treatments recommended in this plan. Specific impacts may include: upstream or downstream flooding, habitat displacement, temporary water quality degradation during construction, and disruption of freshwater inflow patterns to Lemon Bay. As a result, permitting for dredge and fill, stormwater, and erosion control will likely be required (personal communciation with Bruce Hasbrouck, 2006). The State's Environmental Resource Permit (ERP) process, delegated to the Southwest Florida Water Management District (District), includes both dredge and fill and stormwater management. Minor works, such as maintenance dredging and upland disposal of less than 50 cubic yards would be covered through General Permits. More involved works, such as altering the cross-sectional area of a waterway would require an Individual Permit. The individual permit application addresses potential impacts to wetlands and should demonstrate that the project will not cause tailwater impacts upstream or increased flooding downstream.

Since waterways in this project are connected to tidal waters, they would be considered Waters of the U.S. and would therefore require a dredge and fill permit from the US Army Corps of Engineers (USACE). It is anticipated that the UASCE permits would be issued under Section 10 of the Rivers and Harbors Act of 1899, as the project involves regulated waterways. However, the project should not require permitting through the US Coast Guard because there would be no construction of bridges or other works that would restrict access.

National Pollution Discharge Elimination System (NPDES) permitting would be required if the individual construction projects were to disturb more than one acre of soil. If a Notice of Intent (NOI) is submitted for an NPDES permit, the project would require a specific Stormwater Pollution Prevention Plan (SWPPP) to identify methods of erosion control during construction. The SWPPP is typically submitted to the District during the ERP application process to address the sediment and erosion control plan. Additional coordination with Sarasota County's Water and Navigation Control Authority is recommended during the design and permitting phase of the project.

14. Summary & Conclusions

Sarasota County identified the reach of Alligator Creek west of US 41 as having excess sediment deposition in the creek channel. The County may investigate the feasibility of dredging the Creek, but would like to first identify potential sources of sedimentation and potential methods of reducing the loading rate. A reduction of sediment loading into the Creek would decrease the frequency of maintenance dredging required to maintain navigability and good circulation in the channel. The original focus of this Sediment Management Plan was to determine the efficiency and feasibility of installing a series of sediment transport controls at strategic points upstream of US 41 to trap sediment prior to deposition in the lower creek reach. B&H engineers and ecologists conducted visual field investigations of each of the six creek system subwatersheds between May and November of 2005 to characterize existing structural and ecological conditions and to assess the degree of sediment exported from each system to Alligator Creek.

Conditions in the six systems were generally characterized by steep, sandy, often exposed, and sloughing banks; undercutting of the Creek banks from high velocity tributary discharge; deposition of sloughed or transported sediment along channel bottoms; erosive surface water flow over the Creek banks; and nuisance and exotic species proliferation. Based upon the considerable erosion identified along the banks of most of the systems during the initial investigations and the potential for upstream flooding that would likely result from weir placement, the project scope was revised to to investigate a wider variety of sediment load reduction alternatives. Alternatives investigated in this Plan included: slope reduction, bottom widening, stream realignment, bank stabilization techniques (e.g., erosion control blankets and gabions), nuisance and exotic species removal, revegetation, and regularly scheduled system monitoring and maintenance.

For comparison purposes, each system was characterized as having either minimal, moderate, or severe erosion along its banks. Because erosion was variable, however, most systems were subdivided into smaller segments. In total, 14 individual segments were evaluated for erosivity among the six systems. Seven of these segments were characterized as having severe erosion, two as having moderate erosion, and five as having minimal erosion. Sediment load reduction treatments were then evaluated and prioritized for each of the 14 segments.

Treatments for each segment were prioritized based on the severity of the erosion, the length of the segment, and the proximity of the segment discharge point to the mouth of Alligator Creek. Potential sediment load reduction following proper implementation of treatments was estimated at between 70 and 90%. Generalized costs also were estimated to assist the County in determining which stream channel segments potentially could be treated by the County Maintenance Department and which would need to be included in future County Capital Improvement Plans (CIPs). Potential stream channel load reduction per segment varied from 1,000 to 144,000 pounds per year, while estimated treatment costs varied from

$4,000 to $1.47 million. As much as 903,000 pounds of sediment loading could be reduced per year if all of the recommended treatments were implemented and maintained for each segment. The total conceptual level cost for implementation of all recommended treatments was estimated at $2.4 million. Because potential impacts to the Project Study Area may occur as a result of implementation of the recommended sediment load reduction treatments, permitting requirements are anticipated to include dredge and fill, stormwater, and erosion control.

In conclusion, sediment loading into Alligator Creek from the Creek itself and its tributaries could be reduced by between 70 and 90% by implementing the treatments recommended in this Plan and could also result in aesthetic and wildlife habitat improvements, as well as opportunities for future mitigation credits.

15. Figures

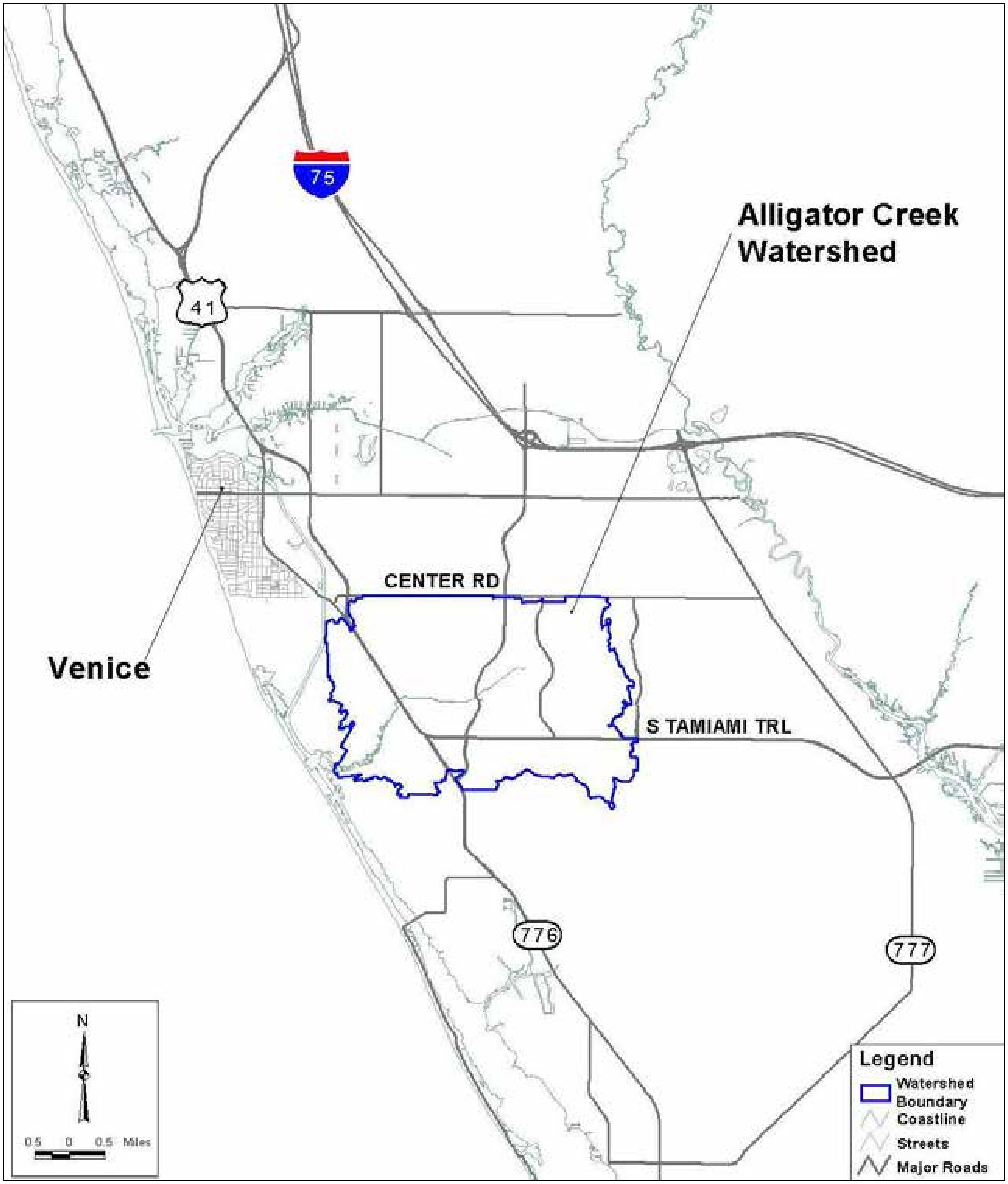


Figure 1. Project Location Map, Alligator Creek Watershed

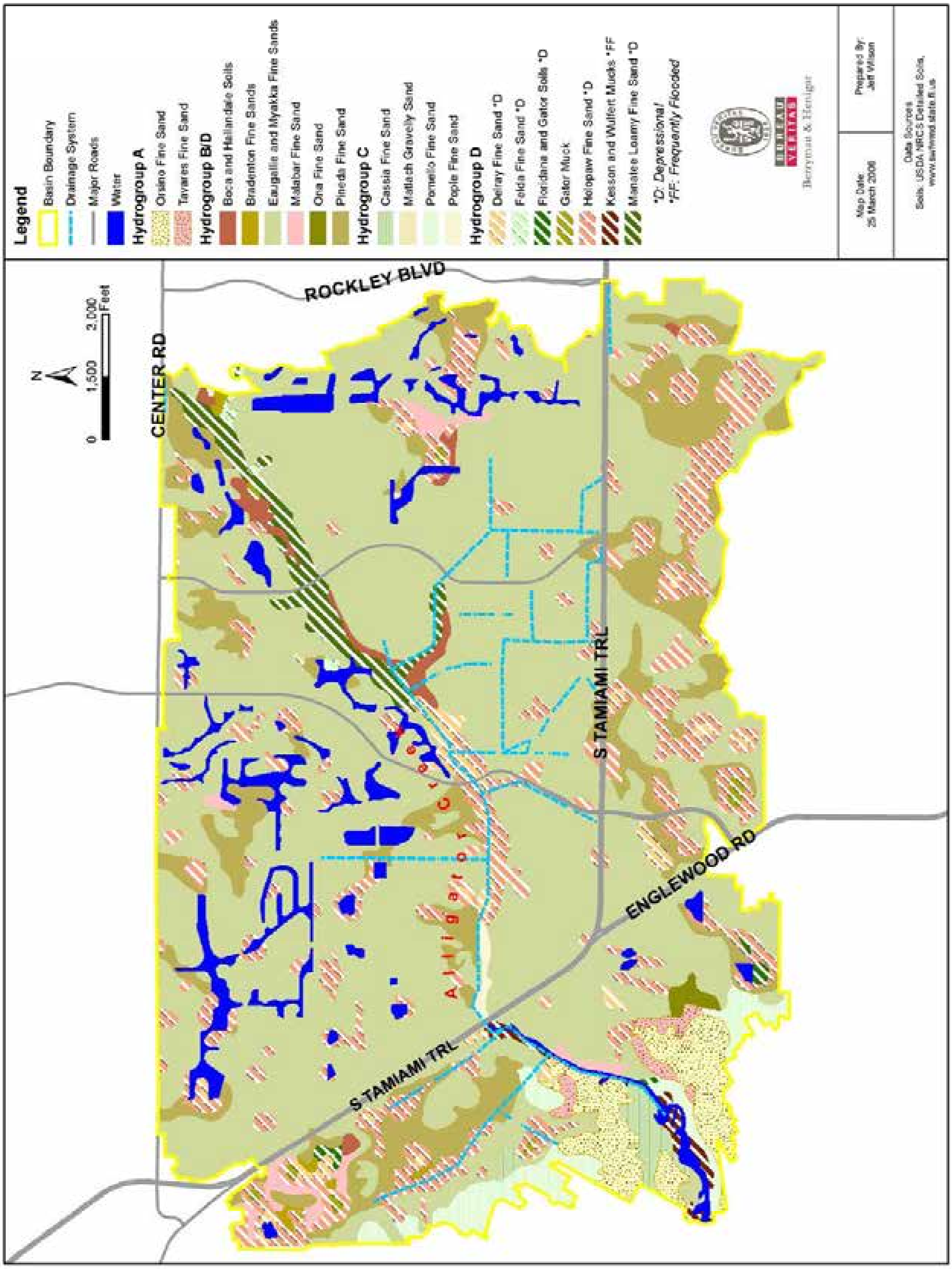


Figure 2. Soil Map, Alligator Creek Watershed

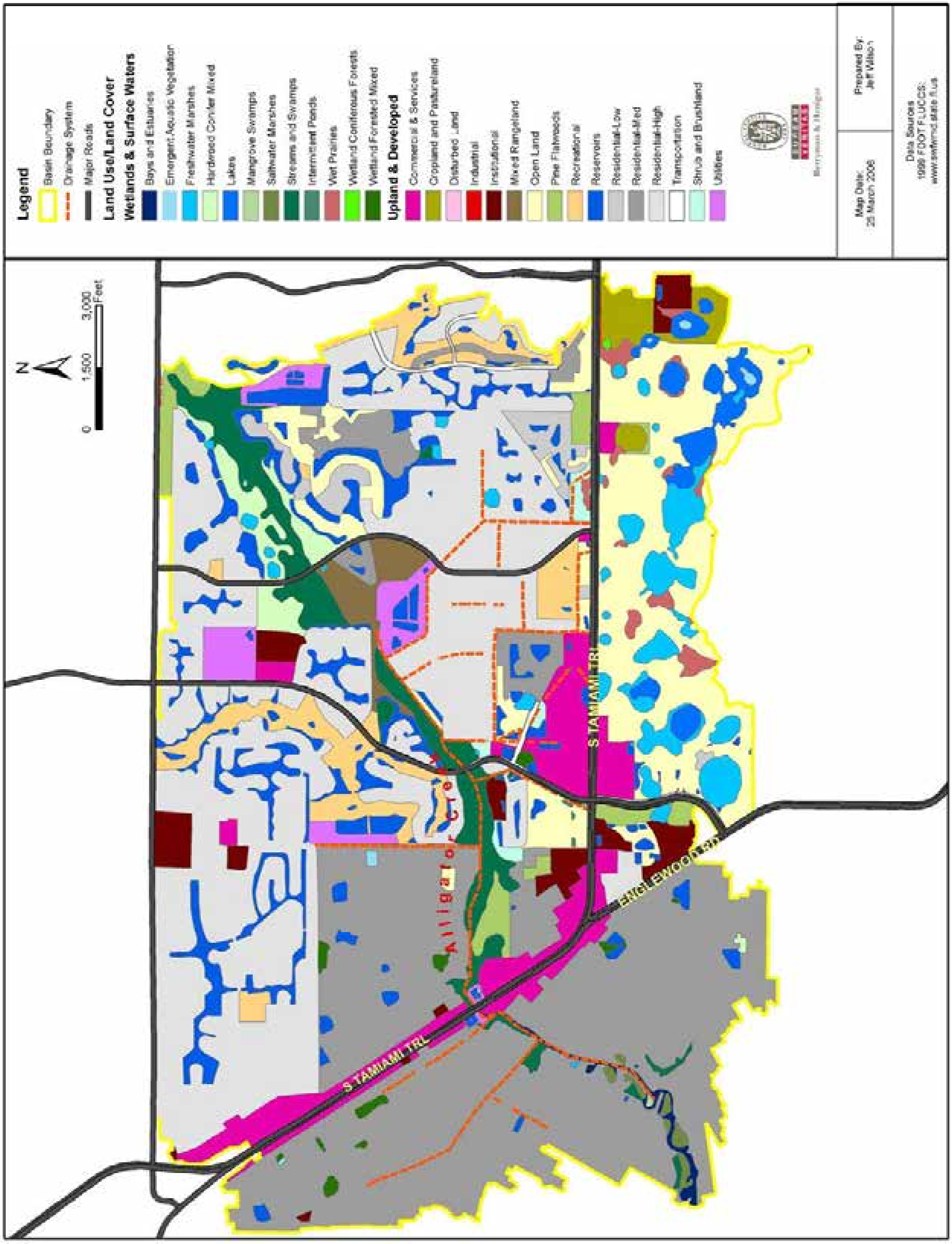


Figure 3. Land Use/Land Cover Map, Alligator Creek Watershed

Figure 4. Creek System Map, Alligator Creek Watershed

Figure 5. **Segment Erosion Map, Alligator Creek Watershed**

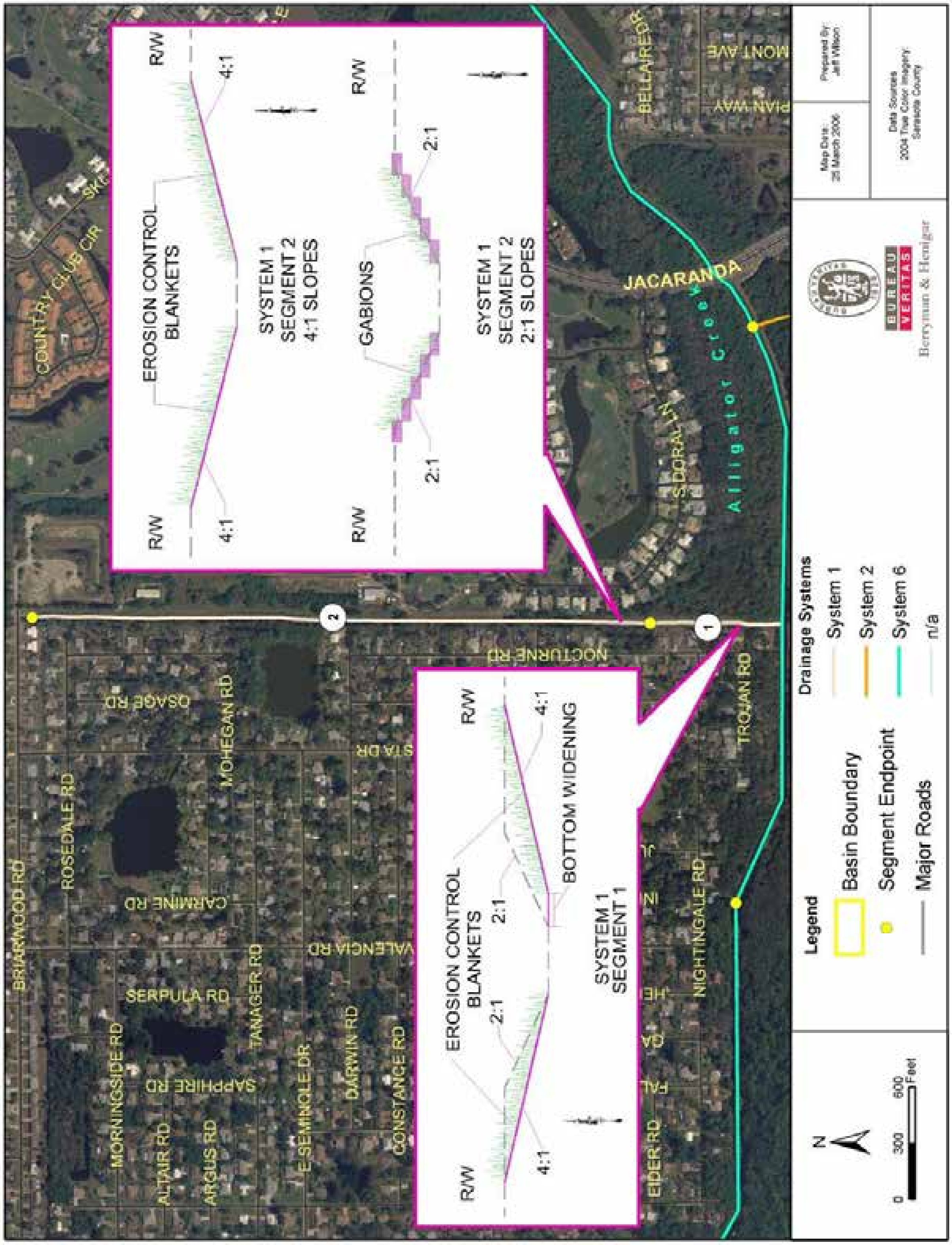


Figure 6. Treatment Recommendations – System 1

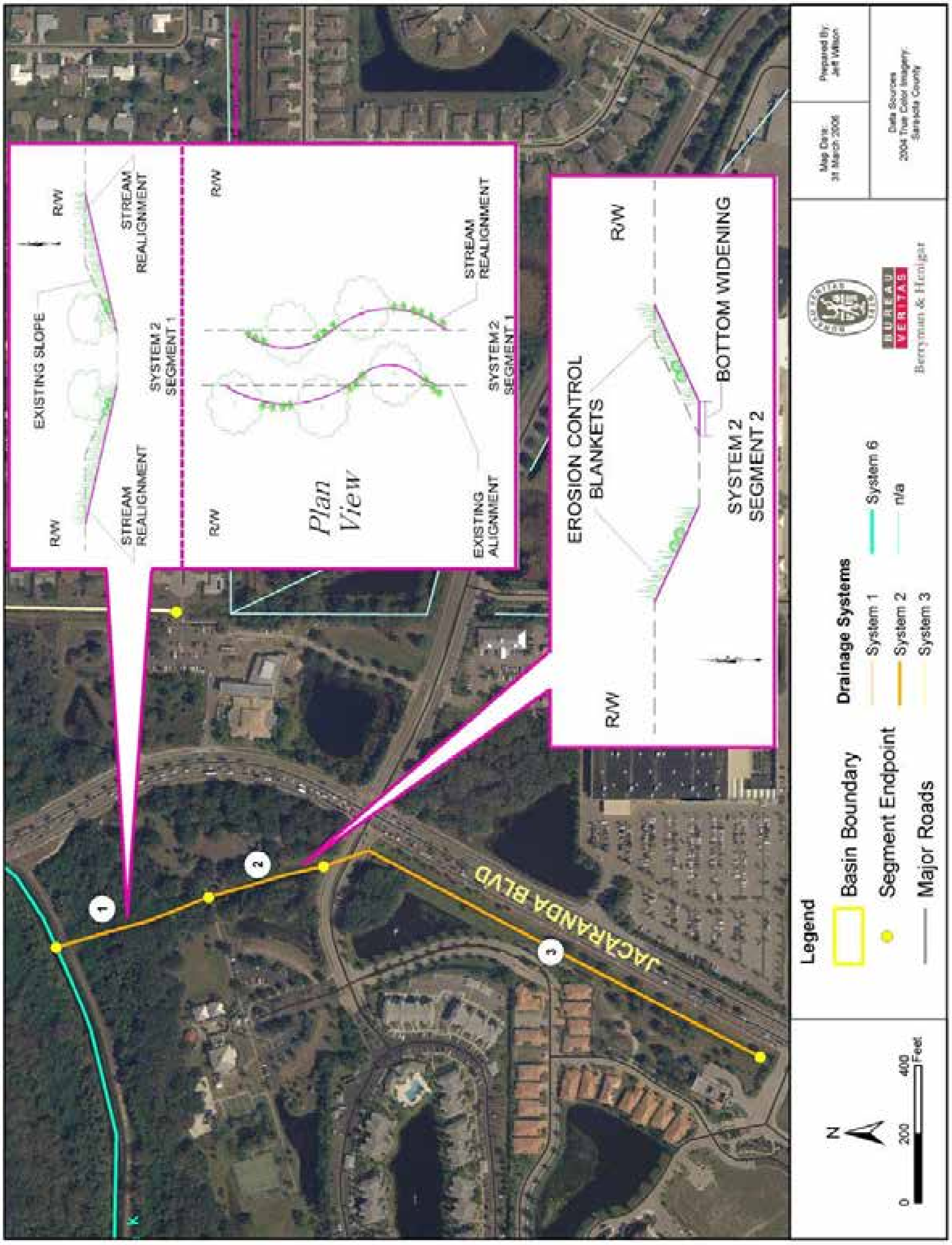


Figure 7. Treatment Recommendations – System 2

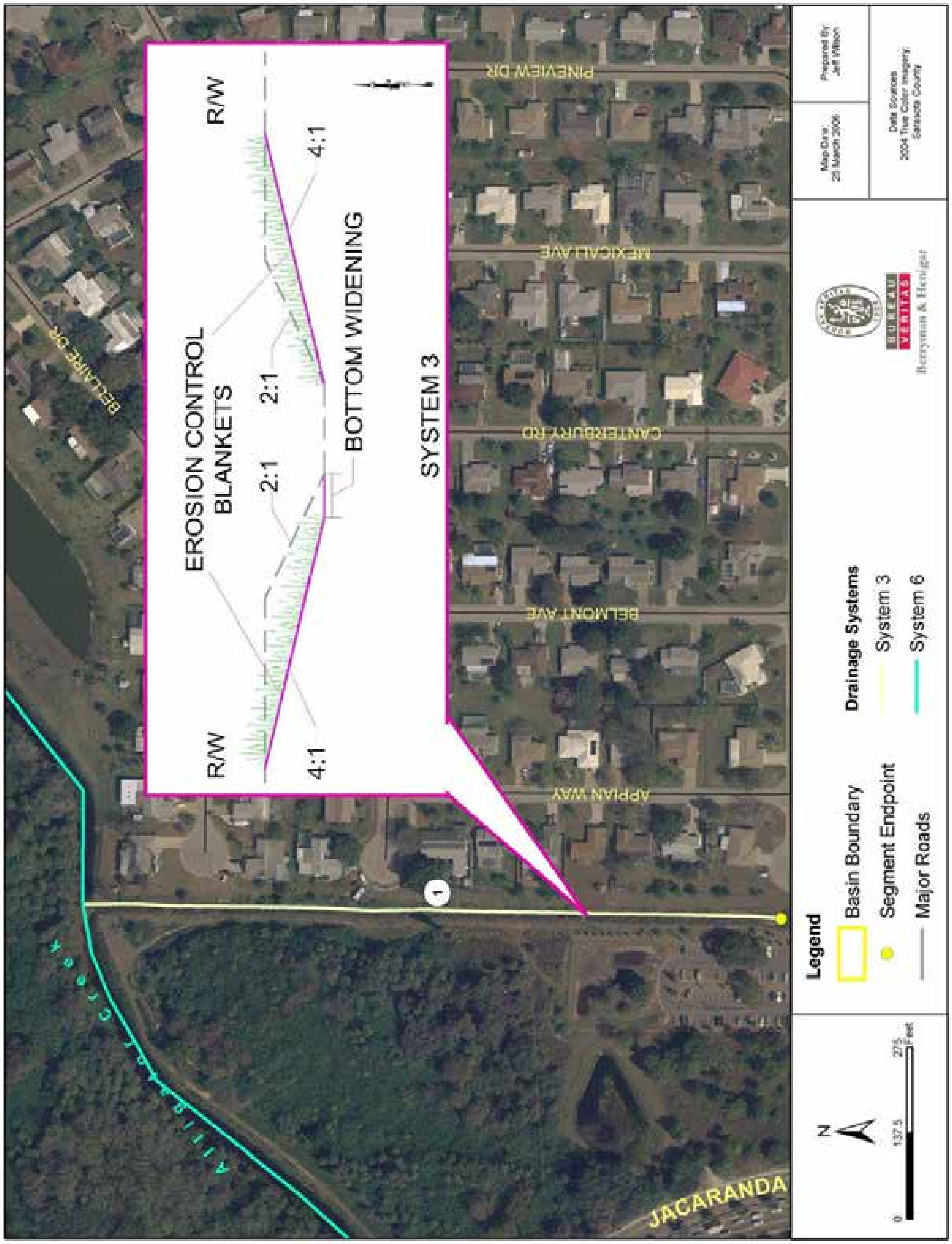


Figure 8. Treatment Recommendations – System 3

Figure 9. Treatment Recommendations – System 4

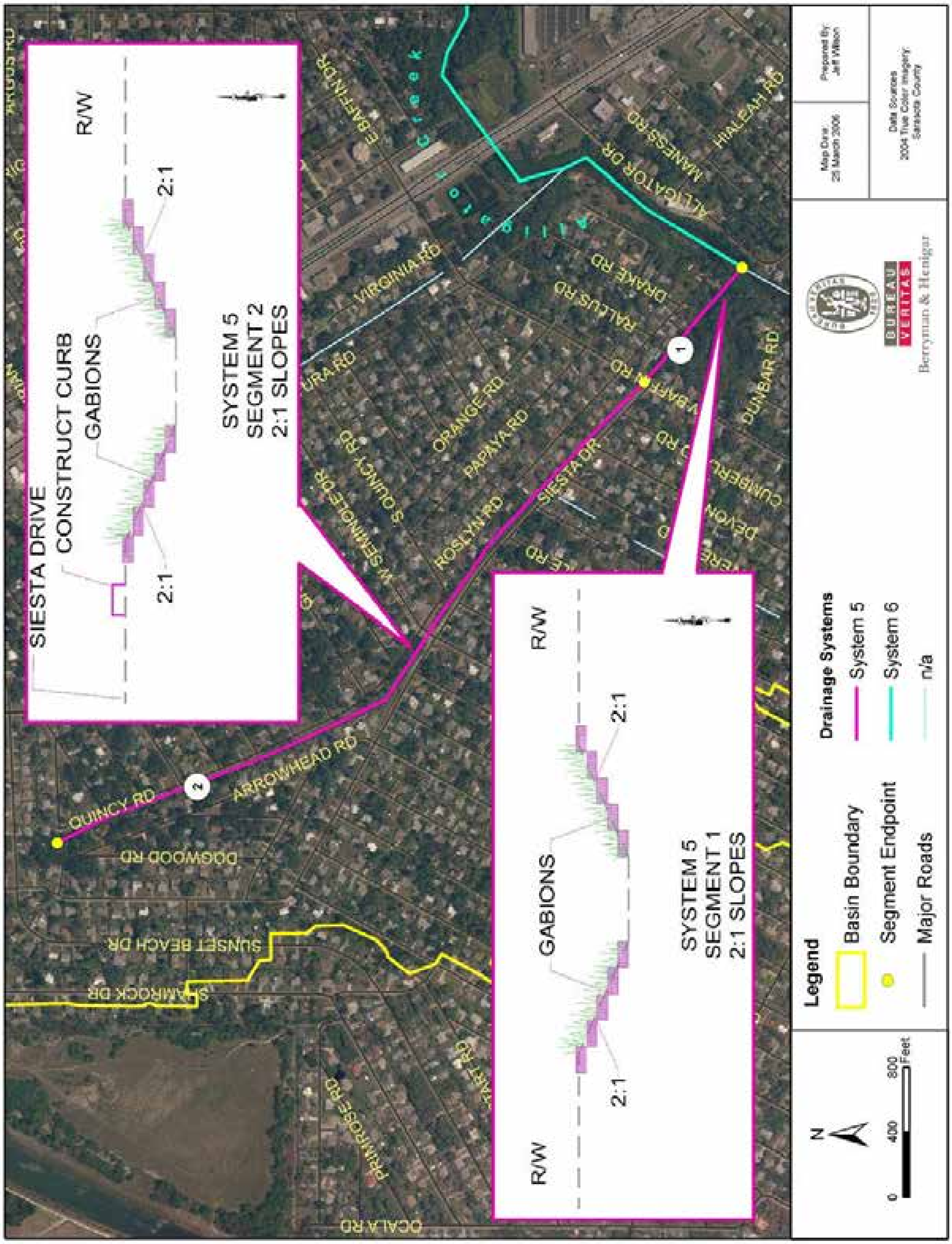


Figure 10. Treatment Recommendations – System 5

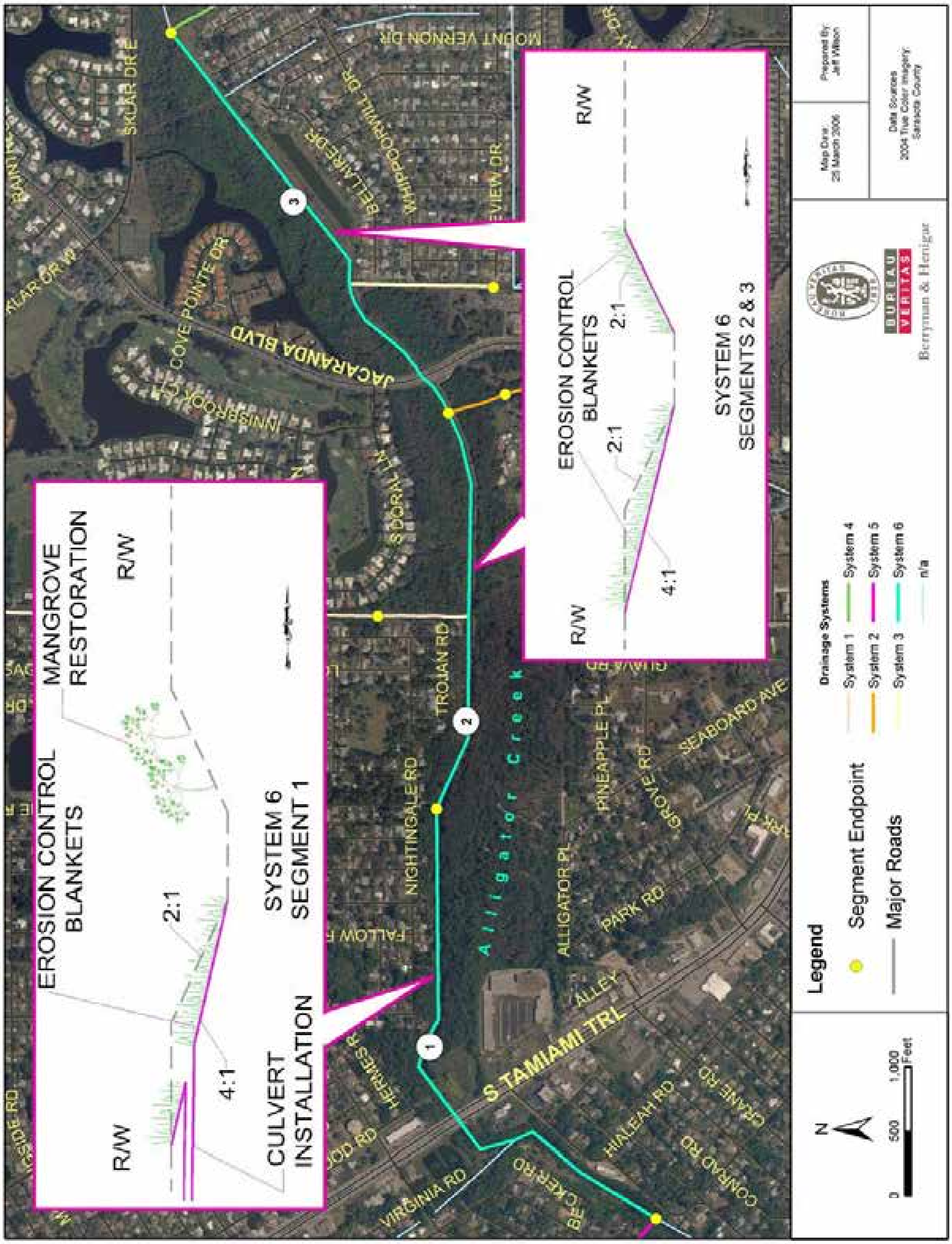


Figure 11. Treatment Recommendations – System 6, Alligator Creek

16. Tables

Table 1. Incidental Wildlife Occurrences

Type	Wildlife Species	Scientific Name	Wetland Dependent	Listing/Protection Status: USFWS	FFWCC	FNAI-state	FNAI-global
Birds	American crow	*Corvus brachyrhynchos*		--	--	--	--
	anhinga	*Anhinga anhinga*	yes	--	--	--	--
	blue jay	*Cyanocitta cristata*		--	--	--	--
	Carolina wren	*Thryothorus ludovicianus*		--	--	--	--
	common flicker	*Colaptes auratus*		--	--	--	--
	great blue heron	*Ardea herodias*	yes	--	--	--	--
	great egret	*Casmerodius albus*	yes	--	--	--	--
	little blue heron	*Egretta caerulea*	yes	--	SSC	--	DS
	northern cardinal	*Cardinalis cardinalis*		--	--	--	--
	red-shouldered hawk	*Buteo lineatus*		--	--	--	--
	snowy egret	*Egretta thula*	yes	--	SSC	R	DS
	swallow tailed kite	*Elanoides forficatus*		--	--	I	DS
	tricolored heron	*Egretta tricolor*	yes	--	SSC	AS	DS
	yellow-crowned night heron	*Nycticorax violaceus*	yes	--	--	--	--
Mollusks	apple snail	*Pomacea paludosus*	yes	--	--	--	--
Reptiles	American alligator	*Alligator mississippiensis*	yes	T	SSC	AS	DS

Status Codes

T - Threatened
E - Endangered
SSC - Species of special concern
-- - None
I - Imperiled, or six to 20 occurrences
R - Rare, restricted, or otherwise vulnerable to extinction
AS - Apparently secure
DS - Demonstrably secure

Table 2. Existing Conditions Model Results

System	Node	LBM_Apr04_update	LBM_Apr04_update with pipes	Alligator Creek Flood Protection Improvement Plan (2002)
		Peak Stage (ft)		
1	12240	8.8	8.8	8.6
2	12203	9.6	10.4	9.2
2	12205	9.7	10.4	9.4
3	12404	9.5	9.5	9.2
3	12405	9.6	9.6	9.3
4	12416	9.6	9.6	9.3
5	12102	8.4	8.4	8.4

Table 3. Existing-Proposed Model Results Comparison

			100 year - 24 hour event									
			Existing Conditions	Proposed Conditions								
				Existing Cross Sections with 1ft Weirs			Expanded Cross Sections with 1ft Weirs			Cross Sections with Treatments - No Weirs		
Existing Cross Sections	System	Node	Peak stage	Peak Stage	Top of Bank		Peak Stage	Top of Bank		Peak Stage	Top of Bank	
			(ft)	(ft)	L(ft)	R(ft)	(ft)	L(ft)	R(ft)	(ft)	L(ft)	R(ft)
ac briar	1	12240	8.8	14.2	12	13	14.2	12.1	13.1	9.1	12.1	13.1
ac low	*2	12203	10.4	*	12.7	9.8	*	12.7	11	9.6	12.7	11
ac low	*2	12205	10.4	*	11.3	9.5	*	11.3	11	9.7	11.3	11
ac mid	3	12404	9.5	11.8	10	8.6	11.8	10.1	11	9	10.1	11
ac mid	3	12405	9.6	11.9	12	11.4	11.8	12	11.4	9.3	12	11.4
ac mid	4	12416	9.6	13.1	10.5	9.7	13	11	11	9.6	11	11
ac snnw	5	12102	8.4	14.4	14	13.6	14.4	14.1	13.7	9	14.1	13.7

*Weirs were not evaluated on this system

Table 4. Overland Pollutant Loading Analysis

System	Acres	Land Use	Type of Treatment System	% TSS Reduction	TSS Loading Rate (kg/ac-yr)	TSS Loading kg/yr	TSS Loading lb/yr
1	177	Single Family Residential	None	--	56.1	9,938	4,517
	502	Multi Family Residential			256.0	128,595	58,452
	12	Recreational/Open Space			7.6	88	40
	78	Open water			8.1	629	286
	30	Commercial			343.0	10,120	4,600
	6	Wetland			11.2	67	30
	10	Highway			182.0	1,898	863
	815	**Total Basin Land Use**	**Wet Detention**	**75**	**--**	**37,833**	**17,197**
2	0	Single Family Residential	None	--	56.1	7	3
	3	Multi Family Residential			256.0	889	404
	85	Recreational/Open Space			7.6	644	293
	14	Open water			8.1	110	50
	14	Wetland			11.2	157	71
	35	Highway			182.0	6,296	2,862
	96	Commercial			343.0	32,766	14,894
	246	**Total Basin Land Use**	**Vegetated Swales**	**70**		**12,261**	**5,573**
3	3	Low Density Residential	None	--	31.9	94	43
	41	Single Family Residential			56.1	2,321	1,055
	17	Multi Family Residential			256.0	4,240	1,927
	63	Commercial			343.0	21,686	9,857
	214	Recreational/Open Space			7.6	1,630	741
	39	Open water			8.1	315	143
	96	Wetland			11.2	1,070	486
	18	Highway			182.0	3,264	1,484
	491	**Total Basin Land Use**	**Wet Detention**	**37**		**21,811**	**9,914**
4	39	Low Density Residential	None	--	31.9	1,247	567
	262	Multi Family Residential			256.0	67,004	30,457
	9	Commercial			343.0	2,979	1,354
	113	Recreational/Open Space			7.6	858	390
	10	Agricultural - Pasture			126.0	1,224	556
	15	Open water			8.1	123	56
	11	Wetland			11.2	124	56
	26	Highway			182.0	4,694	2,134
	484	**Total Basin Land Use**	**Wet Detention**	**37**		**49,299**	**22,409**
5	426	Single Family Residential	None	--	56.1	23,889	10,859
	10	Commercial			343.0	3,361	1,528
	4	Open water			8.1	36	16
	6	Wetland			11.2	66	30
	446	**Total Basin Land Use**	**None**	**--**		**27,353**	**12,433**
6	837	Low Density Residential	None	--	31.9	26,689	12,132
	28,023	Single Family Residential			56.1	1,572,073	714,579
	26,773	Multi Family Residential			256.0	6,853,761	3,115,346
	5,260	Commercial			343.0	1,804,091	820,041
	13,496	Recreational/Open Space			7.6	102,570	46,623
	3,649	Open water			8.1	29,377	13,353
	4,683	Wetland			11.2	52,453	23,842
	3,197	Highway			182.0	581,831	264,469
	85,917	**Total Basin Land Use**	**Wet Detention**	**37**		**6,944,392**	**3,156,542**
TOTALS						**7,092,950**	**3,224,068**

Table 5. Stream Channel Erosion

											Sediment Load			
Season	System	Segment	Area	Unit Runoff	Flow	a	b	LER	Channel Length	Bank Height	cu ft/mon	cu ft/yr	lb/yr	lb/ac/yr
			(acres)	(inches)	(cu ft/sec)			(ft/month)	(ft)					
wet	1	1	824	10	2.84	0.0027	0.4	3.23E-03	710	8	18	73	8,069	10
dry	1	1	824	3	0.85	0.0053	0.4	3.92E-03	710	8	22	178	19,572	24
annual											**251**	**1,717**	**27,641**	**229**
wet	1	2	815	10	2.81	0.0027	0.4	3.21E-03	3300	8	85	339	37,341	46
dry	1	2	815	3	0.84	0.0053	0.4	3.90E-03	3300	8	103	823	90,569	111
annual											**1,163**	**7,945**	**127,910**	**1,072**
wet	2	*1	258	10	0.89	0.0008	0.4	6.09E-04	470	5	1	6	629	2
dry	2	*1	258	3	0.27	0.0016	0.4	7.38E-04	470	5	2	14	1,527	6
annual											**20**	**134**	**2,156**	**57**
wet	2	*2	251	10	0.86	0.0008	0.4	6.02E-04	350	5	1	4	464	2
dry	2	*2	251	3	0.26	0.0016	0.4	7.30E-04	350	5	1	10	1,124	4
annual											**14**	**99**	**1,588**	**43**
wet	2	*3	247	10	0.85	0.0008	0.4	5.98E-04	1430	5	4	17	1,882	8
dry	2	*3	247	3	0.26	0.0016	0.4	7.25E-04	1430	5	5	41	4,565	18
annual											**59**	**400**	**6,447**	**178**
wet	3	1	491	10	1.69	0.0027	0.4	2.62E-03	1120	6	18	71	7,761	16
dry	3	1	491	3	0.51	0.0053	0.4	3.18E-03	1120	6	21	171	18,824	38
annual											**242**	**1,651**	**26,585**	**370**
wet	4	*1	494	10	1.70	0.0008	0.4	7.89E-04	1170	7	6	26	2,845	6
dry	4	*1	494	3	0.51	0.0016	0.4	9.57E-04	1170	7	8	63	6,899	14
annual											**89**	**605**	**9,744**	**135**
wet	4	*2	478	10	1.65	0.0016	0.4	1.56E-03	4570	7	50	199	21,931	46
dry	4	*2	478	3	0.49	0.0032	0.4	1.89E-03	4570	7	60	484	53,192	111
annual											**683**	**4,666**	**75,123**	**1,074**
wet	4	3	229	10	0.79	0.0027	0.4	1.93E-03	1350	7	18	73	8,044	35
dry	4	3	229	3	0.24	0.0053	0.4	2.35E-03	1350	7	22	177	19,511	85
annual											**251**	**1,711**	**27,555**	**822**
wet	5	1	469	10	1.62	0.0027	0.4	2.58E-03	920	10	24	95	10,432	22
dry	5	1	469	3	0.48	0.0053	0.4	3.13E-03	920	10	29	230	25,303	54
annual											**325**	**2,220**	**35,735**	**521**
wet	5	2	446	10	1.54	0.0027	0.4	2.53E-03	4740	10	120	479	52,679	118
dry	5	2	446	3	0.46	0.0053	0.4	3.06E-03	4740	10	145	1,162	127,769	286
annual											**1,640**	**11,208**	**180,447**	**2,764**
wet	6	1	3328	10	11.46	0.0027	0.4	5.64E-03	4500	10	254	1,016	111,740	34
dry	6	1	3328	3	3.44	0.0053	0.4	6.84E-03	4500	10	308	2,464	271,018	81
annual											**3,480**	**23,774**	**382,758**	**786**
wet	6	*2	2617	10	9.01	0.0016	0.4	3.08E-03	3150	10	97	388	42,629	16
dry	6	*2	2617	3	2.70	0.0032	0.4	3.73E-03	3150	10	117	940	103,394	40
annual											**1,327**	**9,070**	**146,023**	**381**
wet	6	*3	2452	10	8.44	0.0008	0.4	1.50E-03	3730	10	56	224	24,590	10
dry	6	*3	2452	3	2.53	0.0016	0.4	1.82E-03	3730	10	68	542	59,642	24
annual											**766**	**5,232**	**84,232**	**235**
										Total	**10,309**	**70,431**	**1,133,945**	**8,667**

***Note: Segments erosion potential factors were multiplied by 0.6 for moderate and 0.3 for low**

LER = aQexpb (Evans et al., 2003)

Sand weight = 110 lb/cu ft

LER = lateral erosion rate (meters/month)
Q = stream flow (cu meters/sec)
a = erosion potential factor = 0.008 annual (Dietrich et al. (1999). Monthly = 0.00067
Wet season = 0.0027 4 months
Dry Season = 0.0053 8 months
b = 0.4 = empirically derived factor (VanSickle and Breschta, 1983)

(FL Water Atlas, 1998)

Runoff	**inches**
annual	**13**
wet	**10**
dry	**3**

Table 6. Potential Sediment Load Modeling Results

System	Segment	Channel Length (ft)	Area (acres)	Cummulative (acres)	Proportional	Proportional Overland (lb/yr)	Channel (lb/yr)	Total (lb/yr)
1	1	710	8	824	1%	176	27,641	27,818
	2	3300	815	815	99%	17,021	127,910	144,931
2	1	470	6	258	2%	131	2,156	2,287
	2	350	5	251	2%	107	1,588	1,695
	3	1430	247	247	96%	5,335	6,447	11,782
3	1	1120	491	491	100%	9,914	26,585	36,499
4	1	1170	16	494	3%	747	9,744	10,491
	2	4570	249	478	50%	11,290	75,123	86,413
	3	1350	229	229	46%	10,371	27,555	37,926
5	1	920	23	469	5%	619	35,735	36,354
	2	4740	446	446	95%	11,814	180,447	192,261
6	1	4500	711	3328	21%	674,375	382,758	1,057,132
	2	3150	165	2617	5%	156,347	146,023	302,370
	3	3730	2452	2452	74%	2,325,820	84,232	2,410,052

Column groups: Area = Area, Cummulative, Proportional; Loads = Proportional Overland, Channel, Total.

Table 7. Drainage Segment Prioritization

			RANKINGS			INDICES			
Priority	System	Segment	Erosivity	Proximity	Length	Erosivity	Proximity	Length	Average
1	**System 5**	**2**	1	2	1	0.0	0.1	0.000	**0.030**
2	**System 6**	**1**	1	1	3	0.0	0.0	0.154	**0.051**
3	**System 1**	**2**	1	5	5	0.0	0.4	0.308	**0.224**
4	**System 5**	**1**	1	1	11	0.0	0.0	0.769	**0.256**
5	**System 6**	**2**	2	3	6	0.5	0.2	0.385	**0.355**
6	**System 1**	**1**	1	4	12	0.0	0.3	0.846	**0.373**
7	**System 3**	**1**	1	9	10	0.0	0.7	0.692	**0.473**
8	**System 4**	**2**	2	11	2	0.5	0.9	0.077	**0.495**
9	**System 4**	**3**	1	12	8	0.0	1.0	0.538	**0.513**
10	**System 6**	**3**	3	6	4	1.0	0.5	0.231	**0.562**
11	**System 2**	**3**	3	8	7	1.0	0.6	0.462	**0.699**
12	**System 2**	**1**	3	6	13	1.0	0.5	0.923	**0.793**
13	**System 4**	**1**	3	10	9	1.0	0.8	0.615	**0.811**
14	**System 2**	**2**	3	7	14	1.0	0.5	1.000	**0.848**

Notes:

Rankings

Erosivity = Low (3), Moderate (2), Severe (1)

Proximity = Rank order by from Project Study Area terminus (i.e., mouth of Alligator Creek)

Length = Inverse rank order of segment length

Indices

Erosivity = Erosivity rescaled to 0 to 1 by formula (value - min)/(max - min)

Proximity Index = Proximity rescaled to 0 to 1 by formulat (value - min)/(max - min)

Length Index = Length (inverse) rescaled to 0 to 1 by formula (value - min)/(max - min)

Average= Average of Erositivity, Proximity, and Length Indices -- lowest value equal to highest priority

Table 8. Estimated Sediment Load Reduction & Conceptual Costs

Prioritization	System	Segment	Potential Sediment Load Reduction (lb/yr)*	Estimated Conceptual Level Costs*
1	System 5	2	144,000	$ 1,470,000
2	System 6	1	306,000	$ 101,000
3	System 1	2	102,000	$ 276,000
4	System 5	1	29,000	$ 285,000
5	System 6	2	119,000	$ 62,000
6	System 1	1	22,000	$ 17,000
7	System 3	1	21,000	$ 26,000
8	System 4	2	60,000	$ 30,000
9	System 4	3	22,000	$ 9,000
10	System 6	3	67,000	$ 74,000
11	System 2	3	minimal	$ -
12	System 2	1	2,000	$ 38,000
13	System 4	1	8,000	$ 27,000
14	System 2	2	1,000	$ 4,000
Basinwide			**903,000**	**$ 2,420,000**

***Notes:**

Sediment Load Reduction

Based on 80% removal of estimated stream channel erosion load.

Generalized Costs

Based on qualifying assumptions (e.g., 5 ft high banks, 5 ft wide channel bottom, decent access, and enough project size to have some economy of scale).

Site-Specific Costs

System 1 -2 - erosion control blankets estimated for 75% of segment; gabions estimated for 25% of length.
System 2 -1 - revegetation estimate for 150% of stream because stream realignment will increase stream channel's original length.
System 3 - 1 - no treatments recommended other than regularly maintenance .
System 5 -2 - estimated costs do not include curb construction along Siesta Drive.
System 6 -1 - Brazilian pepper removal estimated for 50% of the segment length.
System 6 -1 - estimated costs do not include mangrove restoration or culvert installation.

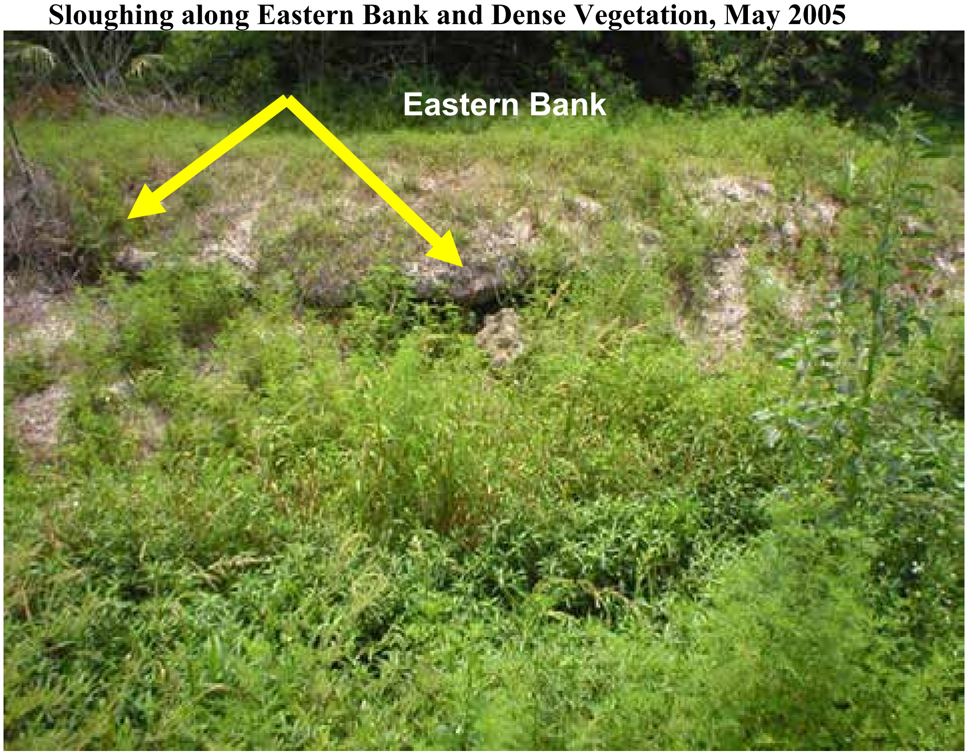
17. Photo-documentation

<u>Photo 1 - System 1 - Segment 2</u>

Sloughing along Western Bank and Sediment Deposition, November 2005

<u>Photo 2 - System 1 - Segment 1</u>

Sloughing along Eastern Bank and Dense Vegetation, May 2005



Yellow Arrows = sloughing. Aqua Arrows = sediment deposition

Photo 3 - System 1 - Segment 1 at System 6 (Alligator Creek)
Sediment Deposition into Alligator Creek, November 2005

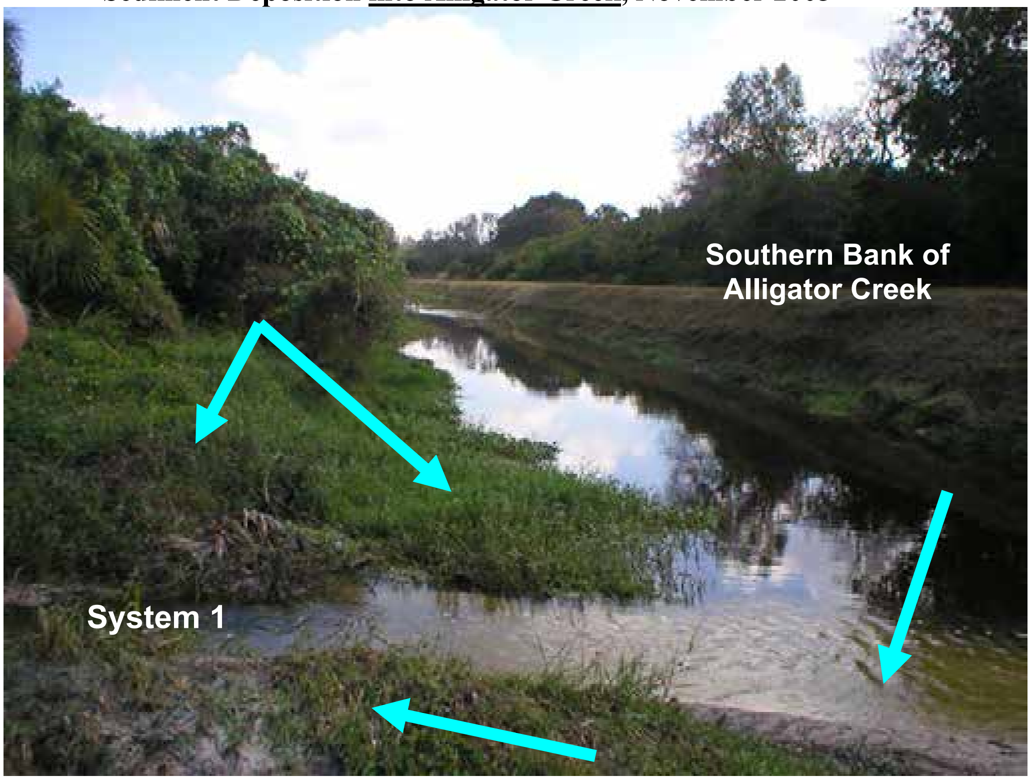
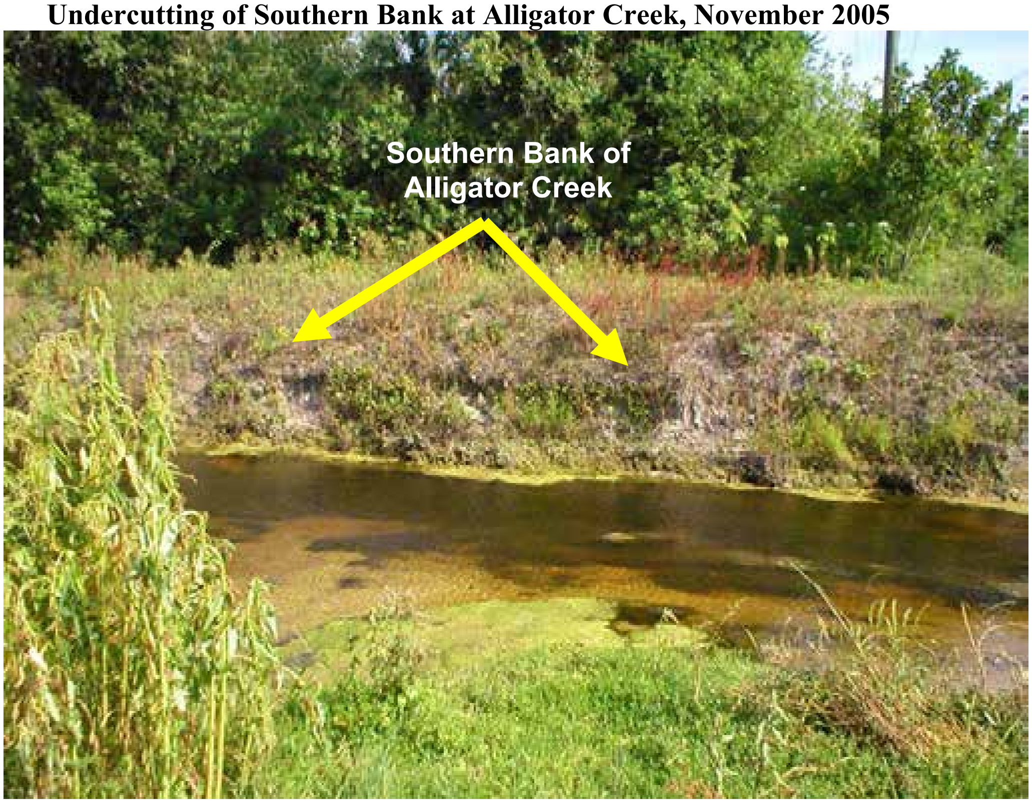


Photo 4 - System 1 - Segment 1
Undercutting of Southern Bank at Alligator Creek, November 2005



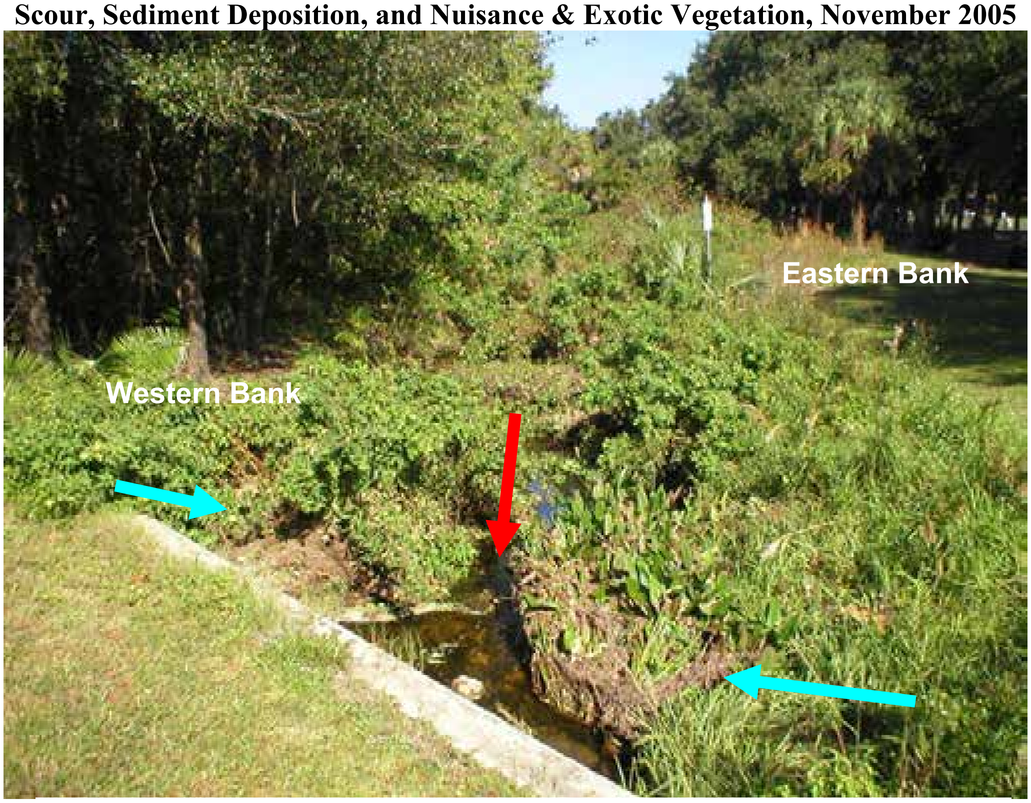
Yellow Arrows = undercutting. Aqua Arrows = sediment deposition

<u>Photo 5 - System 2 - Segment 3</u>
Aquatic Vegetation , May 2005

<u>Photo 6 - System 2 - Segment 3</u>
Culvert at Woodmere Boulevard, November 2005

Photo 7 - System 2 - Segment 2
Nuisance & Exotic Vegetation, May 2005

Photo 8 - System 2 - Segment 2
Scour, Sediment Deposition, and Nuisance & Exotic Vegetation, November 2005



Red Arrow = scour.   Aqua Arrows = sediment deposition

<u>Photo 9 - System 2 - Segment 1</u>
Brazilian Pepper and Exposed Soils along Stream Banks, May 2005

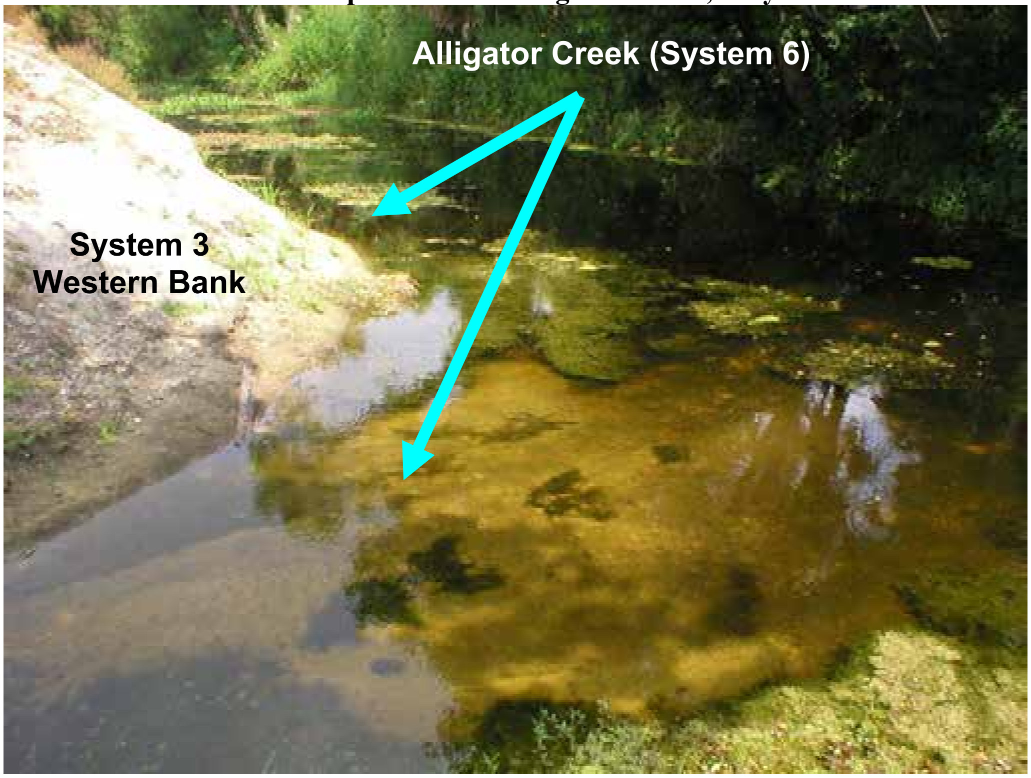
<u>Photo 10 - System 2 - Segment 1</u>
Brazilian Pepper and Eroded Soils along Stream Banks , November 2005

Photo 11 - System 3
Severe Sloughing along Western Bank, October 2005

Photo 12 - System 3
Erosion along Eastern and Western Banks, May 2005

Yellow Arrows = sloughing. Aqua Arrows = sediment deposition

<u>Photo 13 - System 3</u>
Sediment Deposition into Alligator Creek, May 2005



<u>Photo 14 - System 3</u>
Sediment Deposition into Alligator Creek, November 2005

Aqua Arrows = sediment deposition

<u>Photo 15 - System 4 - Segment 3</u>
High Erosivity along Eastern and Western Banks, April 2005

<u>Photo 16 - System 4 – Unevaluated Reach East of Segment 2</u>
Highly Eroded Banks with Variable Vegetative Cover, April 2005

Yellow Arrows = high erosivity. Green Arrows – stabilization materials

<u>Photo 17 - System 4 - Segment 1</u>
Steep, grassy slopes and slightly nutrient-rich aquatic environment, May 2005

<u>Photo 18 - System 4 - Segment 1</u>
Steep, grassy slopes and slightly nutrient-rich aquatic environment, May 2005

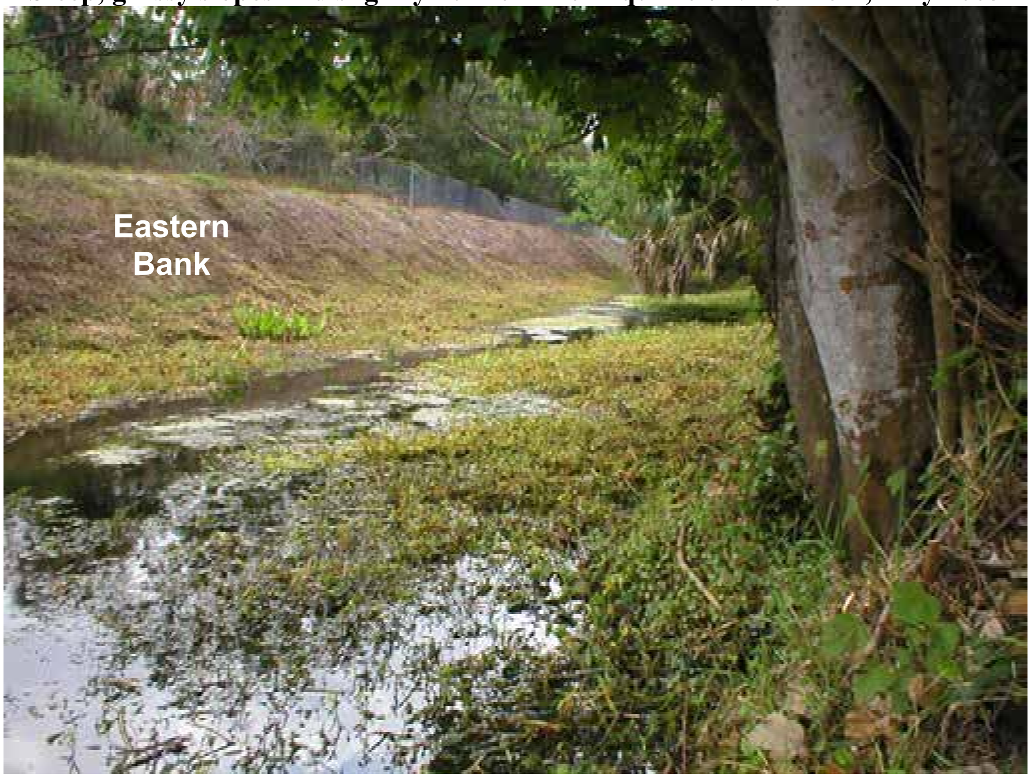
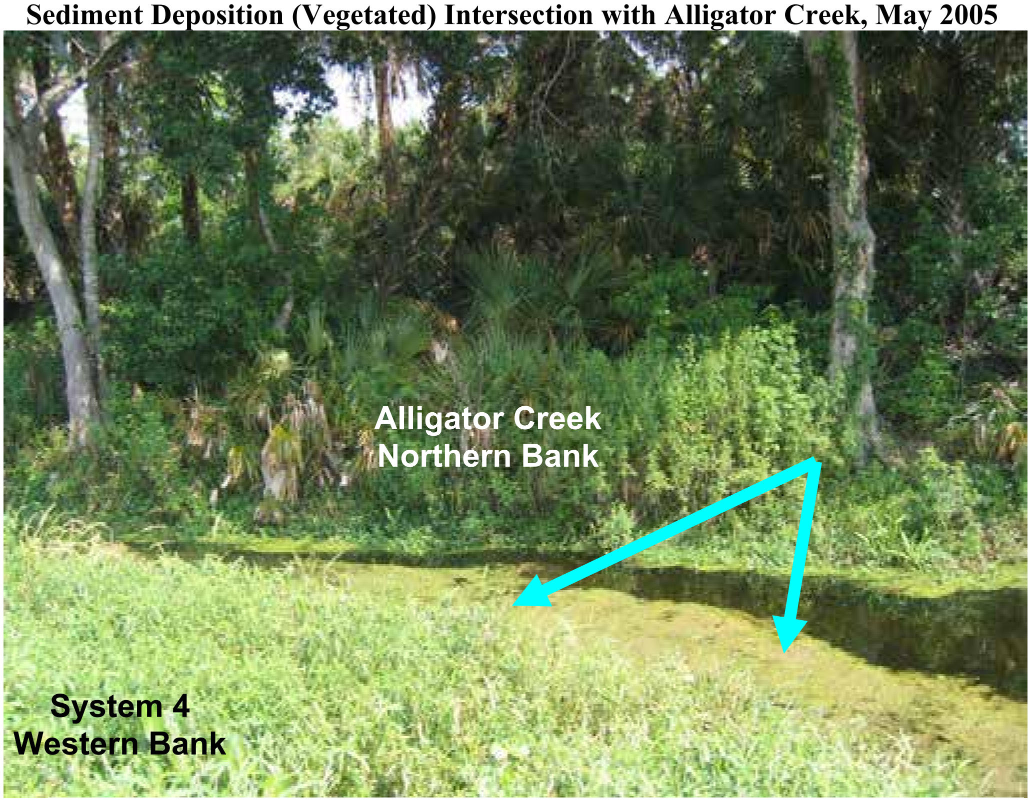


Photo 19 - System 4 Segment 1
Intersection with Alligator Creek, May 2005

Photo 20 – System 4 - Segment 1
Sediment Deposition (Vegetated) Intersection with Alligator Creek, May 2005



Aqua Arrows = sediment deposition

<u>Photo 21 - System 5 - Segment 2</u>
Sloughing Slopes and Sediment Deposition along Western Bank, May 2005

<u>Photo 22 – System 5 - Segment 2</u>
Severely Sloughing Slopes along Western Bank, May 2005

Yellow Arrows = sloughing.   Aqua Arrows = sediment deposition

<u>Photo 23 - System 5 - Segment 1</u>
Culvert beneath Baffin Road, October 2005

<u>Photo 24 – System 5 - Segment 1</u>
Severely Sloughing Slopes and Sediment Deposition, May 2005

Yellow Arrows = sloughing. Aqua Arrows = sediment deposition

<u>Photo 25 - System 6 - Segment 3</u>
Steep, Sandy Southern Bank, April 2005

<u>Photo 26 - System 6 - Segment 3</u>
Undercutting of Northern Bank and Sediment Deposition from System 3, July 2005

Yellow Arrows = undercutting. Aqua Arrows = sediment deposition

Photo 27 – System 6 - Segment 3
Undercutting of Banks from System 4, May 2005

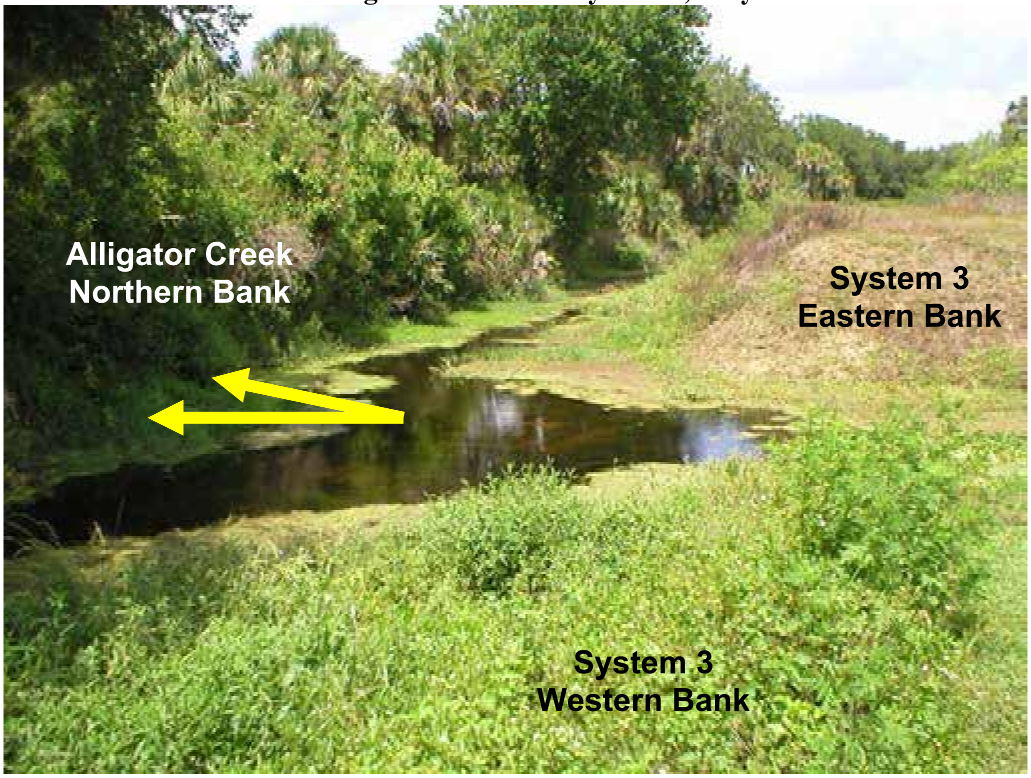


Photo 28 – System 6 - Segment 3
Sediment Deposition and Nutrient-Rich Aquatic Environment, April 2005

Yellow Arrows = sloughing. Aqua Arrows = sediment deposition

<u>Photo 29 – System 6 - Segment 2</u>
Sloughing along Southern Bank, November 2005

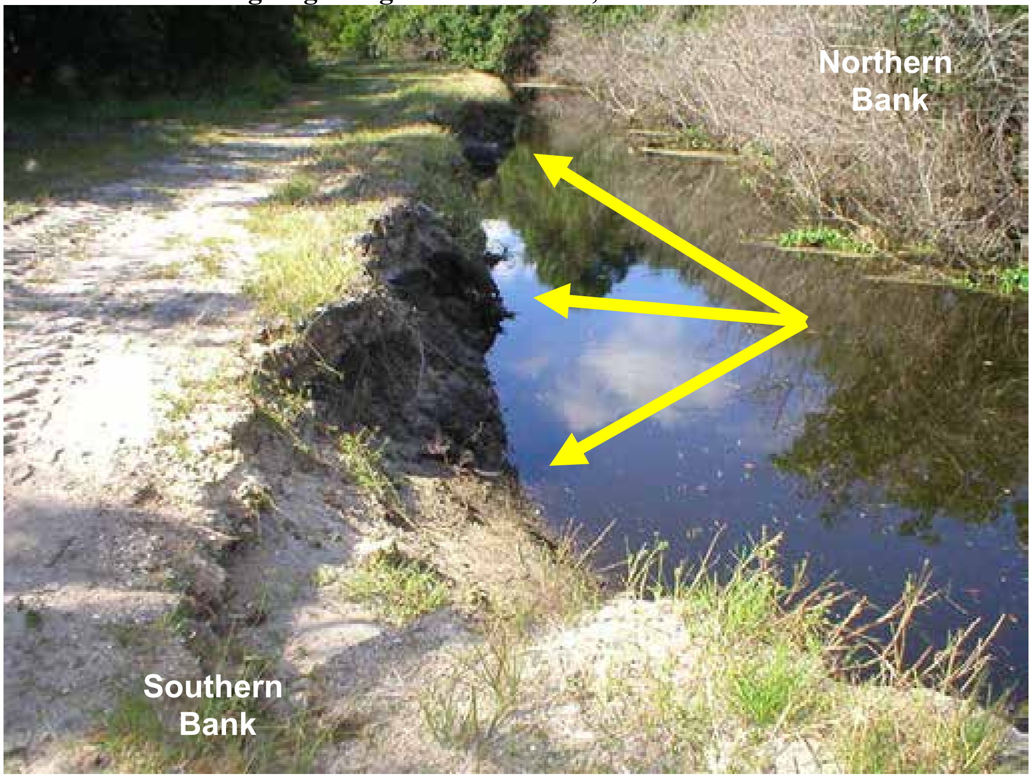
<u>Photo 30 – System 6 - Segment 2</u>
Washout of Banks from System 2, October 2005

Yellow Arrows = sloughing. Red Arrows = washout

<u>Photo 31 – System 6 - Segment 1</u>
Mangroves along Northern Bank, October 2005

<u>Photo 32 – System 6 - Segment 1</u>
Steep, Sandy, Sparsely Vegetated Southern Bank
with Dead Brazilian Pepper at Northern Bank, November 2005

<u>Photo 33 – System 6 - Segment 1</u>
Soughing along Southern Bank, November 2005



<u>Photo 34 – System 6 - Segment 1</u>
Washout of Southern Bank from Wetland to South, November 2005

Yellow Arrows = sloughing. Red Arrows = washout

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<u>APPENDIX A</u>
Meeting Minutes

MEMORANDUM

TO: Herman F. White, P.E., Sarasota County Center for Watershed Management

FROM: Mirko I. Soko, P.E., Berryman & Henigar, Inc.

DATE: May 6, 2005

SUBJECT: Alligator Creek Sediment Management Plan
Project Kickoff Meeting Minutes

The project kickoff meeting of the Alligator Creek Sediment Management Plan (ACSMP) was held on Friday, April 29, 2005 at 9:00 am at the County Center (1001 Sarasota Center Blvd., Sarasota). Attendees were as follows: Herman F. White and Bud R. Goldsby from Sarasota County, and Hans W. Zarbock, ReNae S. Nowicki and Mirko I. Soko from Berryman & Henigar (B&H).

Introduction

Hans Zarbock gave a brief introduction of what the project entails. The ACSMP will follow the same procedure used in the Canal Sediment Abatement Studies previously conducted by B&H for the County, but within the more complex hydrological area of the Alligator Creek Watershed upstream of US 41. B&H will be assessing the placement of a series of weirs and other sediment transport controls on tributaries to the main stem. Herman White pointed out that the scope of this project was originally written by Chuck Walters.

Data Collection

Herman White explained that there is a series of Alligator Creek Drainage Improvements currently under design: Banyan Drive, Bal Harbor, Venice East, Briarwood Area, and Venice East Blvd box culvert. These improvements are at the 60% design and are being designed by Kimley Horn. Improvements are also under design for Center Road and Teresa Goluch would be contacted at the County for this project. The official AdICPR model for the Alligator Creek is dated March 2005.

Bud Goldsby mentioned that Amy Meese would be the contact at the County for any environmental concerns and that he will inquire Sherry Phillip for a password for B&H to access additional GIS data that may not available at the County's public GIS FTP site.

Other Issues

Invoicing will be submitted to Herman White and a summary sheet will be provided to him similar to the previously tables provided to Bud Goldsby.

Mirko Soko handed the attendees a list with estimated dates for each task to be completed based on the notice to proceed and the days from Exhibit A.3 of the scope.

Action Items

The list of action items included the following:

B&H will:

Contact Kimley Horn with reference to the Alligator Creek Drainage Improvements.

Contact Teresa Goluch to obtain data related to the improvements of Center Road.

Contact Amy Meese to inquire about any environmental concerns related to the ACSMP.

The County will:

Inquire about obtaining a password for B&H to access additional GIS data.

Provide SWFWMD topographic maps for the project area.

The meeting was adjourned at 10:00 am.

BUREAU VERITAS
Berryman & Henigar

MEMORANDUM

TO: Scott Woodman, P.E., Sarasota County Center for Watershed Management

FROM: Mirko I. Soko, P.E., Berryman & Henigar, Inc.

DATE: June 30, 2005

SUBJECT: Alligator Creek Sediment Management Plan
Task 5 Workshop Minutes

The Task 5 Workshop for the Alligator Creek Sediment Management Plan (ACSMP) was held on Thursday, June 23 at 10:30 am at the Sarasota County Public Works Building. Sarasota County attendees included: Scott Woodman, Bud Goldsby, Kirk Bagley, Sandra Gonzalez, and Matt Osterhoudt. Berryman & Henigar (B&H) attendees included: Hans Zarbock, ReNae S. Nowicki, and Mirko Soko.

Data Collection Effort
The meeting began with a summary description of the ACSMP project followed by a discussion of the type of data collected and reviewed to date, and the projects currently underway in the Alligator Creek Watershed. These projects include the Alligator Creek Drainage Improvements projects (CIP projects) currently under design by Kimley Horne, and the Center Road Improvements. Plans for the Center Road Improvements has been already collected from Teresa Goluch at the County, but only a location map have been provided by Kimley Horn so far. It was noted that data for these CIP projects will be collected at a later time if it becomes available. Also briefly discussed were the feasibility dredge project on the lower Creek reach, and existing baffle boxes (four currently) being installed outside the Watershed but throughout the County. Matt suggested comparing historical to recent aerials to identify sedimentation hot spots in the Watershed.

Mirko asked whether the abandoned wastewater ponds are still an option for stormwater treatment or whether they were already being used for reused water storage. Scott agreed to investigate the availability of these ponds. Kirk suggested researching historical sources as the main contributor because of the possibility of lack of Best Management Practices (BMPs) used during historical development.

Preliminary Field Evaluation
Per the original project scope, the Alligator Creek channel itself was not to be included as a potential weir location in the Study. Preliminary fieldwork, however, identified several areas of sloughing along the banks of the Creek which may be contributing to downstream sedimentation. As such, the Creek was included in the field evaluation and noted in the presentation. Kirk suggested that the soil type of the Creek and of the ditch banks was the primary erosive cause

because the soil by its very nature, easily lends itself to sloughing. Kirk also suggested that some ditches were graded and sodded, and if previously found to have eroded, were repaired and stabilized. He added that there was no program for repairing spotty areas such as those found along Alligator Creek. Scott Woodman indicated that to date, the County's approach to ditch erosion has been reactive in nature. Kirk commented that currently there are no programs that consider BMPs for ditch maintenance, but suggested that if BMPs were to be recommended in the final report; those recommendations could help establishing the need for making resources available for such work.

B&H then presented a mapped figure of the various ditches evaluated in the field. Each was color coded to indicate the degree of erosion. ReNae summarized the scoring procedure, indicating that ditches colored red on the figure were found to have a high degree of erosion (e.g., severe sloughing or collapse of slopes and infill), those colored orange were found to have a moderate degree of erosion (e.g., obvious loss of sediment from slopes and some infill), and those colored green were found to have a minor degree of erosion (e.g., limited sediment loss and infill). Ditches colored light blue were not evaluated in the preliminary field evaluation.

B&H presented photographs and mapped figures of each of the evaluated ditches and discussed their condition with respect to erosion, infill, and vegetation.

- Ditch #1 (a.k.a., "North-South Ditch"), located west of Jacaranda Blvd., drains south into the Creek. Banks of this ditch are very steep and are only partially vegetated. This ditch was found to have a high degree of erosion, as evidenced by severe sloughing in multiple areas and considerable infill along the ditch bottom. Overgrown nuisance vegetation occurs increasingly downstream. Kirk indicated that this ditch drains several areas, and the pipe at the end of Briarwood blew out twice.

- Ditch #2, located north of the Tamiami Trail and just west of Jacaranda Blvd., drains north into the Creek and was found to have minimal erosion and sediment contribution to the Creek. Three segments define this reach. The southernmost segment which drains north to Woodmere Road, is a shallow, maintained, grassy swale with minimal erosion indicators. The central segment, which occurs between Woodmere Rd. and a footbridge halfway to the Creek, is a mitigation site that is currently overgrown with nuisance vegetation, but exhibits minimal signs of erosion. The northernmost segment drains from this central segment north to the Creek. This segment appears to be the only natural tributary identified in the original project study area (i.e., that portion of the Watershed east of US41). No indicators of erosion were identified, though mature Brazilian pepper tree line much of the banks of this tributary.

- Ditch #3, located east of Jacaranda Blvd, is a short ditch with steep, largely unvegetated slopes. This ditch drains a relatively small area and flows north into the Creek. Numerous areas of sloughing and infill along the bottom of this short ditch suggest a high degree of erosion.

- Ditch #4, located between Jacaranda and Venice East Blvds., consists of multiple segments which traverse through the Venice East residential development and drain north into the Creek. The northernmost of these segments, with largely vegetated banks and minimal infill was determined to have minimal signs of erosion. Of the remaining segments, only one was found to exhibit a high degree of erosion. This more southerly segment has steep, unvegetated, eroding slopes with considerable infill. The remaining segments were found to have a moderate degree of erosion and infill.

- Ditch #5 is located west of the Tamiami Trail (outside the original project area) just east of Siesta Dr. and drains south into the Creek. This ditch was found to exhibit a high degree of erosion, evidenced by severe sloughing and infill at numerous locations, though most notably along the western banks. Restoration of ditch banks on the banks of the southern portion of this ditch (i.e., south of Baffin Rd.) was determined to be limited because the County does not have an easement for this area.

Other issues discussed during the presentation of results included the presence of weirs in other watersheds, the use of vegetation spraying as a means of ditch maintenance, and limitations to ditch restoration. It was determined that weirs were present in the main canal of Phillippi Creek, downstream of Colonial Park, and just south of Bay Vista Street. Weirs were made shallow to allow turtle crossings and little sediment was found to be collecting upstream of these weirs. Kirk indicated that spraying did occur as a means of ditch maintenance, but was limited to the flow line. Kirk acknowledged that many ditch areas with a distinct line of dead vegetation appear to have been sprayed, but were not. On the discussion of decreasing the slope of the ditches as a means of restoration and erosion prevention, Hans mentioned the limitation of on-site utility lines and/or right-of-way issues.

<u>Scope Review and Revisions</u>
B&H identified three issues of concern that might warrant revision of the original scope:

1. Erosion along Alligator Creek itself (versus just the tributaries into it);
2. Sedimentation sources outside the original study area (i.e., west of US41); and
3. Installation of weirs may increase upstream flooding potential and may not be sufficient to reduce sediment into the Creek (i.e., ditch restoration and/or other BMPs necessary).

Kirk asked how in depth was the soils investigation. Hans indicated no soil testing was conducted, but that various means of ditch stabilization would be considered should the scope be expanded/revised to allow such. Scott mentioned expansion of the Alligator Creek cross section and the addition of meanders to reduce flow energy. Bud questioned the feasibility of using rip rap and geotextiles along the Creek. Kirk commented that these were potential solutions. Bud noted that this would be a stormwater operations project and asked whether a Sedimentation Management Plan would be required to implement it. Kirk suggested that the focus be on severe, chronic areas such as the ditch along Siesta Rd. Bud asked whether maintenance excavation would be affected by armoring the ditch. Kirk responded that it would not. Scott commented that blowouts could be covered by emergency management funds from FEMA instead of Sarasota County if the following applied: an area was problematic, it met certain criteria, the problem could be corrected, and the problem occurred as a result of a "declared event".

Scott raised the issue of Environmental Resource Permitting (ERP) from the Southwest Florida Water Management District and the one acre threshold for vegetation loss/ bank armoring. Bud commented that removing exotic vegetation is another issue that could be lumped in with ditch restoration as sediment abatement recommendations in the final report. Matt suggested researching native vegetation (e.g., perennial peanut) to stabilize the steep, sandy banks. Scott suggested that multiple lines of attack be utilized, including: armoring the banks, revegetation, and other means as needed. Kirk noted that armoring does solve the immediate erosion problem, but tends to create new erosion sources where it starts and finishes. Bud also asked that existing right-of-ways (ROWs) be investigated and the identification of possible acquirable ROWs be identified and included in the report.

Hans asked whether an offline pond upstream of US41 could be an option, in what little undeveloped land remained, to allow sediments to settle. Mirko noted that he visited several pond weir structures to evaluate possible downstream erosion, but they all appeared to be working properly. It was noted that one of the CIP projects is proposing increasing the water level in a pond by a very small amount and that the community was not receptive about it. Kirk indicated that the big problems could be in the major tributaries, but that the little residential reaches were vegetated and already serve effectively as BMPs. He suggested that because of the steep, sandy soils, various methods would need to be considered including: baffle boxes, regarding of side slopes, stabilizing/armoring ditch banks, and restoring ditch bank vegetation. Kirk added that he did not think the small residential ditches leading into the North-South ditch were a source of the sedimentation. On the subject of the use of weirs as a means of sediment abatement, Kirk added that their use in catching sediment will treat the symptom, but will not prevent erosion. He added that ditch access may be an issue with some of the ditches and that weirs should not be placed where upstream flooding might occur as a result. He noted a problem at a weir in Phillippi Creek which became submerged. He added that he did not see a substantial accumulation of sediment upstream of the weir. Kirk noted that weirs, if installed, should be placed at the downstream end of the tributaries just upstream of their delta.

Bud and Scott agreed that the scope should be revised to expand the project area to west of US41 and to include these new issues. Scott requested that Mirko revise the scope and budget to account for these revisions.

Scott then summarized the results of the workshop as follows:

- Side slopes of target ditches would likely need to be relieved;
- Baffle boxes could be placed at pipe discharge points if a sediment source was present;
- Weirs were a decent option if coupled with other BMPs, but access and maintenance may be limiting factors;
- The scope could be expanded; and
- A field review with County staff should be planned at locations for which the above issues might be most relevant.

<u>Action Items</u>

The list of action items to be completed as a result of this meeting includes the following:

B&H

- Acquire digital historical imagery and compare to recent to identify sedimentation hot spots
- Submit workshop presentation to Scott
- Research ditch bank revegetation options
- Plan a field visit with County staff
- Provide revised scope of work and budget for review

Sarasota County

- Scott Woodman will investigate whether the abandoned wastewater ponds are available

The meeting was adjourned at 11:35 pm.

APPENDIX B
AdICPR Input Files

Proposed Conditions
Expanded Cross Sections with 1ft Weirs

Name: 12102-X Group: AC-SVNW
Encroachment: No

Eliminated Glass Wall effects
expanded existing cross section

PREVIOUS
CROSS SECTION
0□14□0.045
12□4.7□0.045
24□4.3□0.035
35□13.6□0.045

Station(ft)	Elevation(ft)	Manning's N
0.000	14.100	0.045000
20.000	14.000	0.045000
32.000	4.700	0.045000
44.000	4.300	0.035000
55.000	13.600	0.045000
75.000	13.700	0.045000

Name: 12240-X Group: AC-BRIAR
Encroachment: No

Eliminated Glass Wall effects
expanded existing cross section

PREVIOUS CROSS SECTION
0□12□0
10□11□0.045
20□10□0.045
30□5□0.045
35□4.9□0.045
40□5□0.045
49□10□0.045
55□11□0.045
61□12□0.045
70□13□0.045

Station(ft)	Elevation(ft)	Manning's N
5.000	12.100	0.045000
10.000	12.100	0.045000
15.000	12.100	0.045000
20.000	12.000	0.045000
30.000	11.000	0.045000

40.000	10.000	0.045000
50.000	5.000	0.045000
55.000	4.900	0.045000
60.000	5.000	0.045000
69.000	10.000	0.045000
75.000	11.000	0.045000
81.000	12.000	0.045000
90.000	13.000	0.045000
100.000	13.100	0.045000
110.000	13.100	0.045000
120.000	13.100	0.045000

Name: 12404 Group: AC-MID
Encroachment: No

ELIMINATE GLASS WALLS
EXPANDED X SECTION

PREVIOUS CROSS SECTION
1000 10 0.035
1013 2.6 0.035
1016.5 2.4 0.03
1020 2.64 0.03
1028 8.6 0.04

Station(ft)	Elevation(ft)	Manning's N
0.000	10.100	0.035000
20.000	10.000	0.035000
33.000	2.600	0.035000
36.500	2.400	0.030000
40.000	2.640	0.030000
48.000	8.600	0.040000
108.000	11.000	0.040000

Name: 12404-D Group: AC-MID
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
1000.000	7.900	0.030000
1013.000	1.100	0.030000
1016.000	0.800	0.030000
1019.000	1.200	0.030000

1032.000	9.200	0.040000

Name: 12405 Group: AC-MID
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
1000.000	12.000	0.030000
1008.000	4.100	0.030000
1014.000	4.400	0.030000
1027.000	11.400	0.040000

Name: 12416 Group: AC-MID
Encroachment: No

ELIMINATE GLASS WALLS
EXPANDED X SECTION

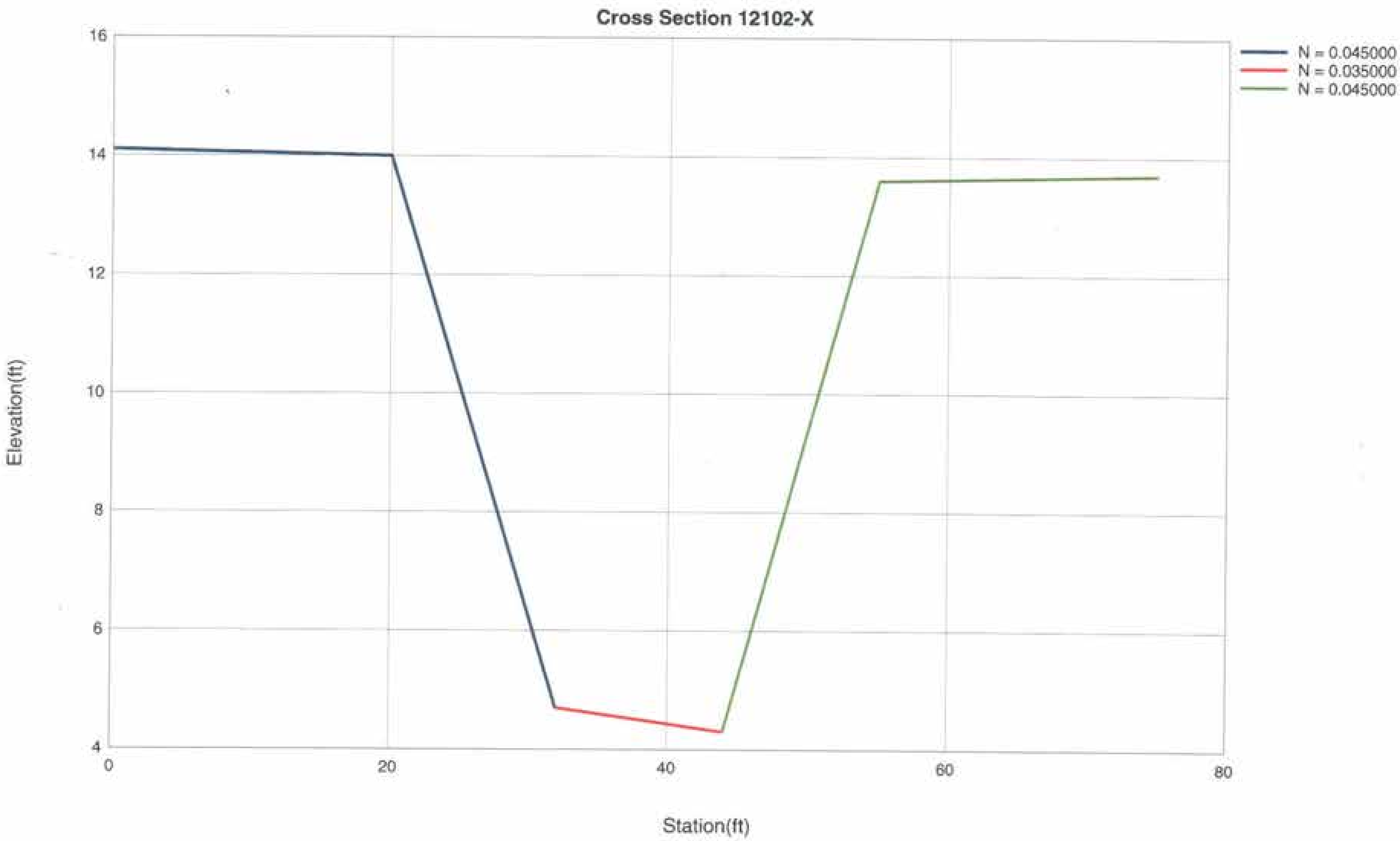
PREVIOUS CROSS SECTION
1000 10.5 0.035
1013 2.4 0.035
1017 1.1 0.03
1022 1.7 0.03
1035 9.7 0.06

Station(ft)	Elevation(ft)	Manning's N
0.000	11.000	0.035000
36.000	10.500	0.035000
49.000	2.400	0.035000
53.000	1.100	0.030000
58.000	1.700	0.030000
71.000	9.700	0.060000
109.000	11.000	0.060000

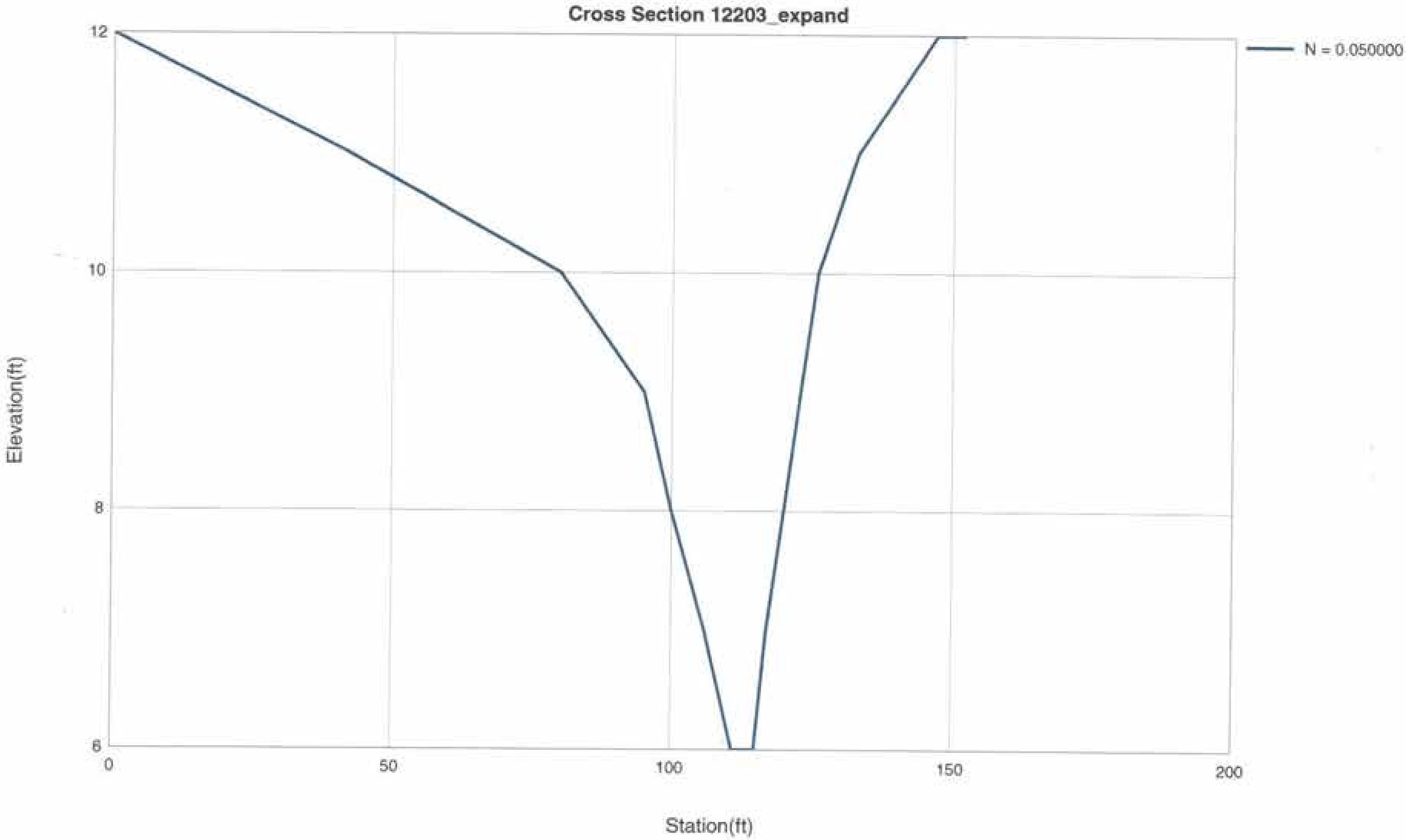
Name: 12416-N Group: AC-MID
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
1000.000	8.700	0.035000

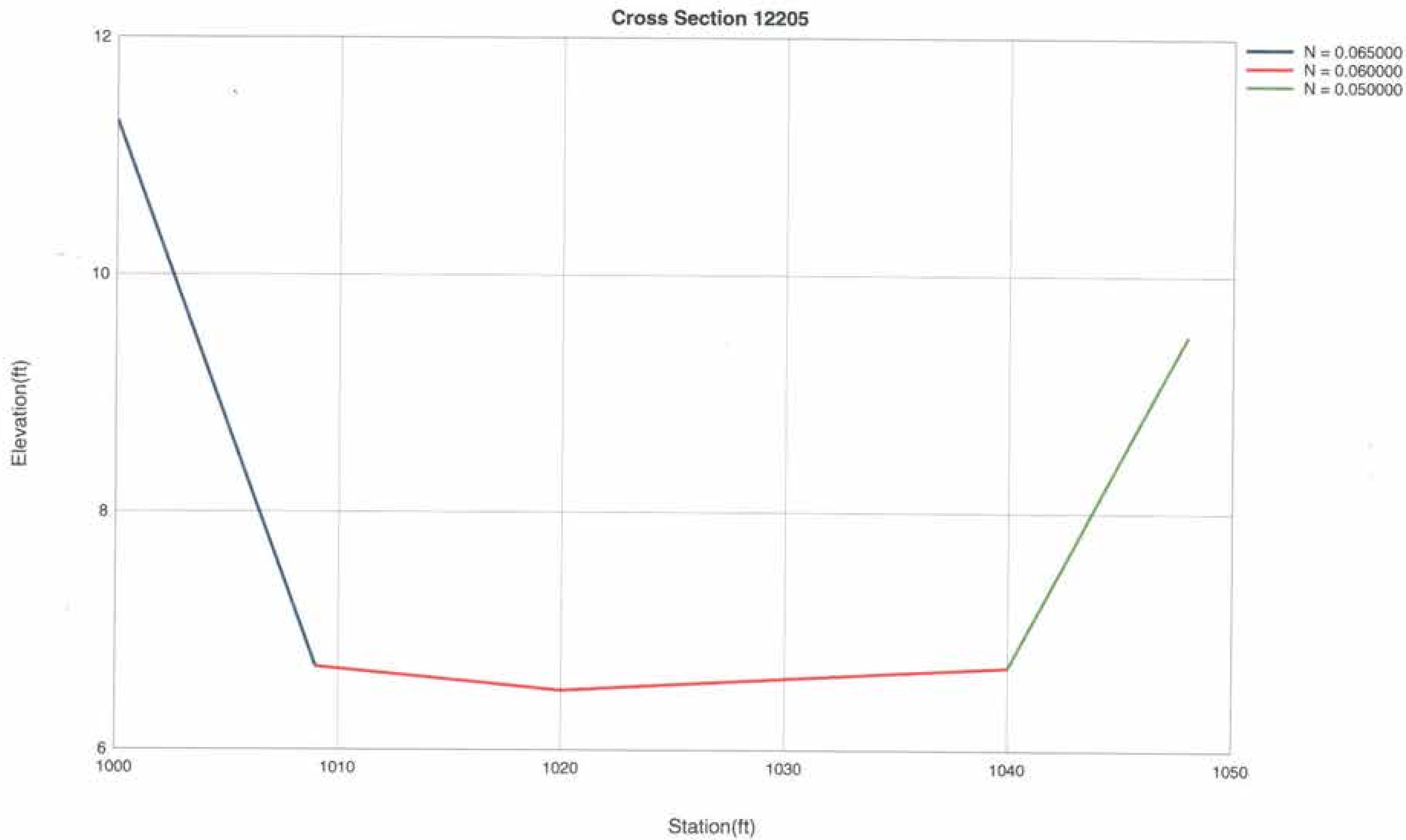
1016.000	1.300	0.035000
1024.000	0.700	0.030000
1033.000	0.900	0.030000
1041.000	6.000	0.060000

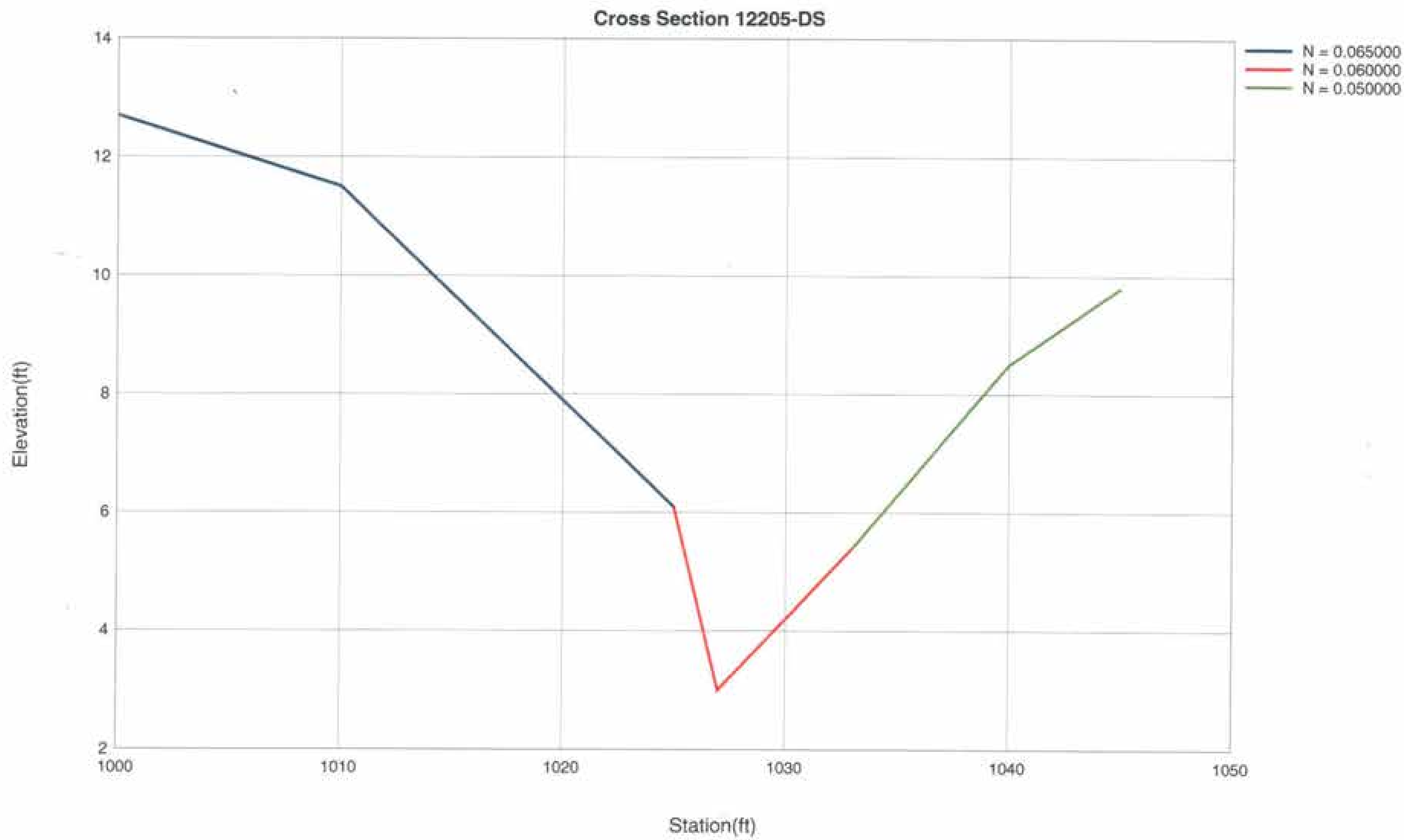

Cross Section 12102-X
16
14
12
10
8
6
4
0
20
40
60
80
Elevation(ft)
Station(ft)
N = 0.045000
N = 0.035000
N = 0.045000

ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
EXPANDED CROSS SECTIONS

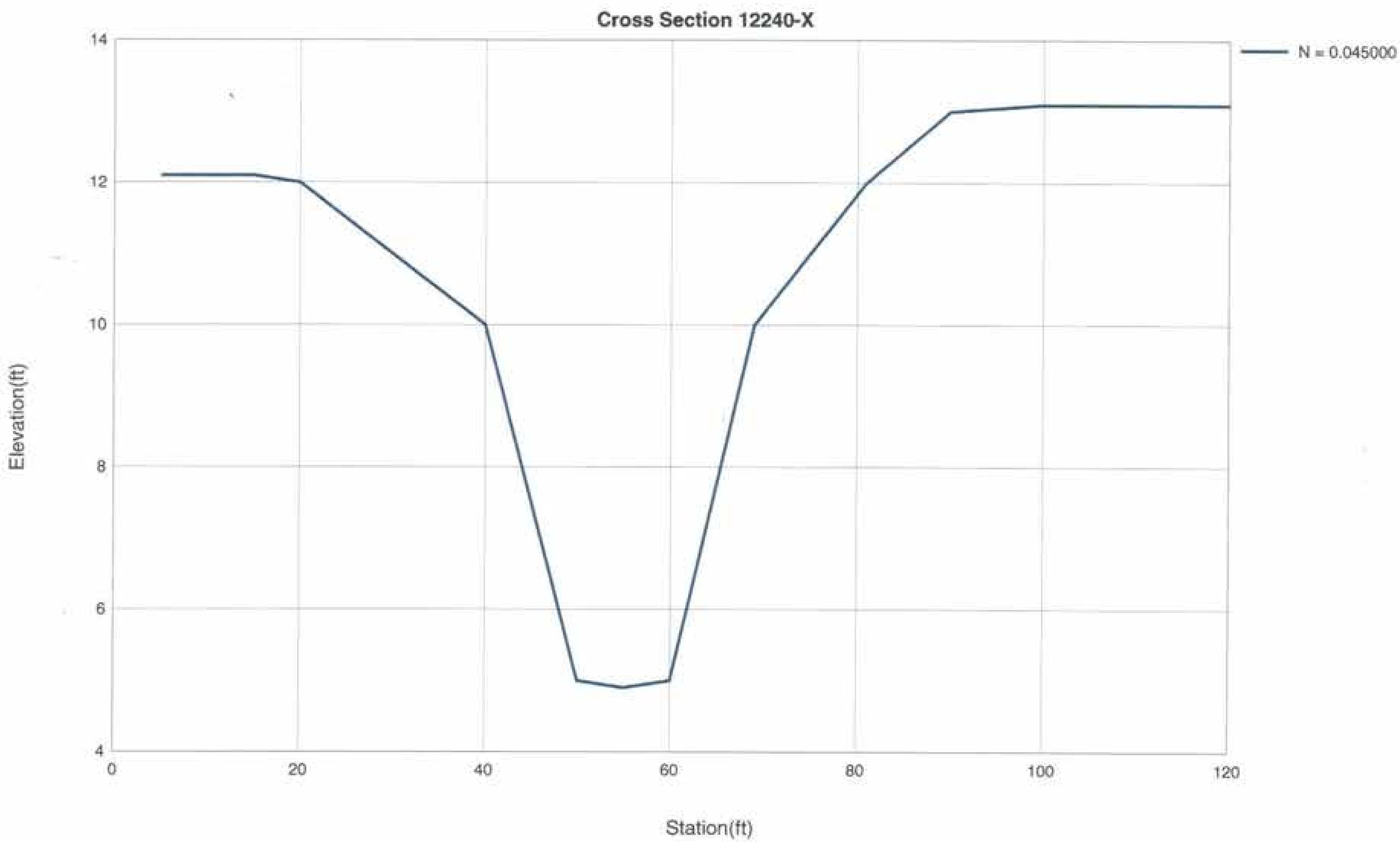


ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
EXPANDED CROSS SECTIONS

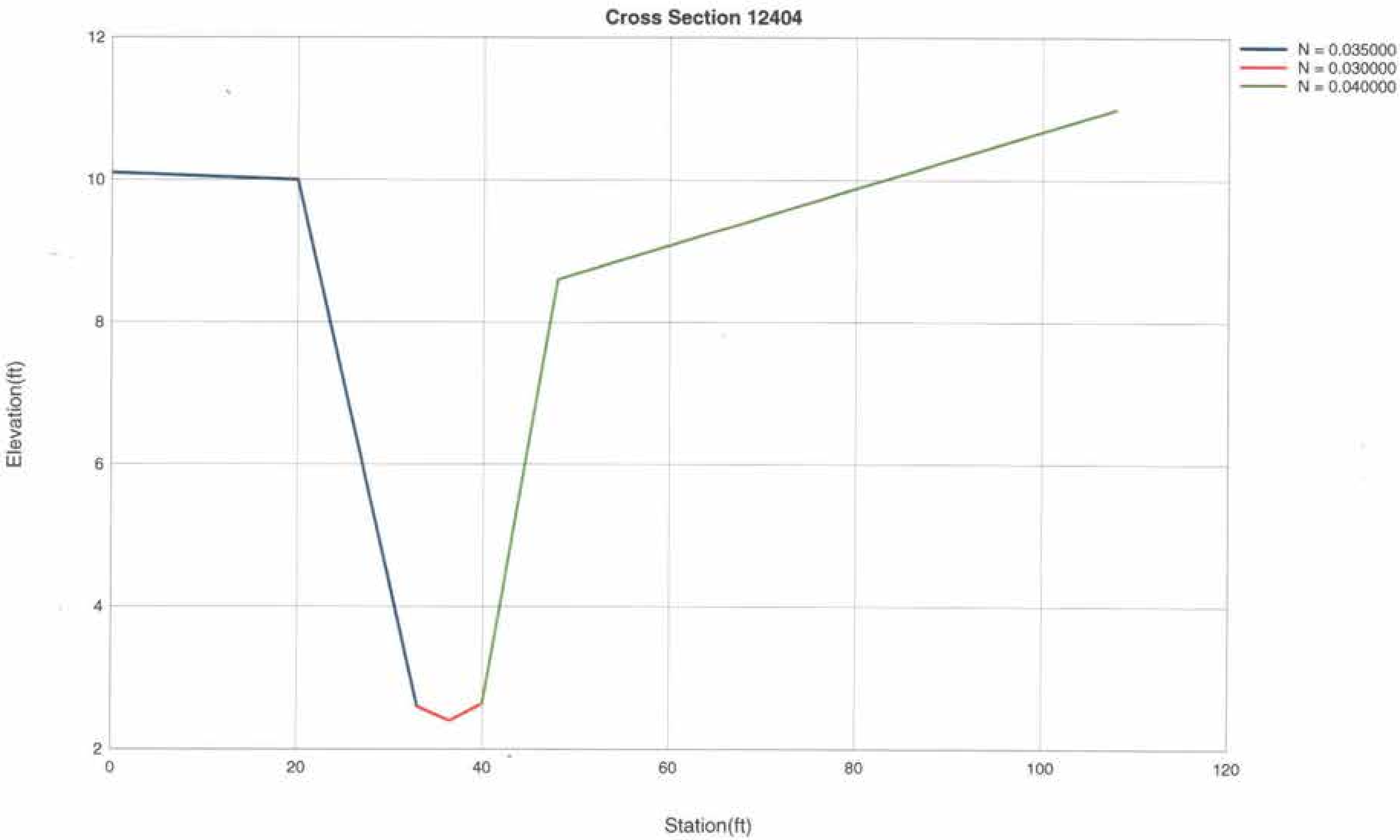



Cross Section 12205-DS
14
12
10
8
6
4
2
Elevation(ft)
1000
1010
1020
1030
1040
1050
Station(ft)
N = 0.065000
N = 0.060000
N = 0.050000

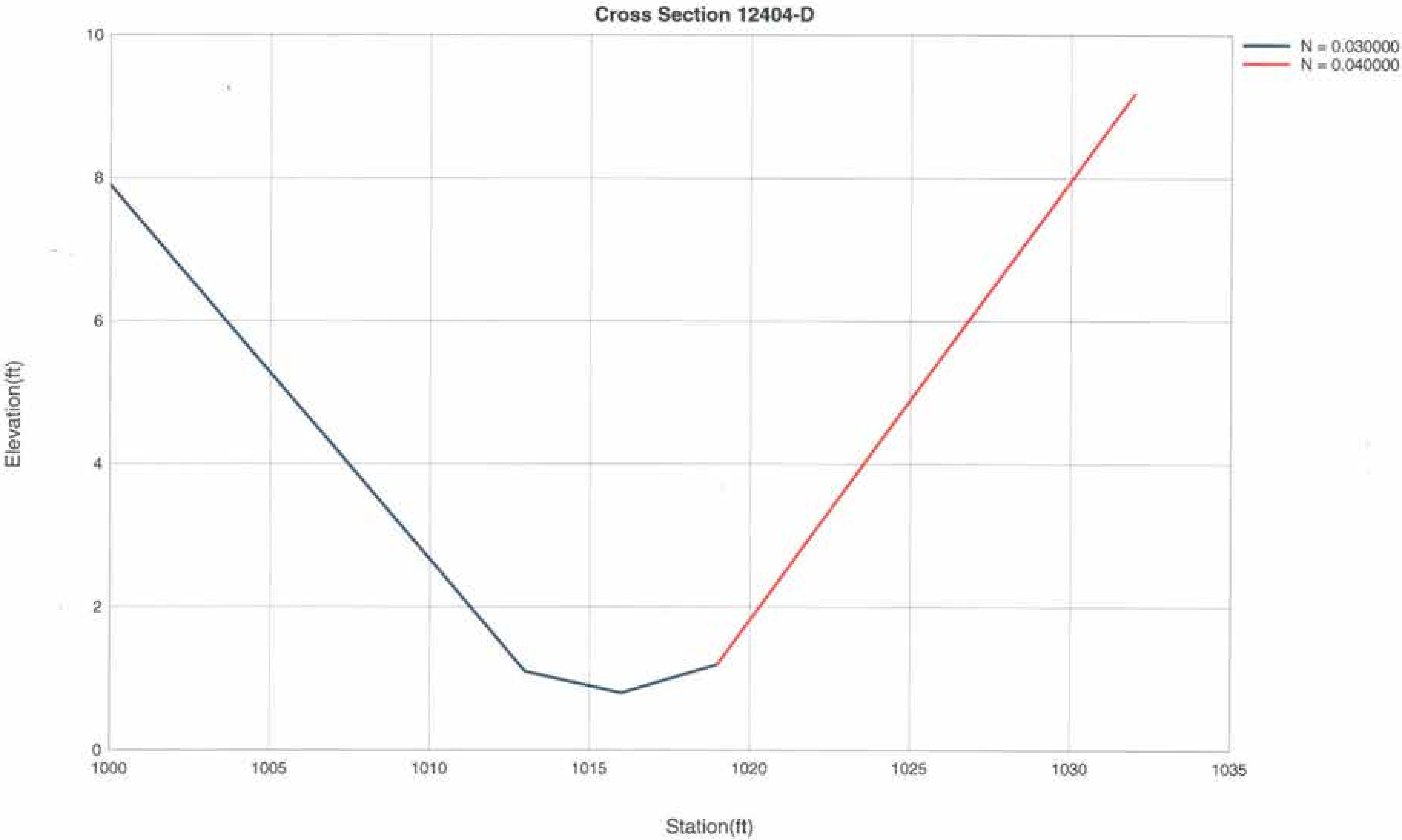
ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
EXPANDED CROSS SECTIONS

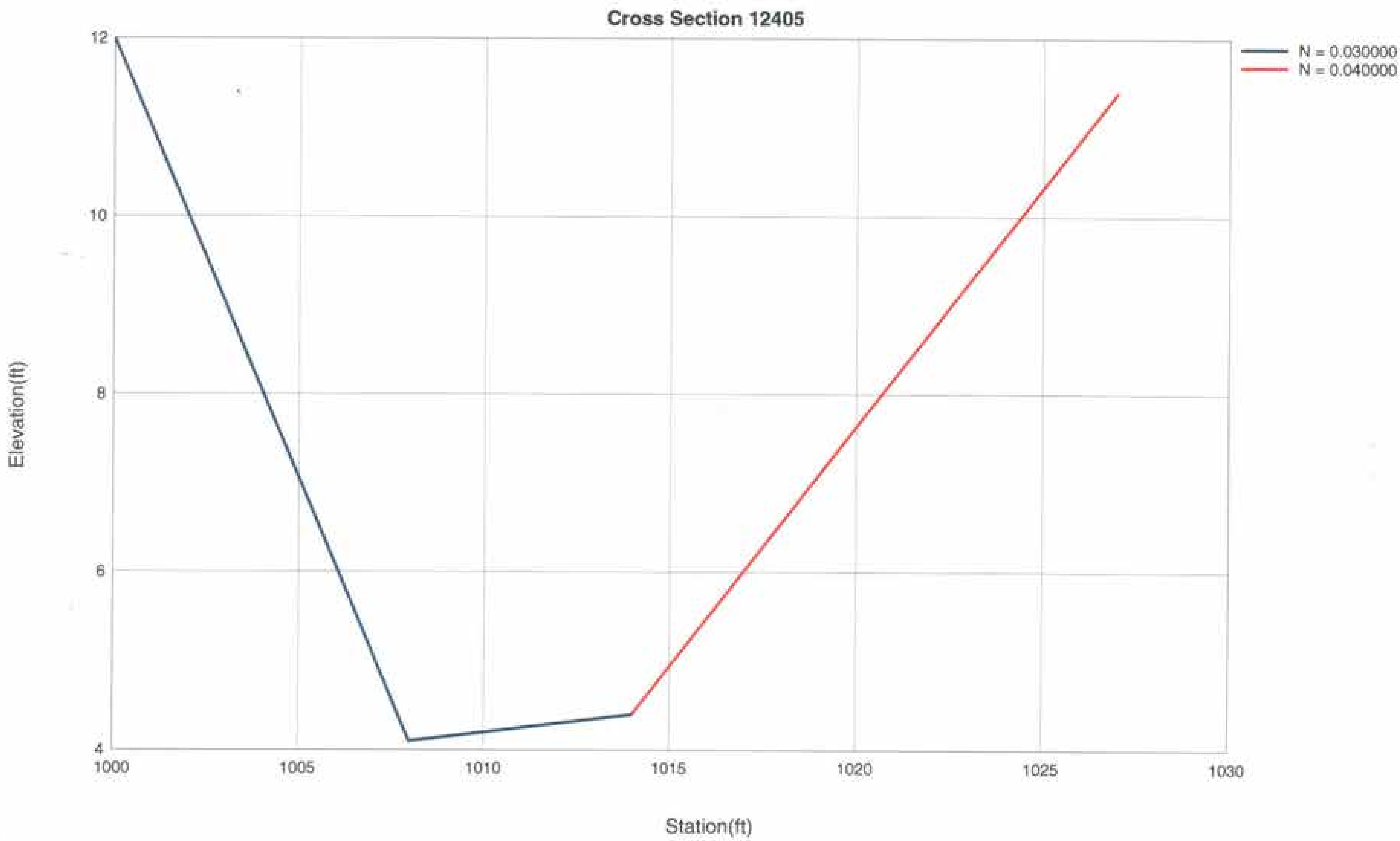


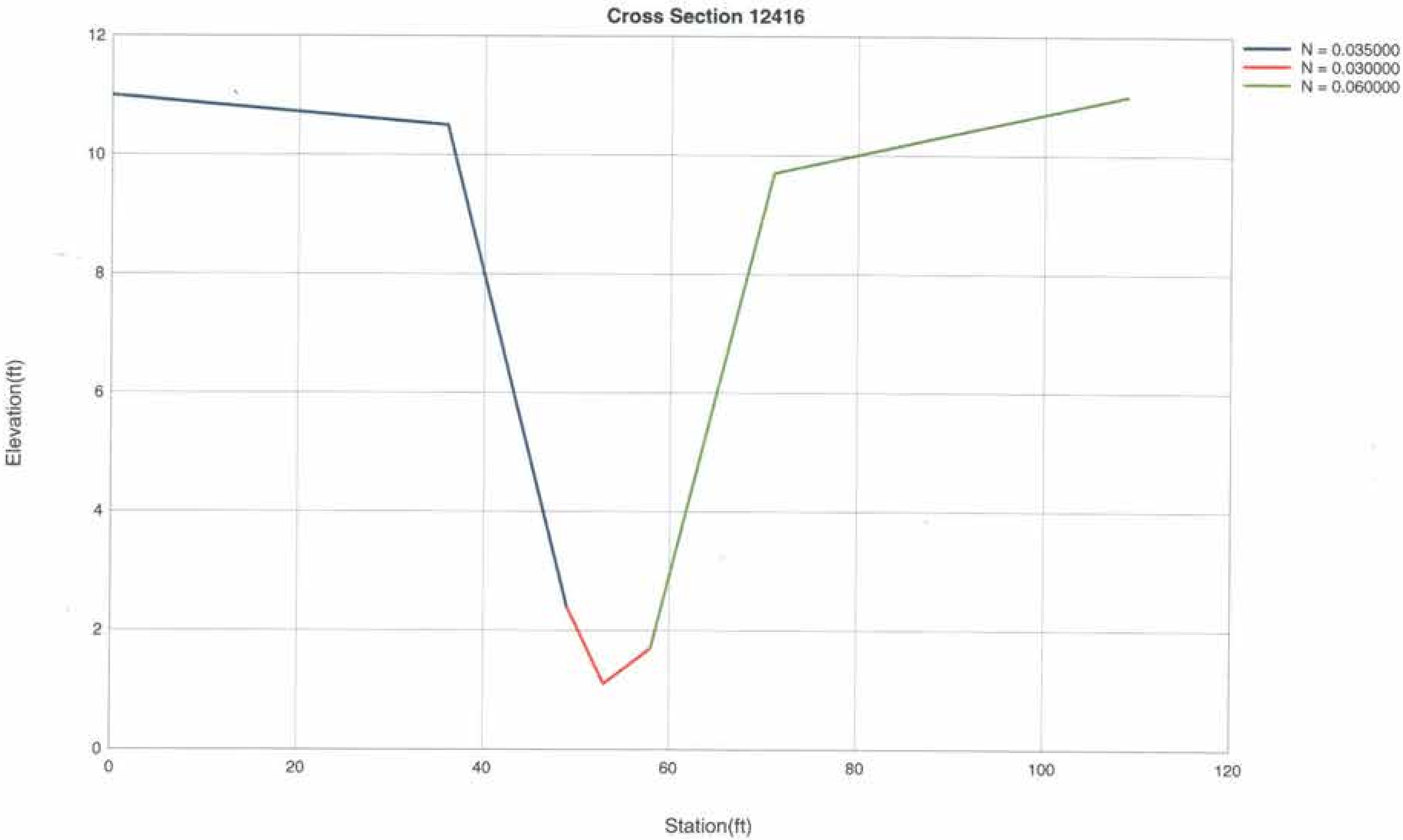
ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
EXPANDED CROSS SECTIONS



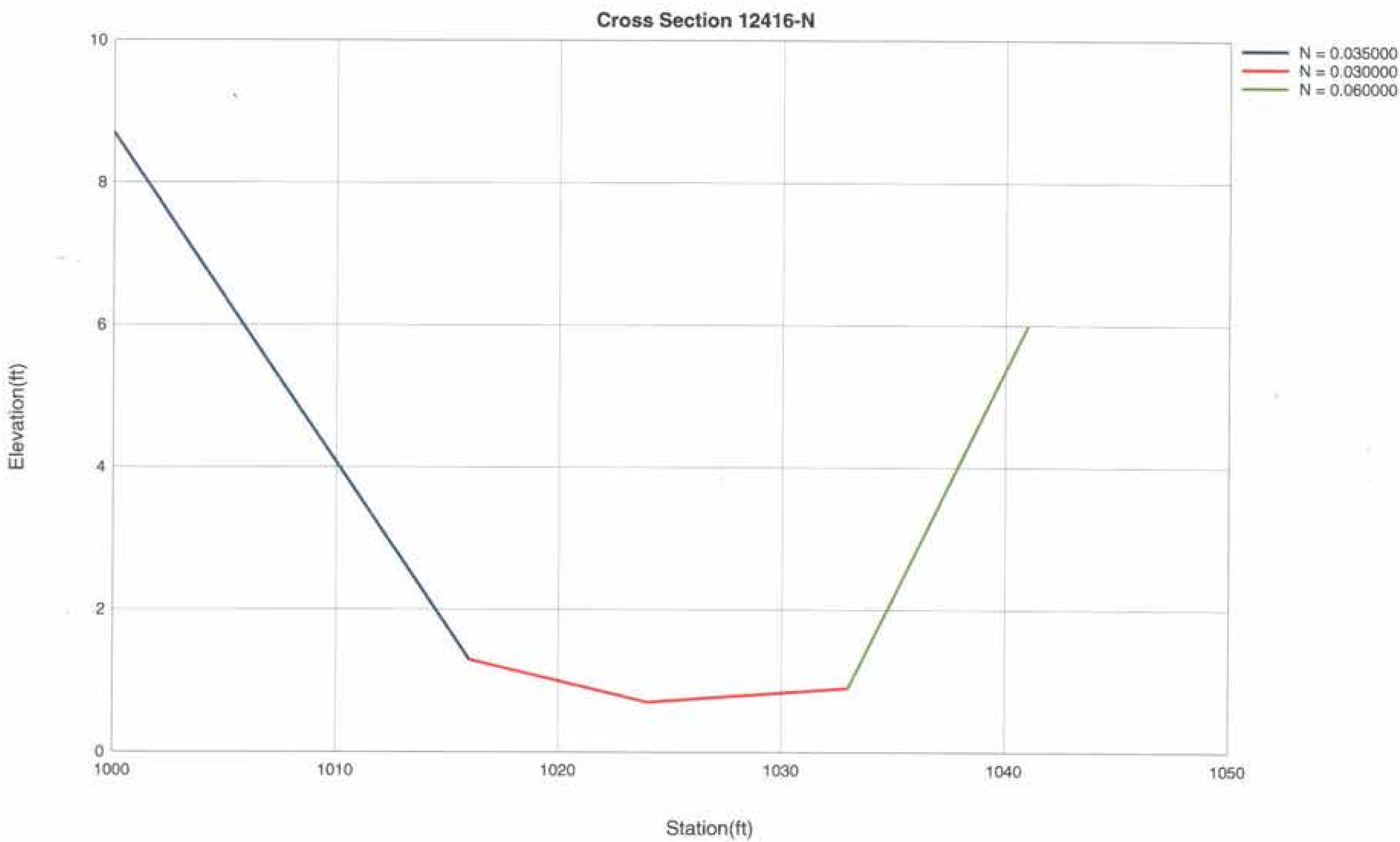
ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
EXPANDED CROSS SECTIONS




Cross Section 12405
N = 0.030000
N = 0.040000
Elevation(ft)
12
10
8
6
4
1000
1005
1010
1015
1020
1025
1030
Station(ft)


Cross Section 12416
Elevation(ft)
Station(ft)
0
2
4
6
8
10
12
0
20
40
60
80
100
120
N = 0.035000
N = 0.030000
N = 0.060000

ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
EXPANDED CROSS SECTIONS



Proposed Conditions
Existing Cross Sections with 1ft Weirs

```
     Name: 12102              Base Flow(cfs): 0.000        Init Stage(ft): 4.300
    Group: AC-SVNW                                         Warn Stage(ft): 5.000
     Type: Stage/Area

     Stage(ft)          Area(ac)
--------------- ---------------

     Name: 12102D             Base Flow(cfs): 0.000        Init Stage(ft): 3.470
    Group: AC-SVNW                                         Warn Stage(ft): 0.000
     Type: Stage/Area

     Stage(ft)          Area(ac)
--------------- ---------------

     Name: 12102U             Base Flow(cfs): 0.000        Init Stage(ft): 3.470
    Group: AC-SVNW                                         Warn Stage(ft): 0.000
     Type: Stage/Area

     Stage(ft)          Area(ac)
--------------- ---------------

     Name: 12203              Base Flow(cfs): 0.000        Init Stage(ft): 3.000
    Group: AC-LOW                                          Warn Stage(ft): 10.000
     Type: Stage/Area

     Stage(ft)          Area(ac)
--------------- ---------------

     Name: 12205              Base Flow(cfs): 0.000        Init Stage(ft): 4.130
    Group: AC-LOW                                          Warn Stage(ft): 10.000
     Type: Stage/Area
north of woodmere apts driveway to Jac.

     Stage(ft)          Area(ac)
--------------- ---------------
```

Name: 12240 Base Flow(cfs): 0.000 Init Stage(ft): 4.900
Group: AC-BRIAR Warn Stage(ft): 0.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: 12240D Base Flow(cfs): 0.000 Init Stage(ft): 3.230
Group: AC-BRIAR Warn Stage(ft): 0.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: 12240U Base Flow(cfs): 0.000 Init Stage(ft): 3.230
Group: AC-BRIAR Warn Stage(ft): 0.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: 12404 Base Flow(cfs): 0.000 Init Stage(ft): 2.500
Group: AC-MID Warn Stage(ft): 10.000
Type: Stage/Area

Stage(ft)	Area(ac)
9.000	0.0100
10.000	0.4100

Name: 12404D Base Flow(cfs): 0.000 Init Stage(ft): 1.620
Group: AC-MID Warn Stage(ft): 0.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: 12404U　　Base Flow(cfs): 0.000　　Init Stage(ft): 1.620
Group: AC-MID　　Warn Stage(ft): 0.000
Type: Stage/Area

Stage(ft)	Area(ac)

```
         Name: 12102            From Node: 12102          Length(ft): 295.00
        Group: AC-SVNW            To Node: 12102U            Count: 1

             UPSTREAM       DOWNSTREAM              Friction Equation: Average Conveyance
    Geometry: Irregular     Irregular              Solution Algorithm: Automatic
  Invert(ft): 4.300         3.470                                Flow: Both
TClpInitZ(ft): 99.000       99.000                 Contraction Coef: 0.100
   Manning's N:                                      Expansion Coef: 0.300
 Top Clip(ft): 0.000        0.000                 Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000        0.000                     Exit Loss Coef: 0.000
    Main XSec: 12102-X      12102-X                Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft): 0.000        0.000                   Inlet Ctrl Spec: Use dn
    Aux XSec1:                                    Stabilizer Option: None
 AuxElev2(ft): 0.000        0.000
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft):
 LtSdSlp(h/v):
 RtSdSlp(h/v):
```

```
         Name: 12102D           From Node: 12102D         Length(ft): 200.00
        Group: AC-SVNW            To Node: 12100             Count: 1

             UPSTREAM       DOWNSTREAM              Friction Equation: Average Conveyance
    Geometry: Irregular     Irregular              Solution Algorithm: Automatic
  Invert(ft): 3.470         2.900                                Flow: Both
TClpInitZ(ft): 99.000       99.000                 Contraction Coef: 0.100
   Manning's N:                                      Expansion Coef: 0.300
 Top Clip(ft): 0.000        0.000                 Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000        0.000                     Exit Loss Coef: 0.000
    Main XSec: 12102-X      12102-X                Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft): 0.000        0.000                   Inlet Ctrl Spec: Use dn
    Aux XSec1:                                    Stabilizer Option: None
 AuxElev2(ft): 0.000        0.000
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft):
 LtSdSlp(h/v):
 RtSdSlp(h/v):
```

```
         Name: 12203            From Node: 12203          Length(ft): 360.00
        Group: AC-LOW             To Node: 12202             Count: 1
```

	UPSTREAM	DOWNSTREAM
Geometry:	Irregular	Irregular
Invert(ft):	3.000	1.500
TClpInitZ(ft):	999.000	999.000
Manning's N:		
Top Clip(ft):	0.000	0.000
Bot Clip(ft):	0.000	0.000
Main XSec:	12203	12203-D
AuxElev1(ft):	0.000	0.000
Aux XSec1:		
AuxElev2(ft):	0.000	0.000
Aux XSec2:		
Top Width(ft):		
Depth(ft):		
Bot Width(ft):		
LtSdSlp(h/v):		
RtSdSlp(h/v):		

Friction Equation: Average Conveyance
Solution Algorithm: Automatic
Flow: Both
Contraction Coef: 0.100
Expansion Coef: 0.300
Entrance Loss Coef: 0.000
Exit Loss Coef: 0.000
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dn
Stabilizer Option: None

west of dog park

Name: 12205 From Node: 12205 Length(ft): 460.00
Group: AC-LOK To Node: 12203 Count: 1

	UPSTREAM	DOWNSTREAM
Geometry:	Irregular	Irregular
Invert(ft):	6.500	3.000
TClpInitZ(ft):	99.000	99.000
Manning's N:		
Top Clip(ft):	0.000	0.000
Bot Clip(ft):	0.000	0.000
Main XSec:	12205	12205-DS
AuxElev1(ft):	0.000	0.000
Aux XSec1:		
AuxElev2(ft):	0.000	0.000
Aux XSec2:		
Top Width(ft):		
Depth(ft):		
Bot Width(ft):		
LtSdSlp(h/v):		
RtSdSlp(h/v):		

Friction Equation: Average Conveyance
Solution Algorithm: Automatic
Flow: Both
Contraction Coef: 0.100
Expansion Coef: 0.300
Entrance Loss Coef: 0.000
Exit Loss Coef: 0.000
Outlet Ctrl Spec: Use dc or tw
Inlet Ctrl Spec: Use dn
Stabilizer Option: None

next to woodmere park

Name: 12240 From Node: 12240 Length(ft): 1085.00
Group: AC-BRIAR To Node: 12240U Count: 1

UPSTREAM DOWNSTREAM Friction Equation: Average Conveyance

```
     Geometry: Irregular        Irregular              Solution Algorithm: Automatic
   Invert(ft): 4.900            3.230                                Flow: Both
 TClpInitZ(ft): 99.000          99.000                   Contraction Coef: 0.100
   Manning's N:                                            Expansion Coef: 0.300
  Top Clip(ft): 0.000           0.000                  Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000           0.000                      Exit Loss Coef: 0.000
    Main XSec: 12240-X          12240-X                  Outlet Ctrl Spec: Use dn or tw
 AuxElev1(ft): 0.000            0.000                     Inlet Ctrl Spec: Use dn
    Aux XSec1:                                           Stabilizer Option: None
 AuxElev2(ft): 0.000            0.000
    Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft):
  LtSdSlp(h/v):
  RtSdSlp(h/v):

--------------------------------------------------------------------------------------------

         Name: 12240D             From Node: 12240D             Length(ft): 215.00
        Group: AC-BRIAR             To Node: 12193                   Count: 1

               UPSTREAM          DOWNSTREAM               Friction Equation: Average Conveyance
     Geometry: Irregular         Irregular               Solution Algorithm: Automatic
   Invert(ft): 3.230             2.900                                 Flow: Both
 TClpInitZ(ft): 99.000           99.000                    Contraction Coef: 0.100
   Manning's N:                                              Expansion Coef: 0.300
  Top Clip(ft): 0.000            0.000                   Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000            0.000                       Exit Loss Coef: 0.000
    Main XSec: 12240-X           12140-X                   Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft): 0.000             0.000                      Inlet Ctrl Spec: Use dn
    Aux XSec1:                                           Stabilizer Option: None
 AuxElev2(ft): 0.000             0.000
    Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft):
  LtSdSlp(h/v):
  RtSdSlp(h/v):

--------------------------------------------------------------------------------------------

         Name: 12404              From Node: 12404              Length(ft): 170.00
        Group: AC-MID               To Node: 12404U                  Count: 1

               UPSTREAM          DOWNSTREAM               Friction Equation: Average Conveyance
     Geometry: Irregular         Irregular               Solution Algorithm: Automatic
   Invert(ft): 2.400             1.620                                 Flow: Both
```

```
TClpInitZ(ft): 99.000     99.000          Contraction Coef: 0.000
  Manning's N:                              Expansion Coef: 0.000
 Top Clip(ft): 0.000      0.000         Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000      0.000             Exit Loss Coef: 0.000
   Main XSec: 12404       12404            Outlet Ctrl Spec: Use dc or tw
AuxElev1(ft): 0.000       0.000             Inlet Ctrl Spec: Use dn
   Aux XSec1:                            Stabilizer Option: None
AuxElev2(ft): 0.000       0.000
   Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft):
 LtSdSlp(h/v):
 RtSdSlp(h/v):

--------------------------------------------------------------------------------
        Name: 12404D          From Node: 12404D        Length(ft): 180.00
       Group: AC-MID            To Node: 12403              Count: 1

              UPSTREAM        DOWNSTREAM           Friction Equation: Average Conveyance
    Geometry: Irregular       Irregular           Solution Algorithm: Automatic
  Invert(ft): 1.620           0.800                             Flow: Both
TClpInitZ(ft): 99.000         99.000                Contraction Coef: 0.000
  Manning's N:                                        Expansion Coef: 0.000
 Top Clip(ft): 0.000          0.000               Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000          0.000                   Exit Loss Coef: 0.000
   Main XSec: 12404           12404-D               Outlet Ctrl Spec: Use dc or tw
AuxElev1(ft): 0.000           0.000                  Inlet Ctrl Spec: Use dn
   Aux XSec1:                                      Stabilizer Option: None
AuxElev2(ft): 0.000           0.000
   Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft):
 LtSdSlp(h/v):
 RtSdSlp(h/v):

--------------------------------------------------------------------------------
        Name: 12416           From Node: 12416         Length(ft): 1000.00
       Group: AC-MID            To Node: 12416U             Count: 1

              UPSTREAM        DOWNSTREAM           Friction Equation: Average Conveyance
    Geometry: Irregular       Irregular           Solution Algorithm: Automatic
  Invert(ft): 1.100           0.750                             Flow: Both
TClpInitZ(ft): 99.000         99.000                Contraction Coef: 0.000
  Manning's N:                                        Expansion Coef: 0.000
```

Top Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Bot Clip(ft):	0.000	0.000	Exit Loss Coef:	0.000
Main XSec:	12416	12416	Outlet Ctrl Spec:	Use dc or tw
AuxElev1(ft):	0.000	0.000	Inlet Ctrl Spec:	Use dn
Aux XSec1:			Stabilizer Option:	None
AuxElev2(ft):	0.000	0.000		
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):				
LtSdSlp(h/v):				
RtSdSlp(h/v):				

Name:	12416D	From Node: 12416D	Length(ft):	150.00
Group:	BASE	To Node: 12482	Count:	1
	UPSTREAM	DOWNSTREAM		
Geometry:	Irregular	Irregular	Friction Equation:	Average Conveyance
Invert(ft):	0.750	0.700	Solution Algorithm:	Automatic
TClpInitZ(ft):	99.000	99.000	Flow:	Both
Manning's N:			Contraction Coef:	0.000
Top Clip(ft):	0.000	0.000	Expansion Coef:	0.000
Bot Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Main XSec:	12416	12416-N	Exit Loss Coef:	0.000
AuxElev1(ft):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Aux XSec1:			Inlet Ctrl Spec:	Use dn
AuxElev2(ft):	0.000	0.000	Stabilizer Option:	None
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):				
LtSdSlp(h/v):				
RtSdSlp(h/v):				

PROPOSED MODEL - 1 FT WEIRS
EXISTING CROSS SECTIONS
WEIR INPUT DATA

```
        Name: 12102-W              From Node: 12102U
       Group: AC-SVNW                To Node: 12102D
        Flow: Both                     Count: 1
        Type: Horizontal            Geometry: Rectangular

               Span(in): 12.00
               Rise(in): 99.00
             Invert(ft): 3.470
   Control Elevation(ft): 3.470
                                         TABLE
        Bottom Clip(in): 0.000
           Top Clip(in): 0.000
     Weir Discharge Coef: 2.800
  Orifice Discharge Coef: 0.600
```

```
        Name: 12240-W              From Node: 12240U
       Group: AC-BRIAR               To Node: 12240D
        Flow: Both                     Count: 1
        Type: Horizontal            Geometry: Rectangular

               Span(in): 15.00
               Rise(in): 99.00
             Invert(ft): 4.230
   Control Elevation(ft): 4.230
                                         TABLE
        Bottom Clip(in): 0.000
           Top Clip(in): 0.000
     Weir Discharge Coef: 2.800
  Orifice Discharge Coef: 0.600
```

```
        Name: 12404-W              From Node: 12404U
       Group: AC-MID                 To Node: 12404D
        Flow: Both                     Count: 1
        Type: Horizontal            Geometry: Rectangular

               Span(in): 10.00
               Rise(in): 99.00
             Invert(ft): 1.620
   Control Elevation(ft): 1.620
                                         TABLE
        Bottom Clip(in): 0.000
           Top Clip(in): 0.000
     Weir Discharge Coef: 2.800
  Orifice Discharge Coef: 0.600
```

```
----------------------------------------------------------------------------------------------
        Name: 12416-W              From Node: 12416U
       Group: RC-MID                 To Node: 12416D
        Flow: Both                     Count: 1
        Type: Horizontal            Geometry: Rectangular

                 Span(in): 20.00
                 Rise(in): 99.00
               Invert(ft): 0.750
     Control Elevation(ft): 0.750
                                                TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
      Weir Discharge Coef: 2.800
   Orifice Discharge Coef: 0.600
```

Existing Conditions Model

ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
UPDATED PIPE INPUT FOR SYSTEM 2

```
        Name: 12202_SOUTH_1_P      From Node: 12202_SOUTH          Length(ft): 40.00
       Group: AC-LOW                 To Node: 12202                     Count: 1
                                                            Friction Equation: Average Conveyance
              UPSTREAM         DOWNSTREAM                  Solution Algorithm: Automatic
    Geometry: Circular         Circular                                  Flow: Both
    Span(in): 24.00            24.00                       Entrance Loss Coef: 0.70
    Rise(in): 24.00            24.00                           Exit Loss Coef: 0.00
  Invert(ft): 2.270            1.270                           Bend Loss Coef: 0.00
 Manning's N: 0.020000         0.020000                      Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000            0.000                          Inlet Ctrl Spec: Use dn
Bot Clip(in): 0.000            0.000                       Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular CMP: Projecting

Downstream FHWA Inlet Edge Description:
Circular CMP: Projecting

```
        Name: 12202_SOUTH_2_P      From Node: 12202_SOUTH          Length(ft): 40.00
       Group: AC-LOW                 To Node: 12202                     Count: 1
                                                            Friction Equation: Average Conveyance
              UPSTREAM         DOWNSTREAM                  Solution Algorithm: Automatic
    Geometry: Circular         Circular                                  Flow: Both
    Span(in): 24.00            24.00                       Entrance Loss Coef: 0.70
    Rise(in): 24.00            24.00                           Exit Loss Coef: 0.00
  Invert(ft): 2.370            1.440                           Bend Loss Coef: 0.00
 Manning's N: 0.020000         0.020000                      Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000            0.000                          Inlet Ctrl Spec: Use dn
Bot Clip(in): 0.000            0.000                       Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular CMP: Projecting

Downstream FHWA Inlet Edge Description:
Circular CMP: Projecting

Name: 12202_SOUTH Base Flow(cfs): 0.000 Init Stage(ft): 3.000
Group: AC-LOW Warn Stage(ft): 10.000
Type: Stage/Area

used data from node 12203

Stage(ft)	Area(ac)

ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
UPDATED WEIR INPUT FOR SYSTEM 2

```
     Name: 12202_SOUTH_W         From Node: 12202_SOUTH
    Group: AC-LOW                  To Node: 12202
     Flow: Both                      Count: 1
     Type: Vertical: Fread        Geometry: Rectangular

                 Span(in): 30.00
                 Rise(in): 9999.00
               Invert(ft): 7.380
    Control Elevation(ft): 7.380
                                            TABLE
           Bottom Clip(in): 0.000
              Top Clip(in): 0.000
       Weir Discharge Coef: 3.200
    Orifice Discharge Coef: 0.600
```

overflow weir

Name: 12102-X Group: AC-SVNW
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
0.000	14.000	0.045000
12.000	4.700	0.045000
24.000	4.300	0.035000
35.000	13.600	0.045000

Name: 12203 Group: AC-LOW
Encroachment: No

460' north of parkmere blvd

Station(ft)	Elevation(ft)	Manning's N
1000.000	12.700	0.080000
1010.000	11.500	0.080000
1025.000	6.100	0.080000
1027.000	3.000	0.065000
1033.000	5.400	0.065000
1040.000	8.500	0.080000
1045.000	9.800	0.080000

Name: 12203-D Group: AC-LOW
Encroachment: No

just south of alligator creek

Station(ft)	Elevation(ft)	Manning's N
1000.000	8.800	0.155000
1025.000	8.700	0.155000
1035.000	3.000	0.155000
1043.000	1.500	0.155000
1045.000	1.500	0.155000
1050.000	6.900	0.155000
1056.000	8.300	0.155000

Name: 12205 Group: AC-LOW
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
1000.000	11.300	0.065000
1009.000	6.700	0.065000
1020.000	6.500	0.060000
1040.000	6.700	0.060000
1048.000	9.500	0.050000

Name: 12205-DS Group: AC-LOW
Encroachment: No

460' north of parkmere blvd

Station(ft)	Elevation(ft)	Manning's N
1000.000	12.700	0.065000
1010.000	11.500	0.065000
1025.000	6.100	0.065000
1027.000	3.000	0.060000
1033.000	5.400	0.060000
1040.000	8.500	0.050000
1045.000	9.800	0.050000

Name: 12240-X Group: AC-BRIAR
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
0.000	12.000	0.000000
10.000	11.000	0.045000
20.000	10.000	0.045000
30.000	5.000	0.045000
35.000	4.900	0.045000
40.000	5.000	0.045000
49.000	10.000	0.045000
55.000	11.000	0.045000
61.000	12.000	0.045000
70.000	13.000	0.045000

Name: 12404 Group: AC-MID
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
1000.000	10.000	0.035000
1013.000	2.600	0.035000
1016.500	2.400	0.030000
1020.000	2.640	0.030000
1028.000	8.600	0.040000

Name: 12404-D Group: AC-MID
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
1000.000	7.900	0.030000
1013.000	1.100	0.030000
1016.000	0.800	0.030000
1019.000	1.200	0.030000
1032.000	9.200	0.040000

Name: 12405 Group: AC-MID
Encroachment: No

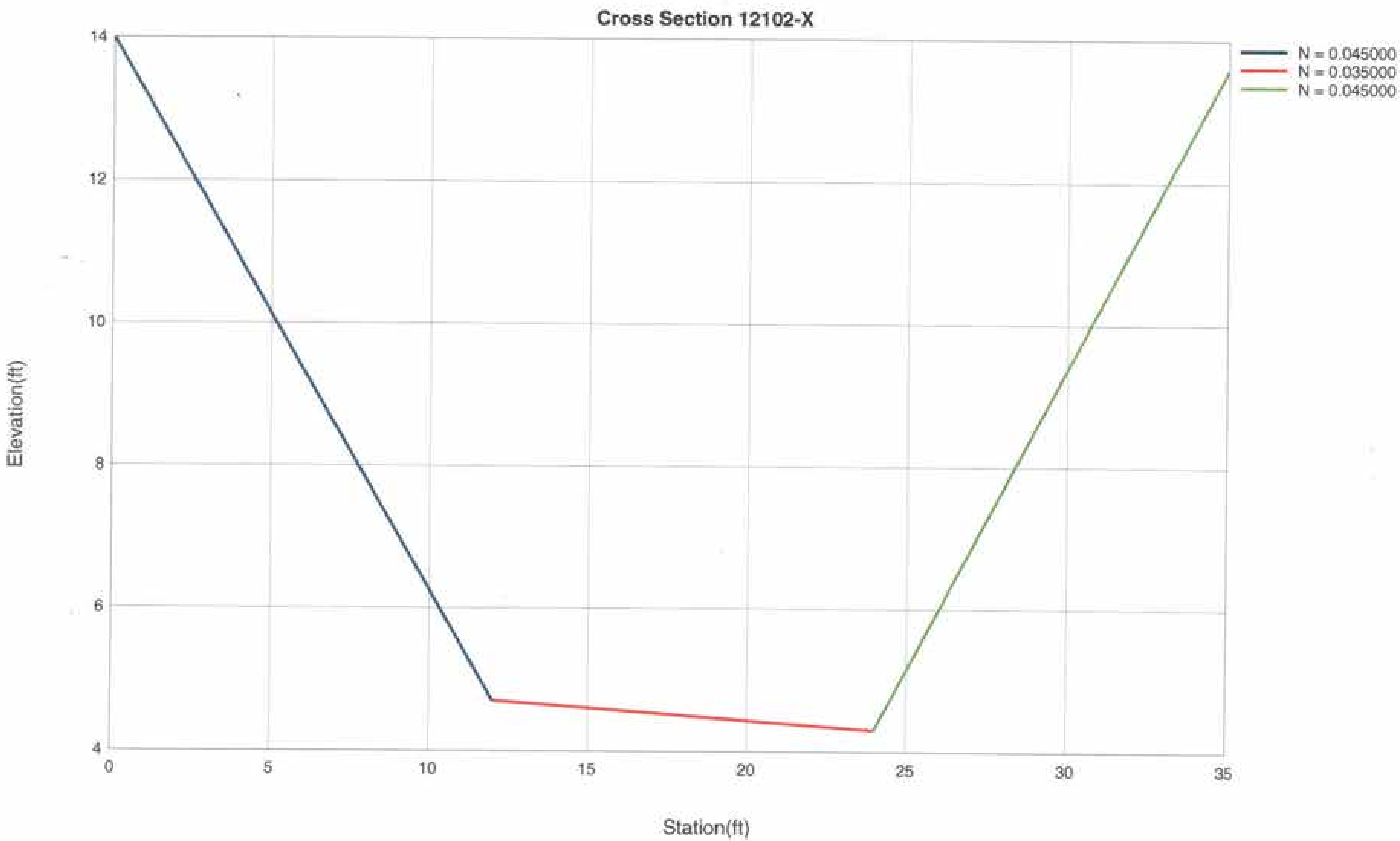
Station(ft)	Elevation(ft)	Manning's N
1000.000	12.000	0.030000
1008.000	4.100	0.030000
1014.000	4.400	0.030000
1027.000	11.400	0.040000

Name: 12416 Group: AC-MID
Encroachment: No

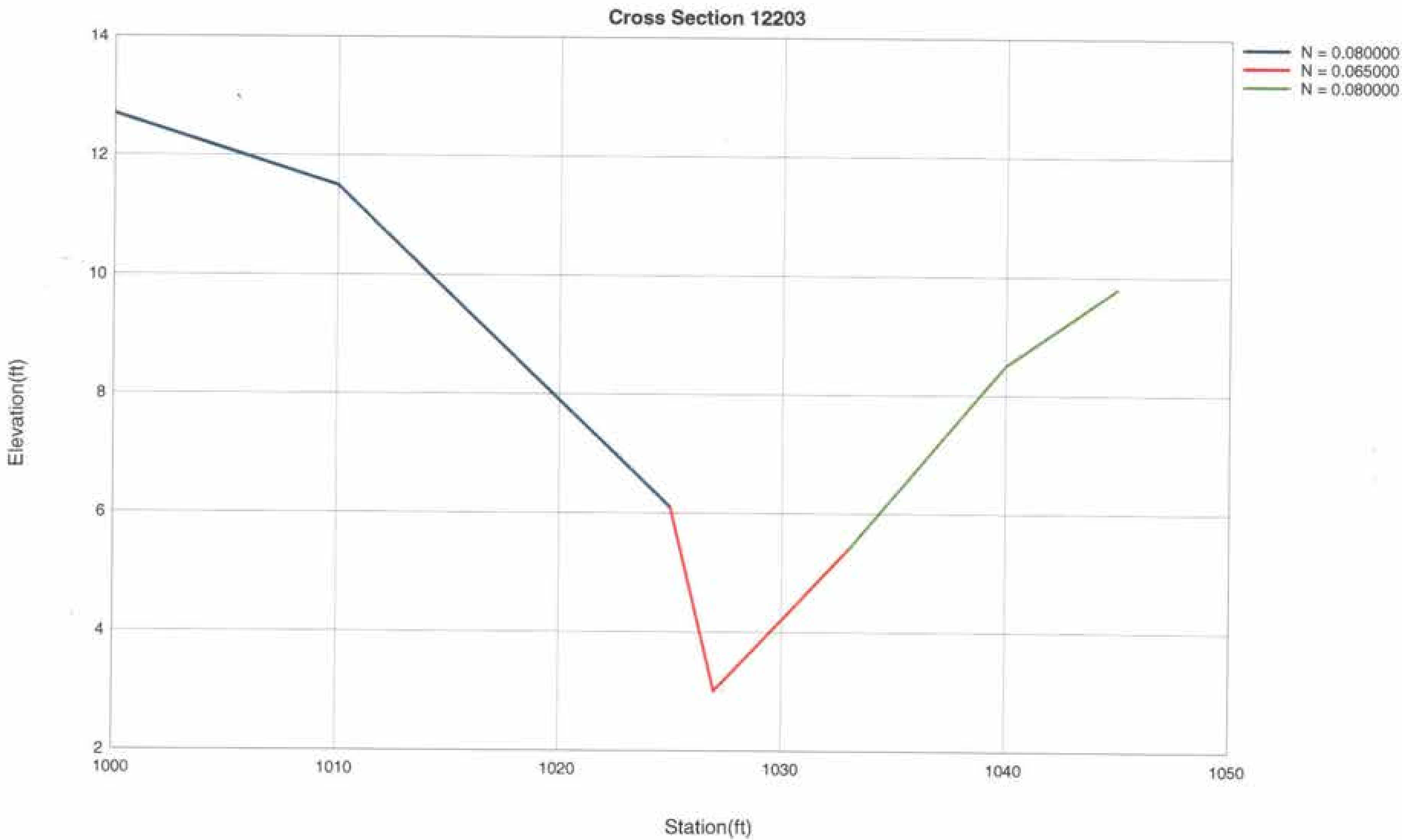
Station(ft)	Elevation(ft)	Manning's N
1000.000	10.500	0.035000
1013.000	2.400	0.035000
1017.000	1.100	0.030000
1022.000	1.700	0.030000
1035.000	9.700	0.060000

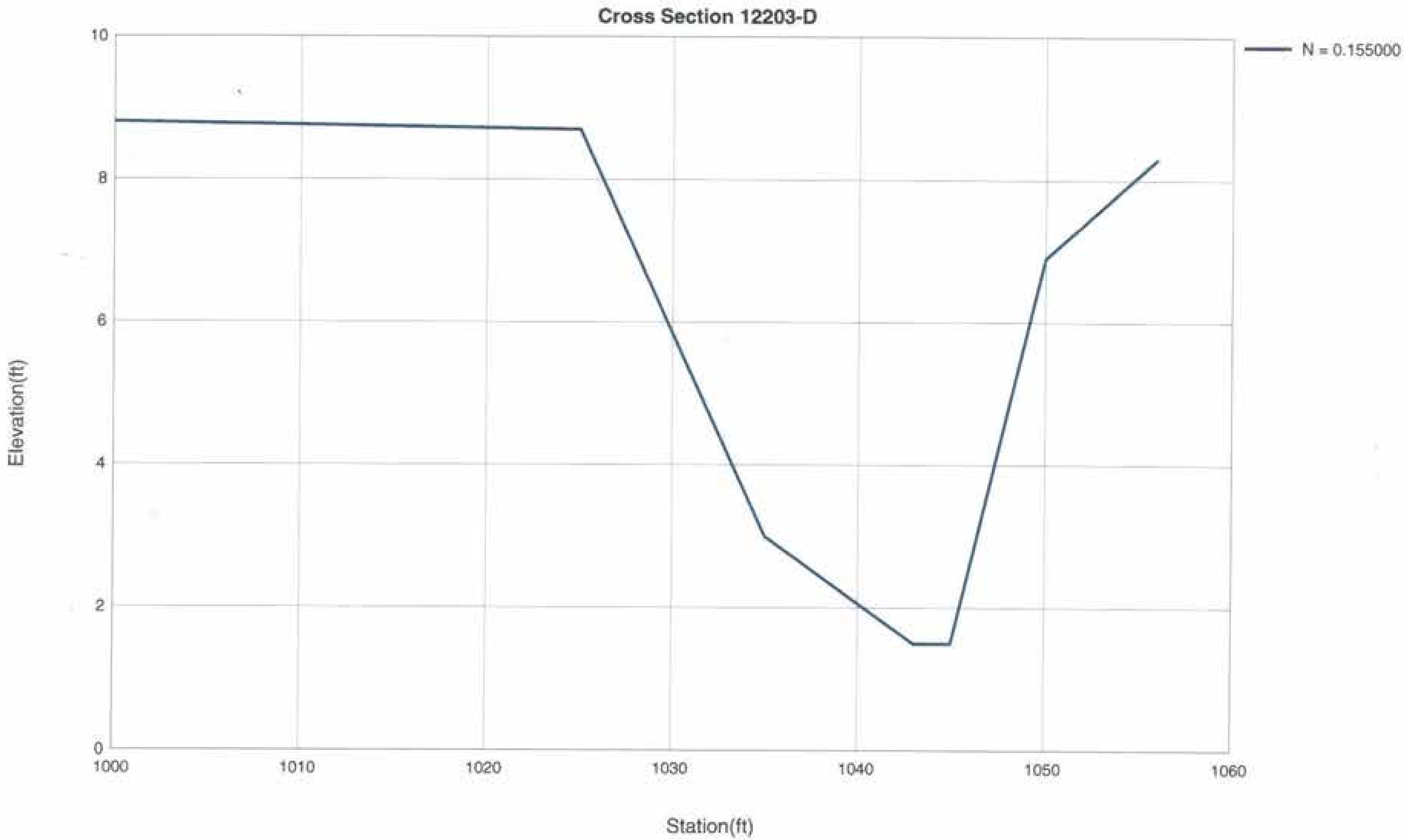
Name: 12416-N Group: AC-MID
Encroachment: No

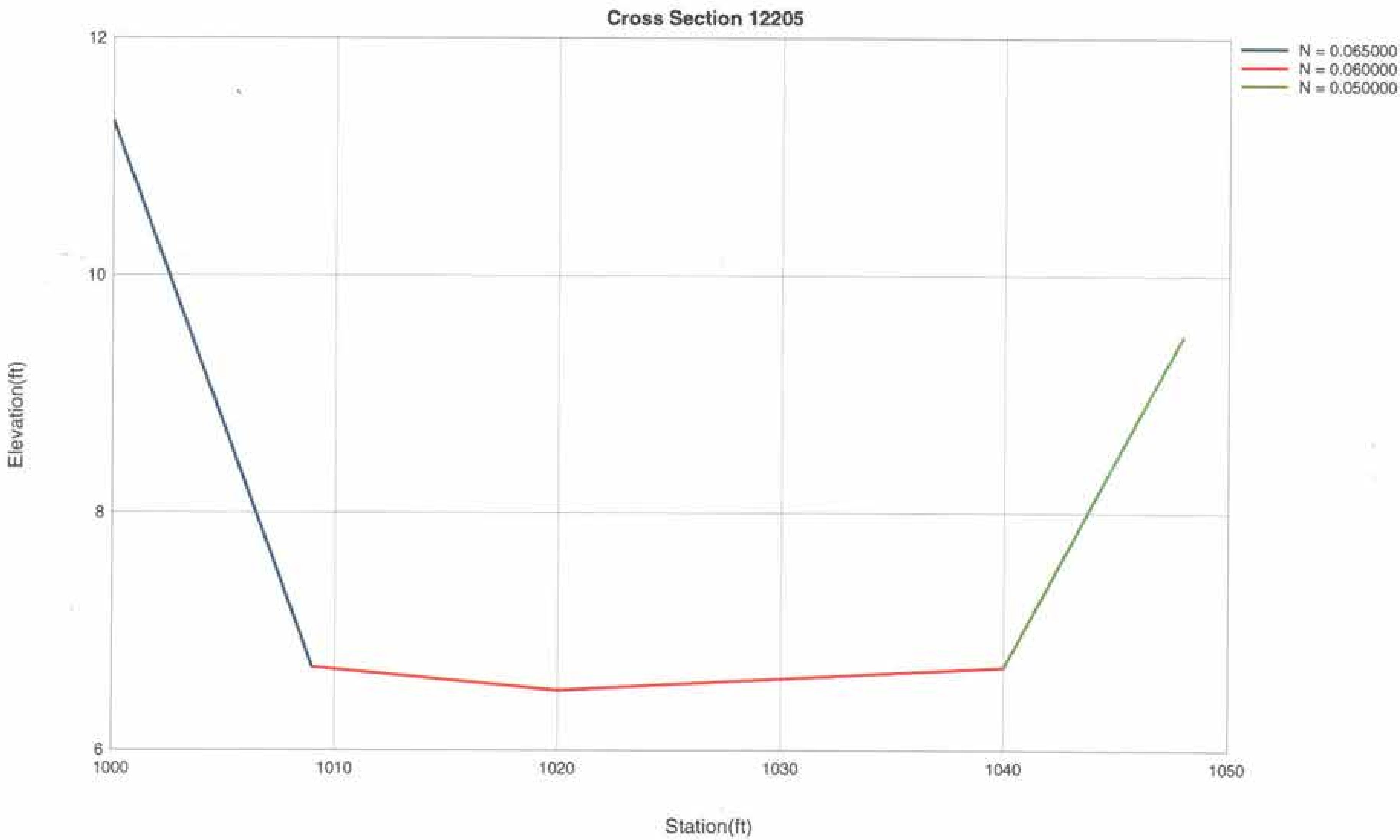
Station(ft)	Elevation(ft)	Manning's N
1000.000	8.700	0.035000
1016.000	1.300	0.035000
1024.000	0.700	0.030000
1033.000	0.900	0.030000
1041.000	6.000	0.060000


Cross Section 12102-X
14
12
10
8
6
4
Elevation(ft)
0
5
10
15
20
25
30
35
Station(ft)
N = 0.045000
N = 0.035000
N = 0.045000

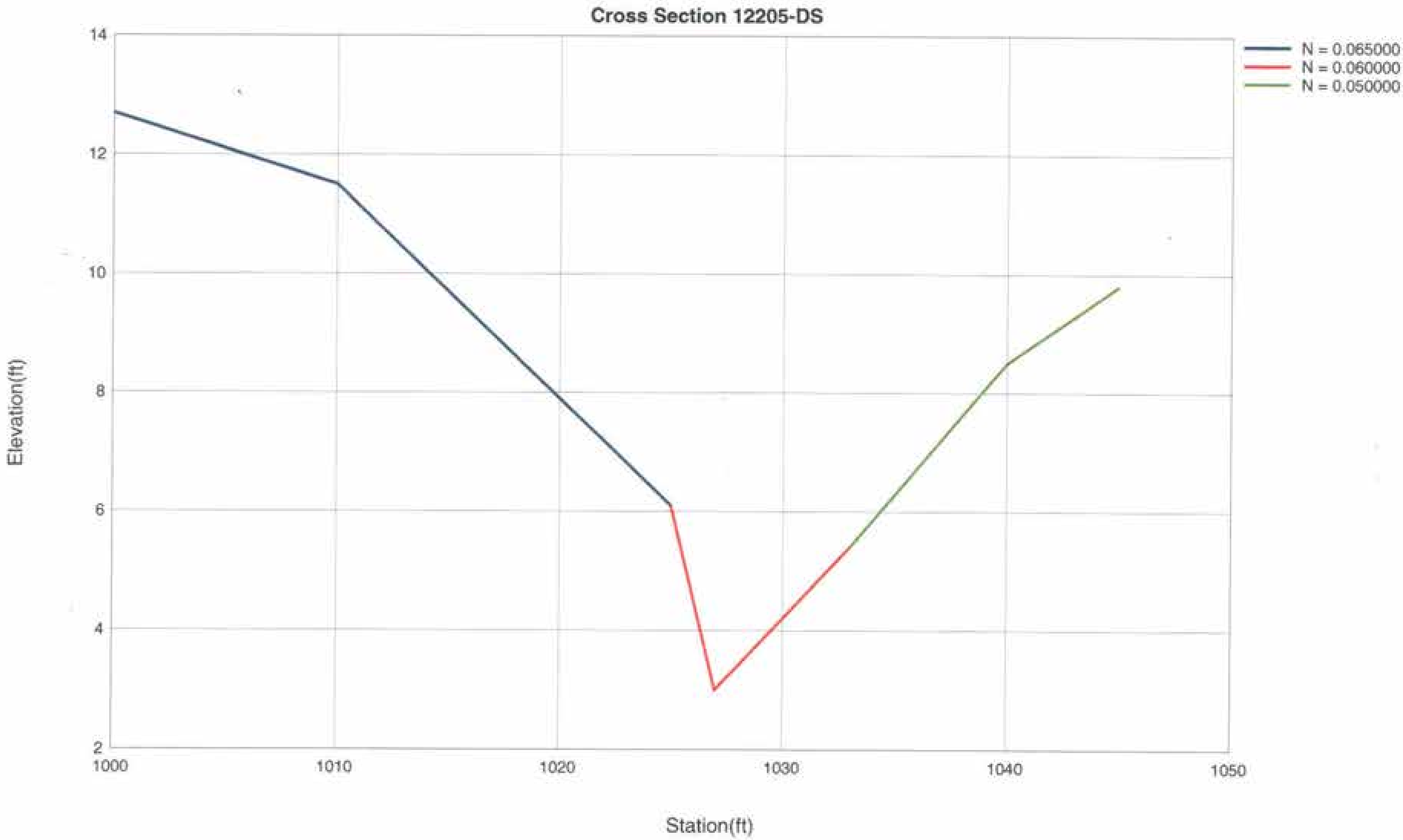
ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
CROSS SECTIONS



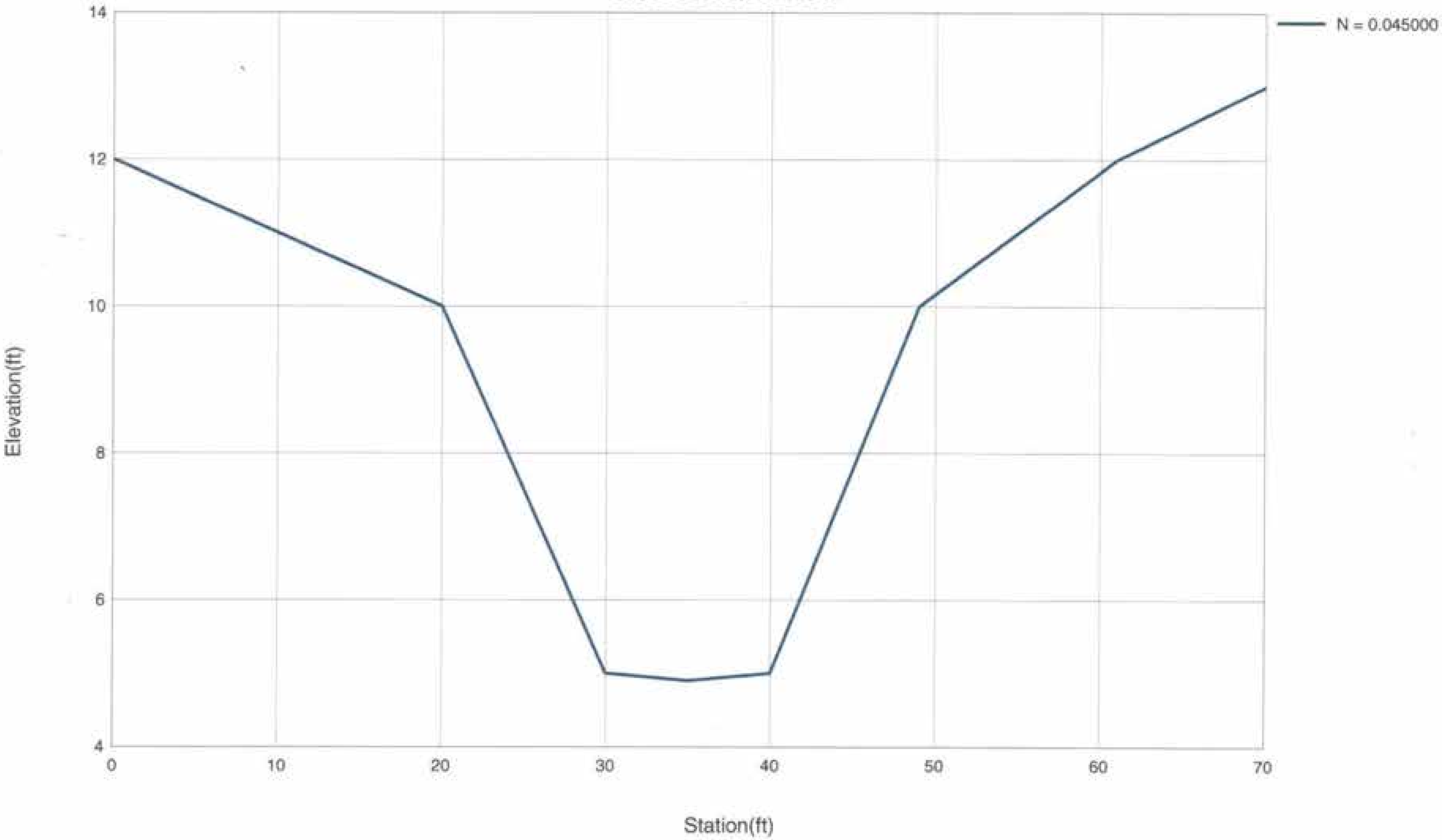

Cross Section 12203-D
N = 0.155000
Elevation(ft)
10
8
6
4
2
0
1000
1010
1020
1030
1040
1050
1060
Station(ft)


Cross Section 12205
12
10
8
6
Elevation(ft)
1000
1010
1020
1030
1040
1050
Station(ft)
N = 0.065000
N = 0.060000
N = 0.050000

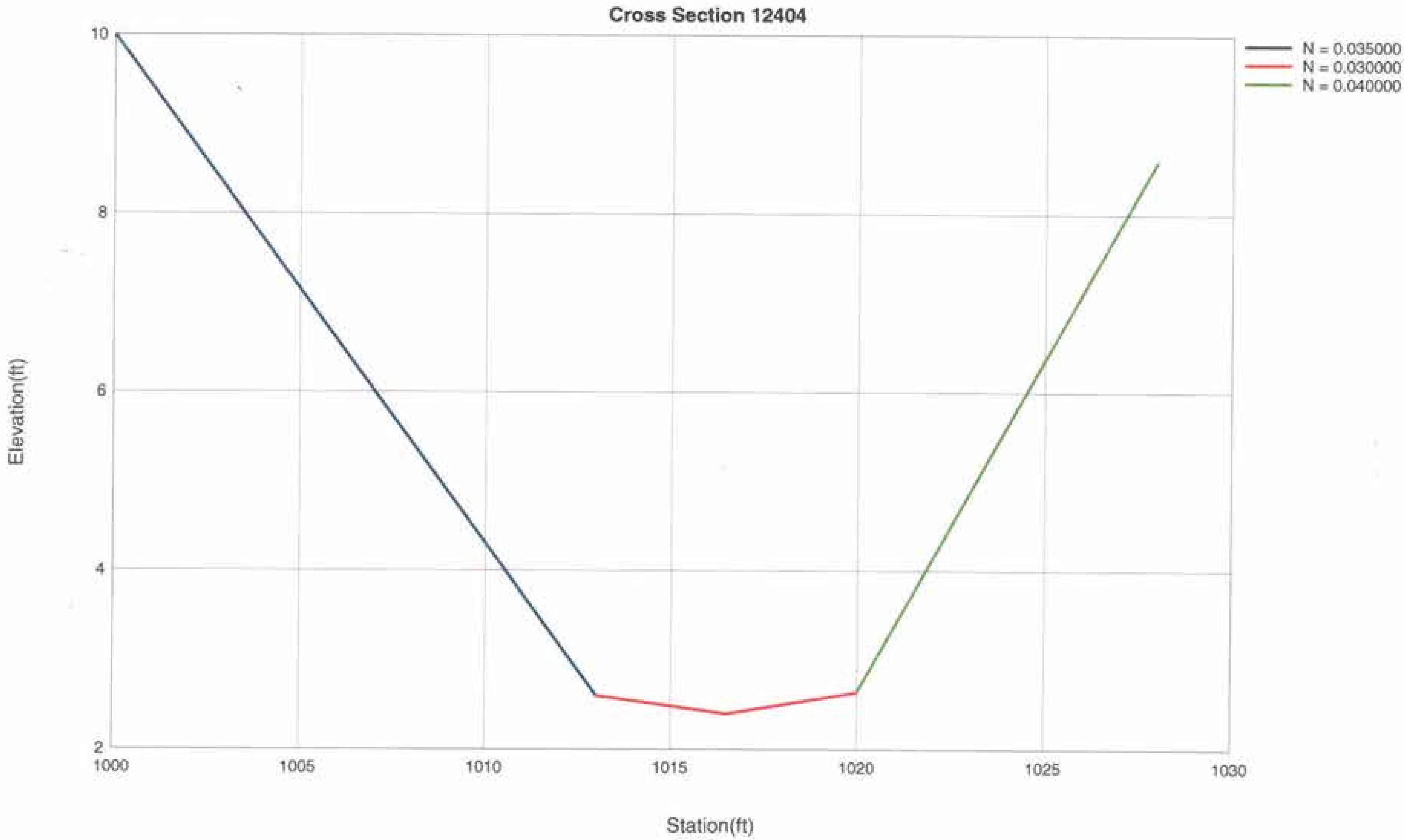
ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
CROSS SECTIONS



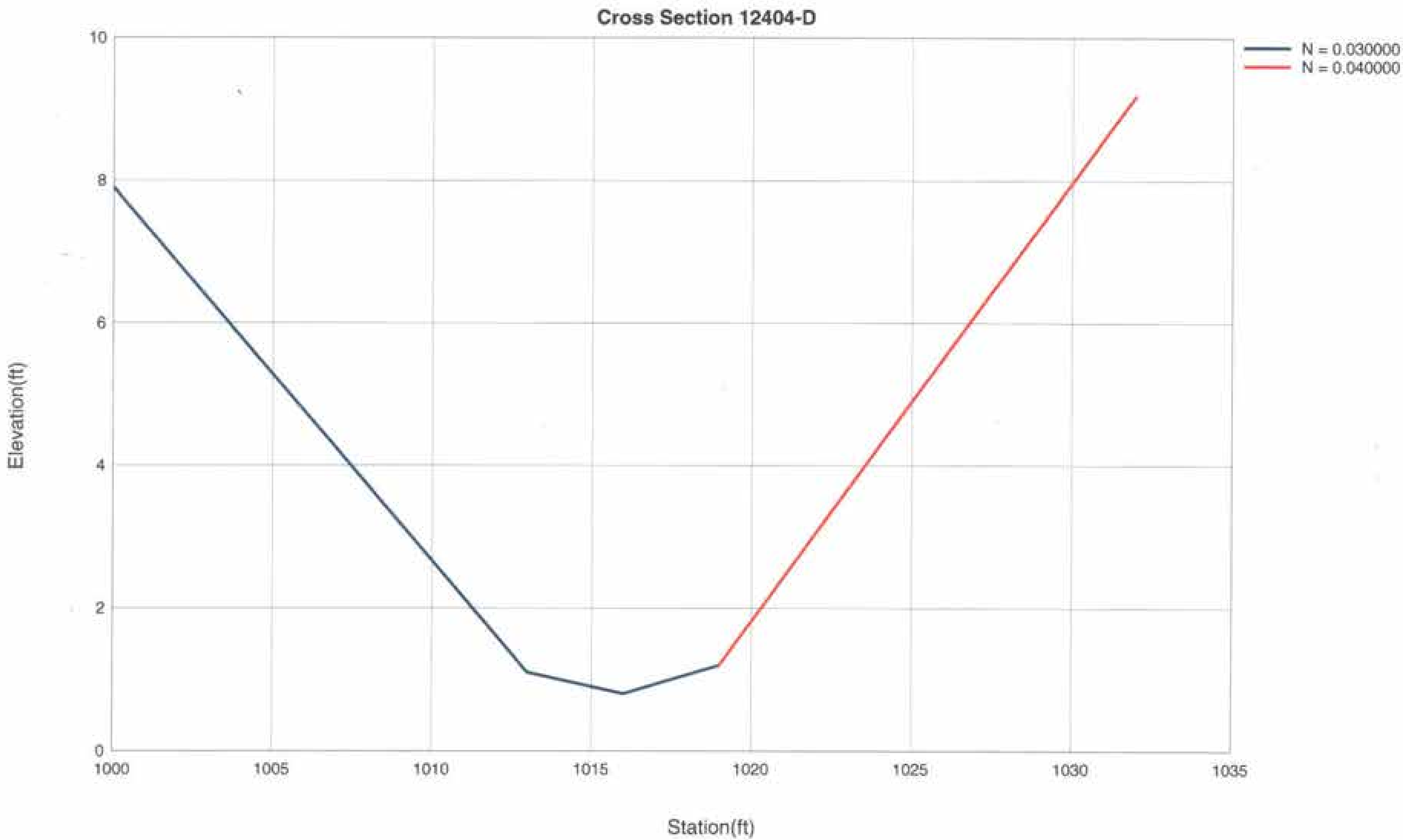
Cross Section 12240-X



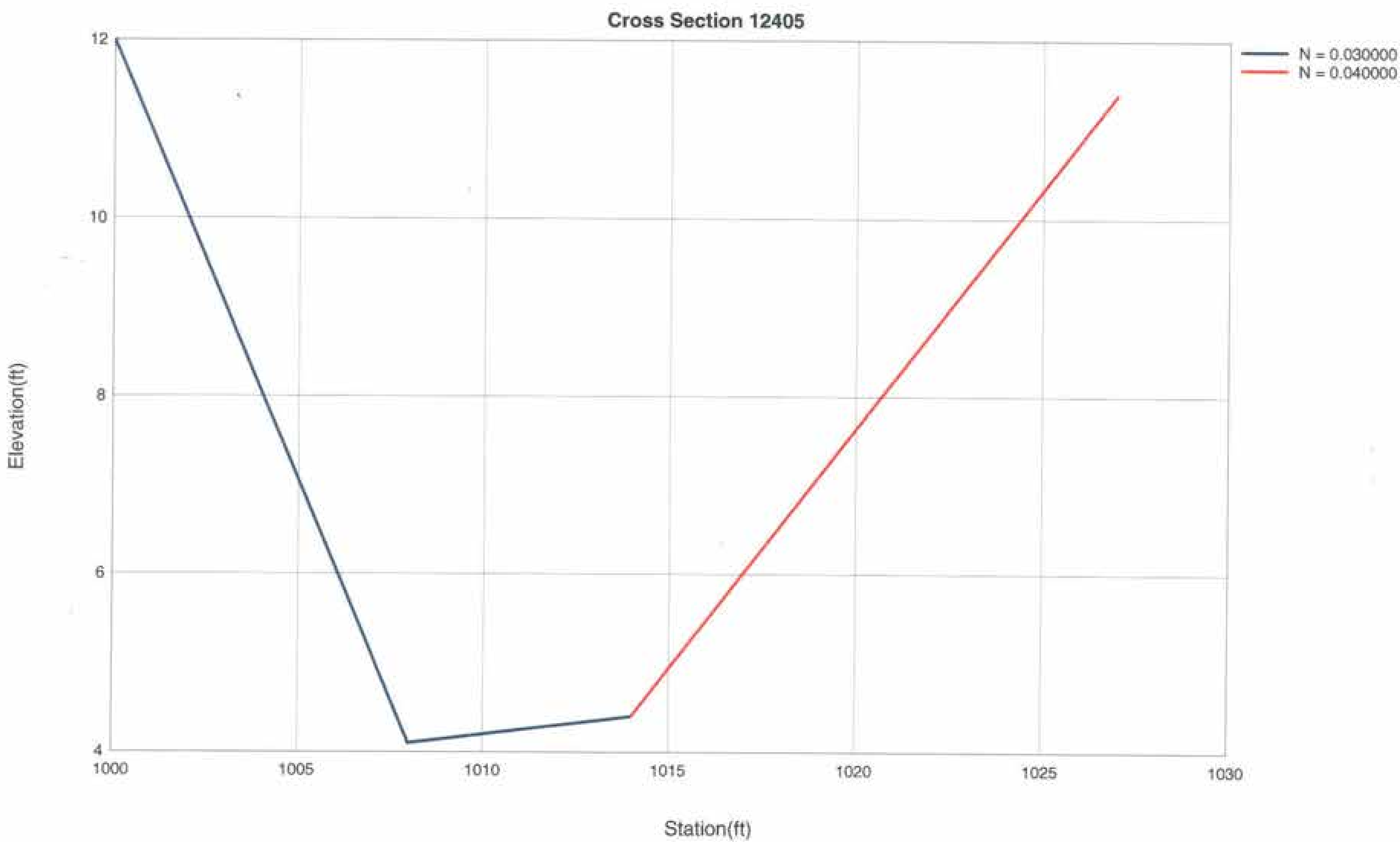
ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
CROSS SECTIONS



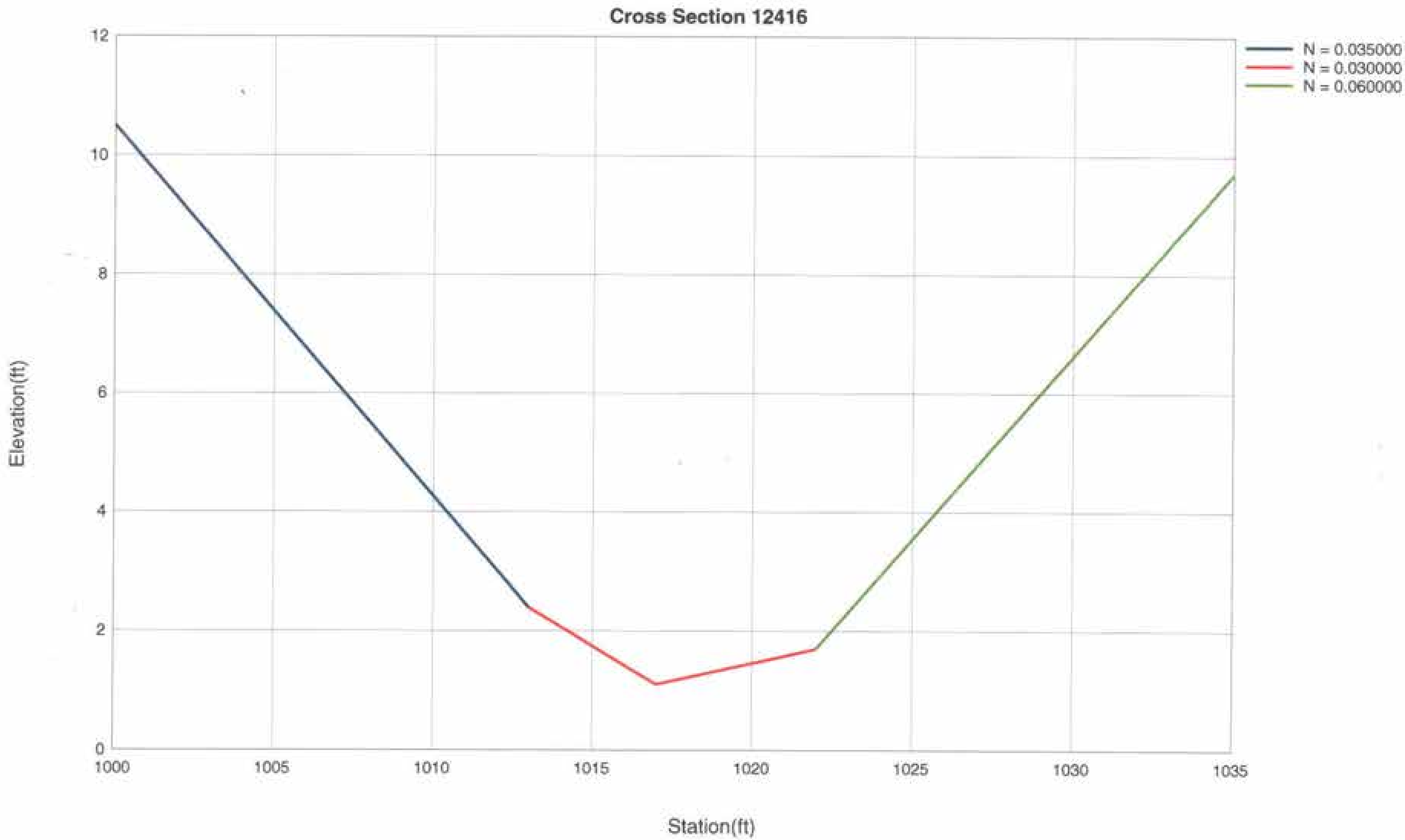
ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
CROSS SECTIONS



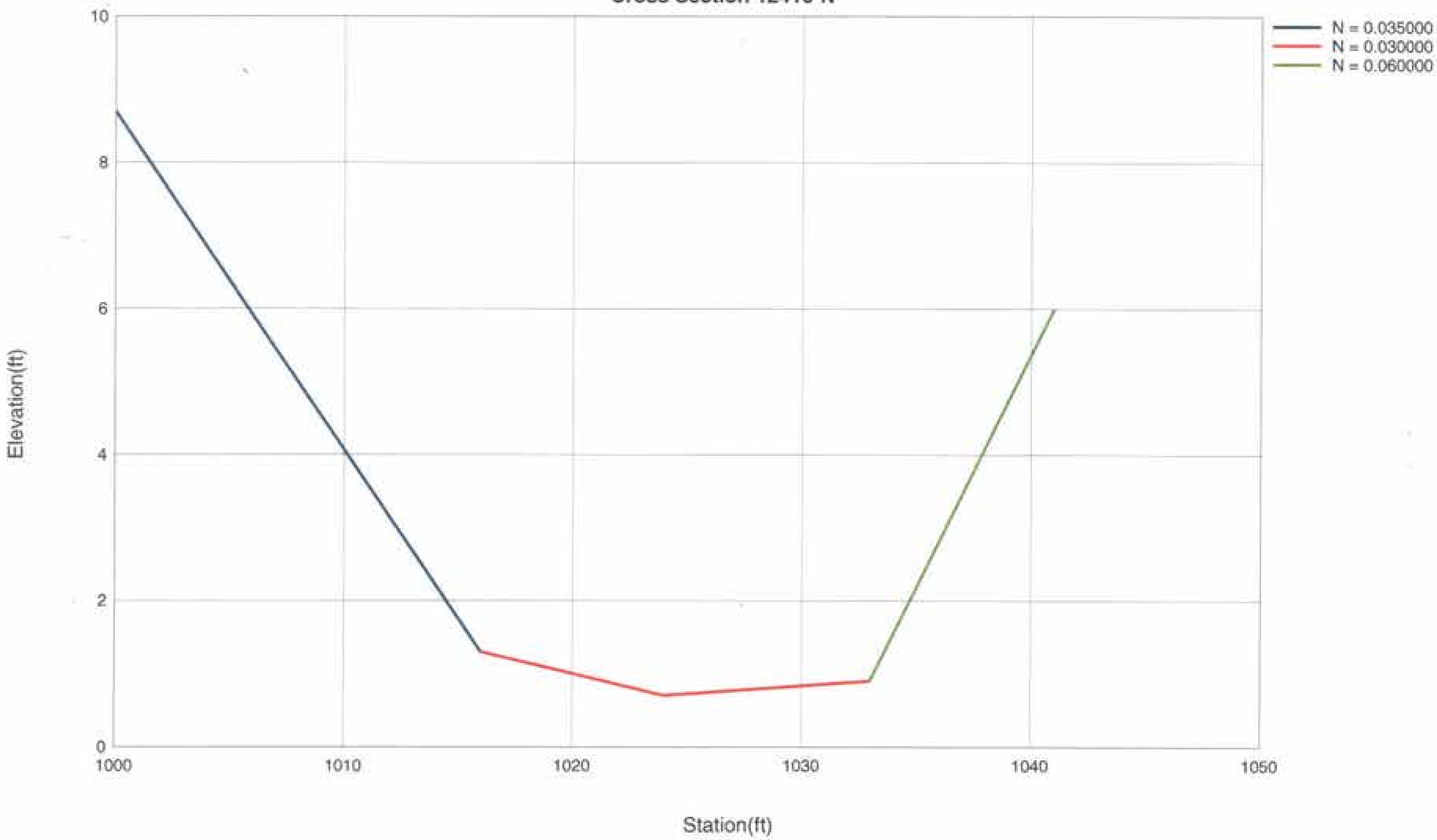
ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
CROSS SECTIONS



ALLIGATOR CREEK
EXISTING CONDITIONS MODEL
CROSS SECTIONS



Cross Section 12416-N



Proposed Conditions
Cross Sections with Treatments -No Weirs

ALLIGATOR CREEK
PROPOSED CONDITIONS MODEL
WITH ALTERNATIVE CROSS SECTIONS
UPDATED PIPE INPUT FOR SYSTEM 2

```
        Name: 12202_SOUTH_1_P     From Node: 12202_SOUTH        Length(ft): 40.00
       Group: AC-LOW                To Node: 12202                   Count: 1
                                                       Friction Equation: Average Conveyance
              UPSTREAM         DOWNSTREAM             Solution Algorithm: Automatic
    Geometry: Circular         Circular                             Flow: Both
    Span(in): 24.00            24.00                 Entrance Loss Coef: 0.70
    Rise(in): 24.00            24.00                     Exit Loss Coef: 0.00
  Invert(ft): 2.270            1.270                     Bend Loss Coef: 0.00
 Manning's N: 0.020000         0.020000                Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000            0.000                    Inlet Ctrl Spec: Use dn
Bot Clip(in): 0.000            0.000                  Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular CMP: Projecting

Downstream FHWA Inlet Edge Description:
Circular CMP: Projecting

```
        Name: 12202_SOUTH_2_P     From Node: 12202_SOUTH        Length(ft): 40.00
       Group: AC-LOW                To Node: 12202                   Count: 1
                                                       Friction Equation: Average Conveyance
              UPSTREAM         DOWNSTREAM             Solution Algorithm: Automatic
    Geometry: Circular         Circular                             Flow: Both
    Span(in): 24.00            24.00                 Entrance Loss Coef: 0.70
    Rise(in): 24.00            24.00                     Exit Loss Coef: 0.00
  Invert(ft): 2.370            1.440                     Bend Loss Coef: 0.00
 Manning's N: 0.020000         0.020000                Outlet Ctrl Spec: Use dc or tw
Top Clip(in): 0.000            0.000                    Inlet Ctrl Spec: Use dn
Bot Clip(in): 0.000            0.000                  Stabilizer Option: None
```

Upstream FHWA Inlet Edge Description:
Circular CMP: Projecting

Downstream FHWA Inlet Edge Description:
Circular CMP: Projecting

Name: 12202_SOUTH   Base Flow(cfs): 0.000   Init Stage(ft): 3.000
Group: AC-LOW   Warn Stage(ft): 10.000
Type: Stage/Area

used data from node 12203

Stage(ft)	Area(ac)

ALLIGATOR CREEK
PROPOSED CONDITIONS MODEL
WITH ALTERNATIVE CROSS SECTIONS
UPDATED WEIR INPUT FOR SYSTEM 2

```
         Name: 12202_SOUTH_W        From Node: 12202_SOUTH
        Group: AC-LOW                 To Node: 12202
         Flow: Both                     Count: 1
         Type: Vertical: Fread       Geometry: Rectangular

                   Span(in): 30.00
                   Rise(in): 9999.00
                 Invert(ft): 7.380
      Control Elevation(ft): 7.380
                                          TABLE
            Bottom Clip(in): 0.000
               Top Clip(in): 0.000
        Weir Discharge Coef: 3.200
     Orifice Discharge Coef: 0.600
```

overflow weir

Name: 12102 Base Flow(cfs): 0.000 Init Stage(ft): 4.300
Group: AC-SVNW Warn Stage(ft): 0.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: 12102U Base Flow(cfs): 0.000 Init Stage(ft): 3.470
Group: AC-SVNW Warn Stage(ft): 0.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: 12202 Base Flow(cfs): 0.000 Init Stage(ft): 2.500
Group: AC-LOW Warn Stage(ft): 10.000
Type: Stage/Area

west of Jacaranda

Stage(ft)	Area(ac)
8.000	0.5600
9.000	2.7700
10.000	3.5200

Name: 12202_SOUTH Base Flow(cfs): 0.000 Init Stage(ft): 3.000
Group: AC-LOW Warn Stage(ft): 10.000
Type: Stage/Area

used data from node 12203

Stage(ft)	Area(ac)

Name: 12203 Base Flow(cfs): 0.000 Init Stage(ft): 3.000
Group: AC-LOW Warn Stage(ft): 10.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: 12205
Group: AC-LOW
Type: Stage/Area

Base Flow(cfs): 0.000

Init Stage(ft): 4.130
Warn Stage(ft): 10.000

north of woodmere apts driveway to Jac.

Stage(ft)	Area(ac)

Name: 12240
Group: AC-BRIAR
Type: Stage/Area

Base Flow(cfs): 0.000

Init Stage(ft): 4.900
Warn Stage(ft): 0.000

Stage(ft)	Area(ac)

Name: 12240U
Group: AC-BRIAR
Type: Stage/Area

Base Flow(cfs): 0.000

Init Stage(ft): 3.230
Warn Stage(ft): 0.000

Stage(ft)	Area(ac)

Name: 12403
Group: AC-MID
Type: Stage/Area

Base Flow(cfs): 0.000

Init Stage(ft): 2.500
Warn Stage(ft): 10.000

Stage(ft)	Area(ac)
4.000	0.4000
5.000	1.5300
6.000	4.1700
7.000	8.2500
8.000	10.5300
9.000	12.3000
10.000	13.6800

Name: 12404 Base Flow(cfs): 0.000 Init Stage(ft): 2.500
Group: AC-MID Warn Stage(ft): 10.000
Type: Stage/Area

Stage(ft)	Area(ac)
9.000	0.0100
10.000	0.4100

Name: 12404U Base Flow(cfs): 0.000 Init Stage(ft): 1.620
Group: AC-MID Warn Stage(ft): 0.000
Type: Stage/Area

Stage(ft)	Area(ac)

Name: 12405 Base Flow(cfs): 0.000 Init Stage(ft): 4.100
Group: AC-MID Warn Stage(ft): 10.600
Type: Stage/Area

Stage(ft)	Area(ac)

Name: 12416 Base Flow(cfs): 0.000 Init Stage(ft): 2.500
Group: AC-MID Warn Stage(ft): 10.000
Type: Stage/Area

Stage(ft)	Area(ac)
9.500	0.9700
10.000	3.1100

Name: 12416U Base Flow(cfs): 0.000 Init Stage(ft): 2.500
Group: AC-MID Warn Stage(ft): 0.000
Type: Stage/Area

Stage(ft)	Area(ac)

```
         Name: 12102             From Node: 12102          Length(ft): 295.00
        Group: AC-SVNW             To Node: 12102U              Count: 1

               UPSTREAM         DOWNSTREAM              Friction Equation: Average Conveyance
     Geometry: Irregular        Irregular              Solution Algorithm: Automatic
   Invert(ft): 4.300            3.470                                Flow: Both
 TClpInitZ(ft): 99.000          99.000                  Contraction Coef: 0.100
   Manning's N:                                           Expansion Coef: 0.300
 Top Clip(ft): 0.000            0.000                 Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000            0.000                     Exit Loss Coef: 0.000
    Main XSec: 12102-X          12102-X                 Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft): 0.000            0.000                    Inlet Ctrl Spec: Use dn
    Aux XSec1:                                          Stabilizer Option: None
 AuxElev2(ft): 0.000            0.000
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft):
  LtSdSlp(h/v):
  RtSdSlp(h/v):

---------------------------------------------------------------------------------------------------
         Name: 12102D            From Node: 12102U         Length(ft): 200.00
        Group: AC-SVNW             To Node: 12100               Count: 1

               UPSTREAM         DOWNSTREAM              Friction Equation: Average Conveyance
     Geometry: Irregular        Irregular              Solution Algorithm: Automatic
   Invert(ft): 3.470            2.900                                Flow: Both
 TClpInitZ(ft): 99.000          99.000                  Contraction Coef: 0.100
   Manning's N:                                           Expansion Coef: 0.300
 Top Clip(ft): 0.000            0.000                 Entrance Loss Coef: 0.000
 Bot Clip(ft): 0.000            0.000                     Exit Loss Coef: 0.000
    Main XSec: 12102-X          12102-X                 Outlet Ctrl Spec: Use dc or tw
 AuxElev1(ft): 0.000            0.000                    Inlet Ctrl Spec: Use dn
    Aux XSec1:                                          Stabilizer Option: None
 AuxElev2(ft): 0.000            0.000
    Aux XSec2:
Top Width(ft):
    Depth(ft):
Bot Width(ft):
  LtSdSlp(h/v):
  RtSdSlp(h/v):

---------------------------------------------------------------------------------------------------
         Name: 12202             From Node: 12202          Length(ft): 1200.00
```

```
         Group: AC-LOW               To Node: 12197              Count: 1

                UPSTREAM     DOWNSTREAM               Friction Equation: Average Conveyance
      Geometry: Irregular    Irregular               Solution Algorithm: Automatic
    Invert(ft): -1.200       -0.200                                Flow: Both
 TClpInitZ(ft): 99.000       99.000                    Contraction Coef: 0.100
   Manning's N:                                          Expansion Coef: 0.300
  Top Clip(ft): 0.000        0.000                   Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000        0.000                       Exit Loss Coef: 0.000
     Main XSec: 12202        12197                     Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft): 0.000        0.000                      Inlet Ctrl Spec: Use dn
     Aux XSec1:                                       Stabilizer Option: None
  AuxElev2(ft): 0.000        0.000
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft):
  LtSdSlp(h/v):
  RtSdSlp(h/v):

west of Jacaranda

--------------------------------------------------------------------------------------------------
          Name: 12203              From Node: 12203            Length(ft): 320.00
         Group: AC-LOW               To Node: 12202_SOUTH           Count: 1

                UPSTREAM     DOWNSTREAM               Friction Equation: Average Conveyance
      Geometry: Irregular    Irregular               Solution Algorithm: Automatic
    Invert(ft): 3.000        1.500                                 Flow: Both
 TClpInitZ(ft): 999.000      999.000                   Contraction Coef: 0.100
   Manning's N:                                          Expansion Coef: 0.300
  Top Clip(ft): 0.000        0.000                   Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000        0.000                       Exit Loss Coef: 0.000
     Main XSec: 12203_expand 12203_expand              Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft): 0.000        0.000                      Inlet Ctrl Spec: Use dn
     Aux XSec1:                                       Stabilizer Option: None
  AuxElev2(ft): 0.000        0.000
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft):
  LtSdSlp(h/v):
  RtSdSlp(h/v):

west of dog park

--------------------------------------------------------------------------------------------------
          Name: 12205              From Node: 12205            Length(ft): 460.00
         Group: AC-LOW               To Node: 12203                 Count: 1
```

```
                UPSTREAM        DOWNSTREAM                   Friction Equation: Average Conveyance
      Geometry: Irregular       Irregular                   Solution Algorithm: Automatic
    Invert(ft): 6.500           3.000                                     Flow: Both
 TClpInitZ(ft): 99.000          99.000                        Contraction Coef: 0.100
   Manning's N:                                                 Expansion Coef: 0.300
  Top Clip(ft): 0.000           0.000                       Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000           0.000                           Exit Loss Coef: 0.000
     Main XSec: 12205_prop      12205_prop                   Outlet Ctrl Spec: Use dc or tw
  AuxElev1(ft): 0.000           0.000                         Inlet Ctrl Spec: Use dn
     Aux XSec1:                                              Stabilizer Option: None
  AuxElev2(ft): 0.000           0.000
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft):
  LtSdSlp(h/v):
  RtSdSlp(h/v):

next to woodmere park

---------------------------------------------------------------------------------------------------
          Name: 12240              From Node: 12240                Length(ft): 659.00
         Group: AC-BRIAR             To Node: 12240U                    Count: 1

                UPSTREAM        DOWNSTREAM                   Friction Equation: Average Conveyance
      Geometry: Irregular       Irregular                   Solution Algorithm: Automatic
    Invert(ft): 4.900           3.890                                     Flow: Both
 TClpInitZ(ft): 99.000          99.000                        Contraction Coef: 0.100
   Manning's N:                                                 Expansion Coef: 0.300
  Top Clip(ft): 0.000           0.000                       Entrance Loss Coef: 0.000
  Bot Clip(ft): 0.000           0.000                           Exit Loss Coef: 0.000
     Main XSec: 12240-X         12240-X                      Outlet Ctrl Spec: Use dn or tw
  AuxElev1(ft): 0.000           0.000                         Inlet Ctrl Spec: Use dn
     Aux XSec1:                                              Stabilizer Option: None
  AuxElev2(ft): 0.000           0.000
     Aux XSec2:
 Top Width(ft):
     Depth(ft):
 Bot Width(ft):
  LtSdSlp(h/v):
  RtSdSlp(h/v):

---------------------------------------------------------------------------------------------------
          Name: 12240D             From Node: 12240U               Length(ft): 641.00
         Group: AC-BRIAR             To Node: 12193                     Count: 1
```

	UPSTREAM	DOWNSTREAM		
Geometry:	Irregular	Irregular	Friction Equation:	Average Conveyance
Invert(ft):	3.890	2.900	Solution Algorithm:	Automatic
TClpInitZ(ft):	99.000	99.000	Flow:	Both
Manning's N:			Contraction Coef:	0.100
Top Clip(ft):	0.000	0.000	Expansion Coef:	0.300
Bot Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Main XSec:	12240-X	12140-X	Exit Loss Coef:	0.000
AuxElev1(ft):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Aux XSec1:			Inlet Ctrl Spec:	Use dn
AuxElev2(ft):	0.000	0.000	Stabilizer Option:	None
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):				
LtSdSlp(h/v):				
RtSdSlp(h/v):				

Name: 12404 From Node: 12404 Length(ft): 170.00
Group: AC-MID To Node: 12404U Count: 1

	UPSTREAM	DOWNSTREAM		
Geometry:	Irregular	Irregular	Friction Equation:	Average Conveyance
Invert(ft):	2.400	1.620	Solution Algorithm:	Automatic
TClpInitZ(ft):	99.000	99.000	Flow:	Both
Manning's N:			Contraction Coef:	0.000
Top Clip(ft):	0.000	0.000	Expansion Coef:	0.000
Bot Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Main XSec:	12404	12404	Exit Loss Coef:	0.000
AuxElev1(ft):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Aux XSec1:			Inlet Ctrl Spec:	Use dn
AuxElev2(ft):	0.000	0.000	Stabilizer Option:	None
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):				
LtSdSlp(h/v):				
RtSdSlp(h/v):				

Name: 12404D From Node: 12404U Length(ft): 180.00
Group: AC-MID To Node: 12403 Count: 1

	UPSTREAM	DOWNSTREAM		
			Friction Equation:	Average Conveyance

Geometry:	Irregular	Irregular	Solution Algorithm:	Automatic
Invert(ft):	1.620	0.800	Flow:	Both
TClpInitZ(ft):	99.000	99.000	Contraction Coef:	0.000
Manning's N:			Expansion Coef:	0.000
Top Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Bot Clip(ft):	0.000	0.000	Exit Loss Coef:	0.000
Main XSec:	12404	12404-D	Outlet Ctrl Spec:	Use dc or tw
AuxElev1(ft):	0.000	0.000	Inlet Ctrl Spec:	Use dn
Aux XSec1:			Stabilizer Option:	None
AuxElev2(ft):	0.000	0.000		
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):				
LtSdSlp(h/v):				
RtSdSlp(h/v):				

Name:	12416	From Node: 12416	Length(ft):	1000.00
Group:	AC-MID	To Node: 12416U	Count:	1

	UPSTREAM	DOWNSTREAM		
Geometry:	Irregular	Irregular	Friction Equation:	Average Conveyance
Invert(ft):	1.100	0.750	Solution Algorithm:	Automatic
TClpInitZ(ft):	99.000	99.000	Flow:	Both
Manning's N:			Contraction Coef:	0.000
Top Clip(ft):	0.000	0.000	Expansion Coef:	0.000
Bot Clip(ft):	0.000	0.000	Entrance Loss Coef:	0.000
Main XSec:	12416	12416	Exit Loss Coef:	0.000
AuxElev1(ft):	0.000	0.000	Outlet Ctrl Spec:	Use dc or tw
Aux XSec1:			Inlet Ctrl Spec:	Use dn
AuxElev2(ft):	0.000	0.000	Stabilizer Option:	None
Aux XSec2:				
Top Width(ft):				
Depth(ft):				
Bot Width(ft):				
LtSdSlp(h/v):				
RtSdSlp(h/v):				

Name: 12102-X Group: AC-SVNW
Encroachment: No

Eliminated Glass Wall effects
expanded existing cross section

PREVIOUS
CROSS SECTION
0□14□0.045
1204.7S0.045
2404.3S0.035
35013.600.045

Station(ft)	Elevation(ft)	Manning's N
0.000	14.100	0.050000
20.000	14.000	0.050000
32.000	4.700	0.050000
44.000	4.300	0.030000
55.000	13.600	0.050000
75.000	13.700	0.050000

Name: 12203_expand Group: AC-LOW
Encroachment: No

460' north of parkmere blvd

Station(ft)	Elevation(ft)	Manning's N
0.000	12.000	0.050000
42.000	11.000	0.050000
80.000	10.000	0.050000
95.000	9.000	0.050000
100.000	8.000	0.050000
106.000	7.000	0.050000
111.000	6.000	0.050000
115.000	6.000	0.030000
117.000	7.000	0.050000
120.000	8.000	0.050000
123.000	9.000	0.050000
126.000	10.000	0.050000
133.000	11.000	0.050000
147.000	12.000	0.050000
152.000	12.000	0.050000

Name: 12205_prop Group: AC-LOW

Encroachment: No

expanded flood plain
proposed system 2 seg 2
widen eastern bank

Station(ft)	Elevation(ft)	Manning's N
0.000	11.000	0.050000
45.000	10.000	0.050000
75.000	9.000	0.050000
84.000	8.000	0.050000
94.000	7.000	0.050000
122.000	7.000	0.030000
130.000	8.000	0.050000
137.000	9.000	0.050000
141.000	10.000	0.050000
214.000	11.000	0.050000

Name: 12240-X Group: AC-BRIAR
Encroachment: No

PROPOSED CROSS SECTION
FROM NODE 12193 UPSTREAM 641'

expanded existing cross section
5□12.1□0.045
10112.100.045
15112.100.045
20□12m0.045
30□11m0.045
40□10m0.045
50□500.045
5514.910.045
60□500.045
69□1000.045
75□1100.045
81□1200.045
90□1300.045
100I13.1R0.045
110I13.1R0.045
120I13.1R0.045

PREVIOUS CROSS SECTION
0□12□0
10□11e0.045
20□10e0.045
30□500.045
3514.910.045
40□500.045
49□1000.045
55□1100.045
61□1200.045
70□1300.045

Station(ft)	Elevation(ft)	Manning's N
0.000	12.100	0.050000
30.000	10.000	0.050000
50.000	5.000	0.050000
55.000	4.900	0.030000
60.000	5.000	0.030000
80.000	10.000	0.050000
120.000	13.100	0.050000

Name: 12404 Group: AC-MID
Encroachment: No

PROPOSED X SECTION
FOR SITE 3
HOLD EAST TOB CONSTANT @ 10

EXPANDED X SECTION
0510.110.035
20R1010.035
3312.610.035
36.5.2.4.0.03
40.2.6440.03
48R8.600.04
10881100.04

PREVIOUS CROSS SECTION
1000.1040.035
1013G2.6R0.035
1016.5.2.4.0.03

102062.64 0.03
1028.8.600.04

Station(ft)	Elevation(ft)	Manning's N
0.000	10.100	0.050000
12.000	10.000	0.050000
42.600	2.400	0.050000
52.600	2.400	0.030000
83.000	10.000	0.050000
108.000	11.000	0.050000

Name: 12404-D Group: AC-MID
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
1000.000	7.900	0.050000
1013.000	1.100	0.050000
1016.000	0.800	0.030000
1019.000	1.200	0.030000
1032.000	9.200	0.050000

Name: 12405 Group: AC-MID
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
1000.000	12.000	0.050000
1008.000	4.100	0.050000
1014.000	4.400	0.030000
1027.000	11.400	0.050000

Name: 12416 Group: AC-MID
Encroachment: No

PROPOSED X SECTION
SITE 4
SEGMENT 1

EXPANDED X SECTION
0□11 0.035
36□10.5□0.035
49□2.450.035
5311.1.0.03
5811.7.0.03
7119.7.0.06
109911.0.06

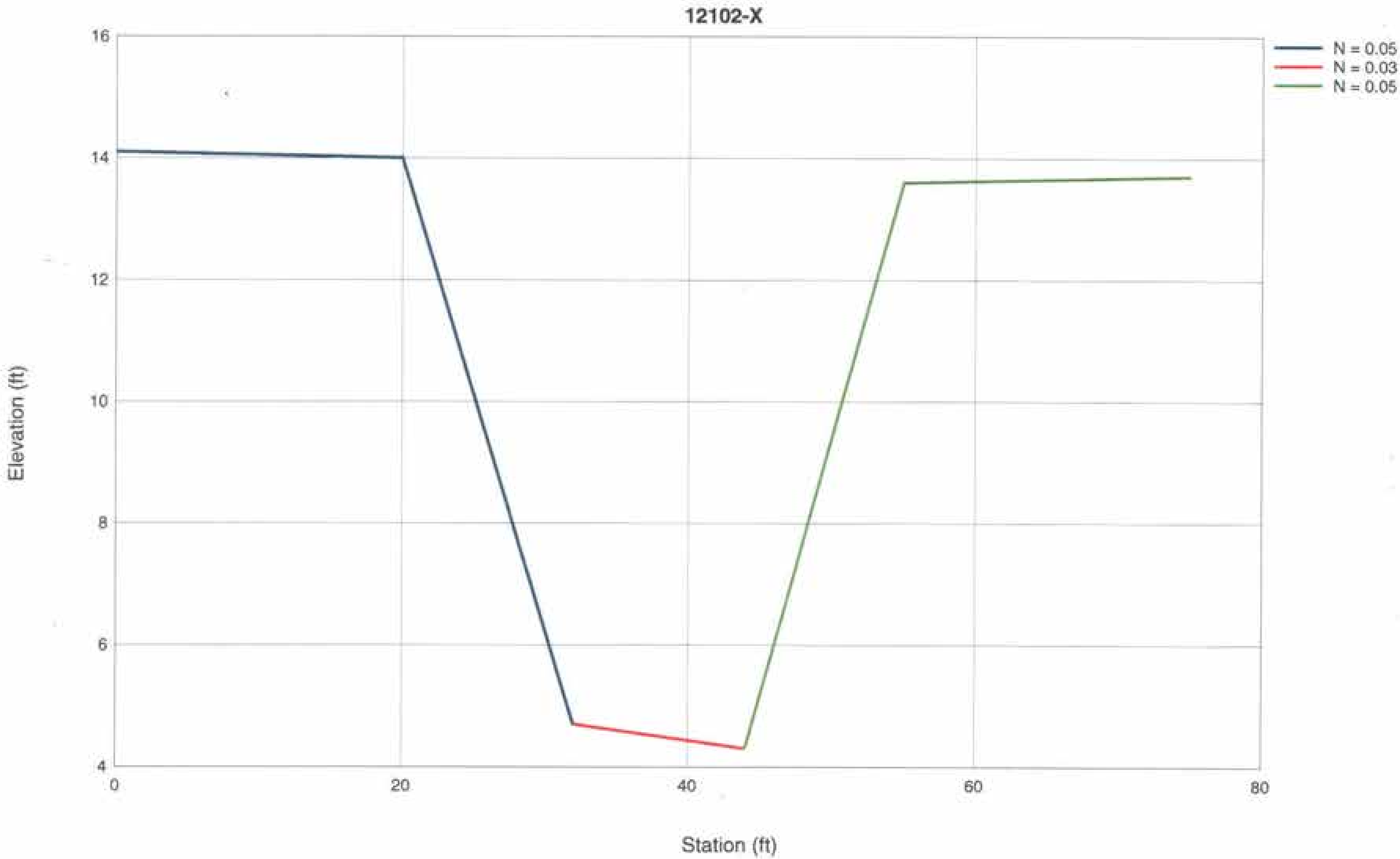
PREVIOUS CROSS SECTION
1000G10.5 0.035
1013G2.450.035
1017.1.1.0.03
1022.1.7.0.03
1035.9.7.0.06

Station(ft)	Elevation(ft)	Manning's N
0.000	11.000	0.050000
38.350	9.000	0.050000
67.550	1.700	0.050000
77.550	1.700	0.030000
110.750	10.000	0.050000
120.000	10.100	0.050000

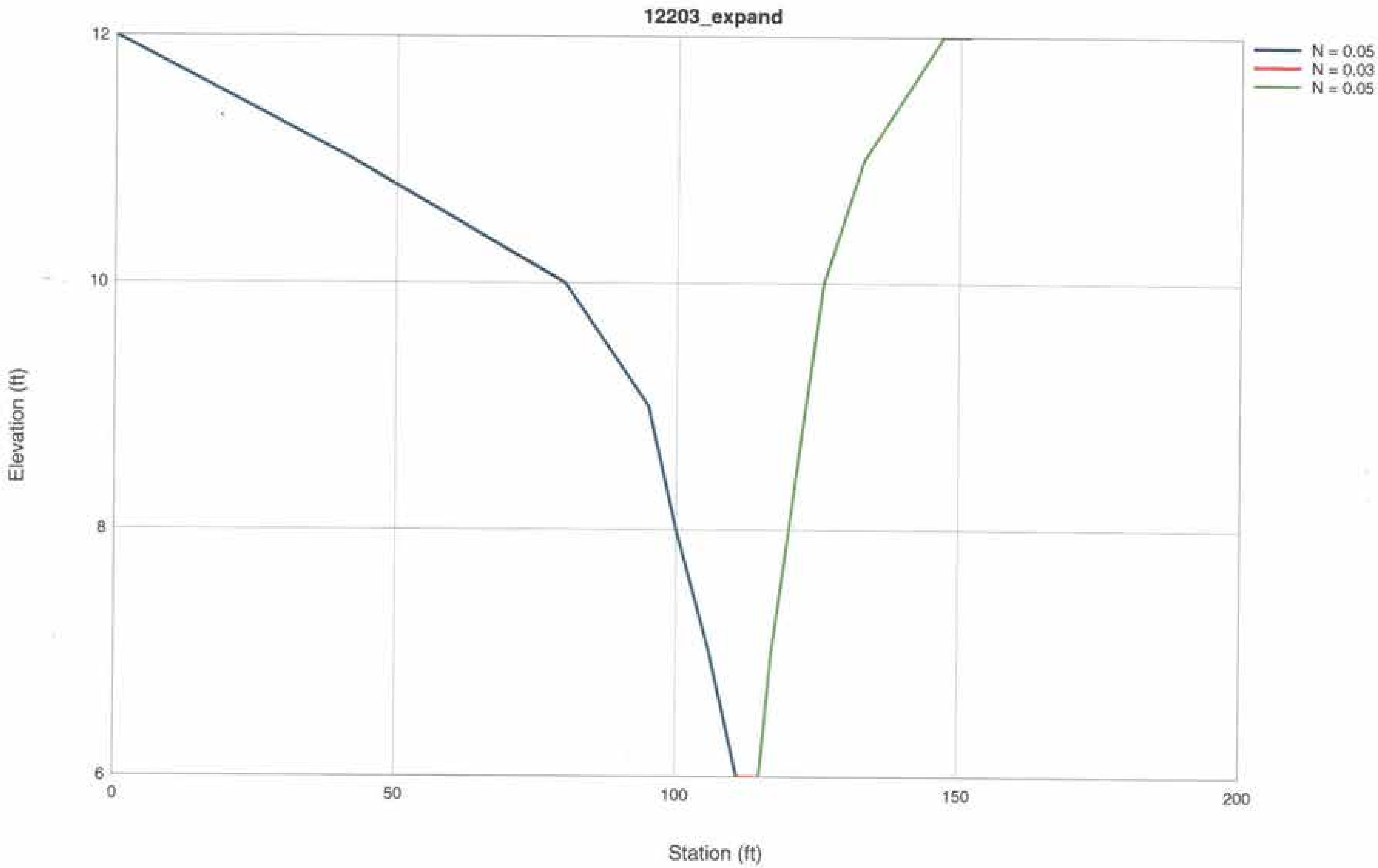
Name: 12416-N Group: AC-MID
Encroachment: No

Station(ft)	Elevation(ft)	Manning's N
1000.000	8.700	0.050000
1016.000	1.300	0.050000
1024.000	0.700	0.030000
1033.000	0.900	0.030000
1041.000	6.000	0.050000

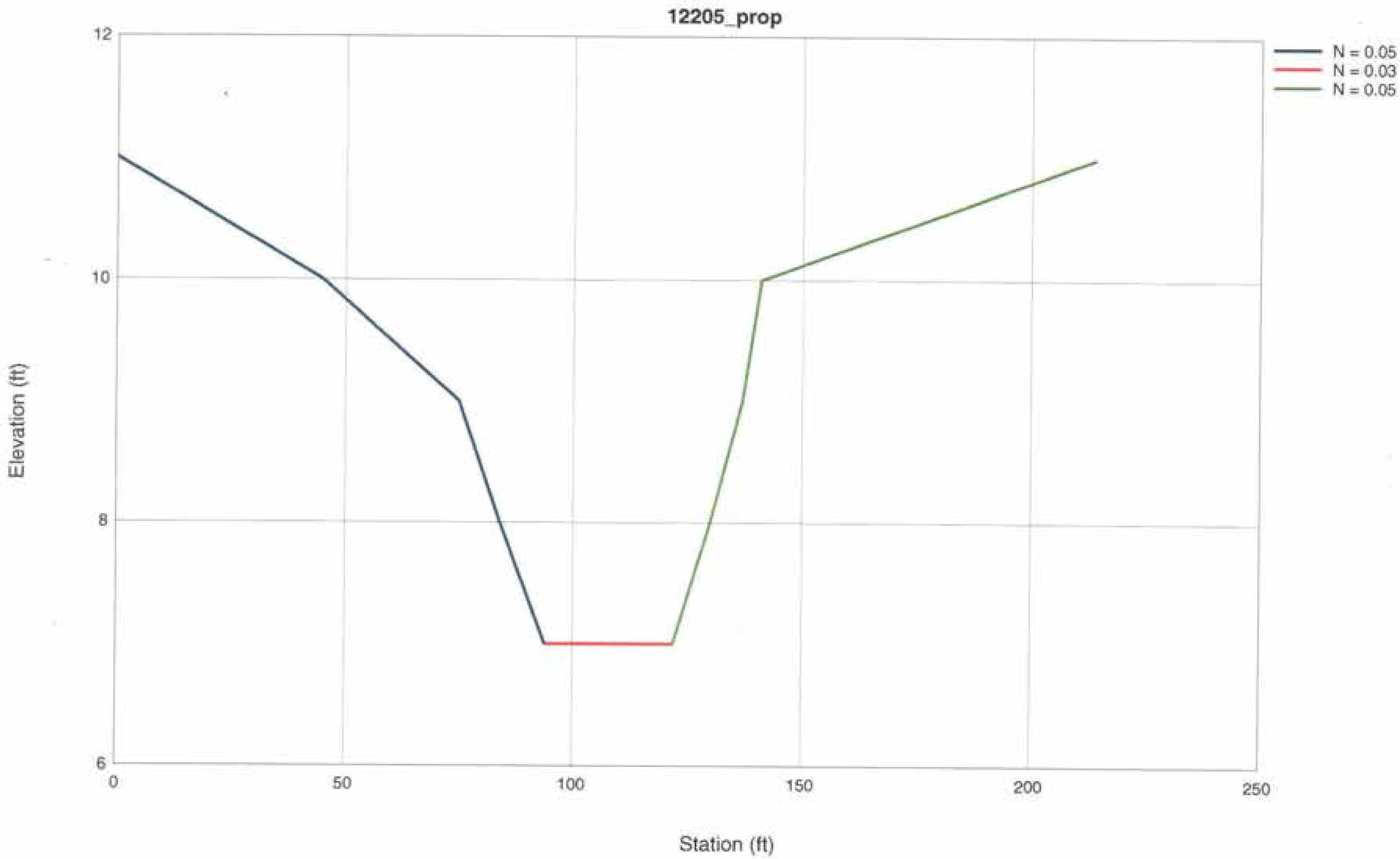
ALLIGATOR CREEK
PROPOSED CONDITIONS MODEL
PROPOSED CROSS SECTIONS

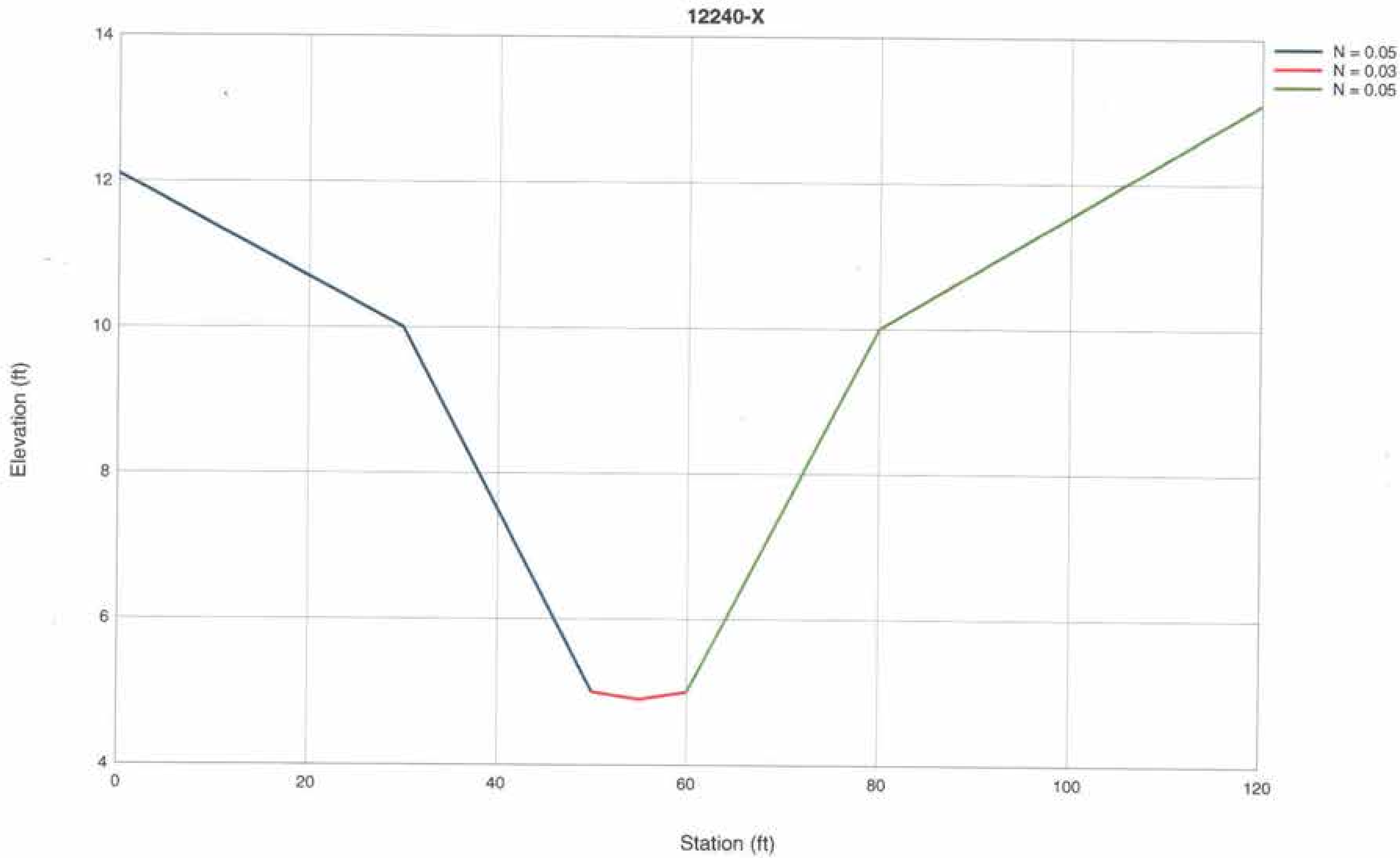


ALLIGATOR CREEK
PROPOSED CONDITIONS MODEL
PROPOSED CROSS SECTIONS

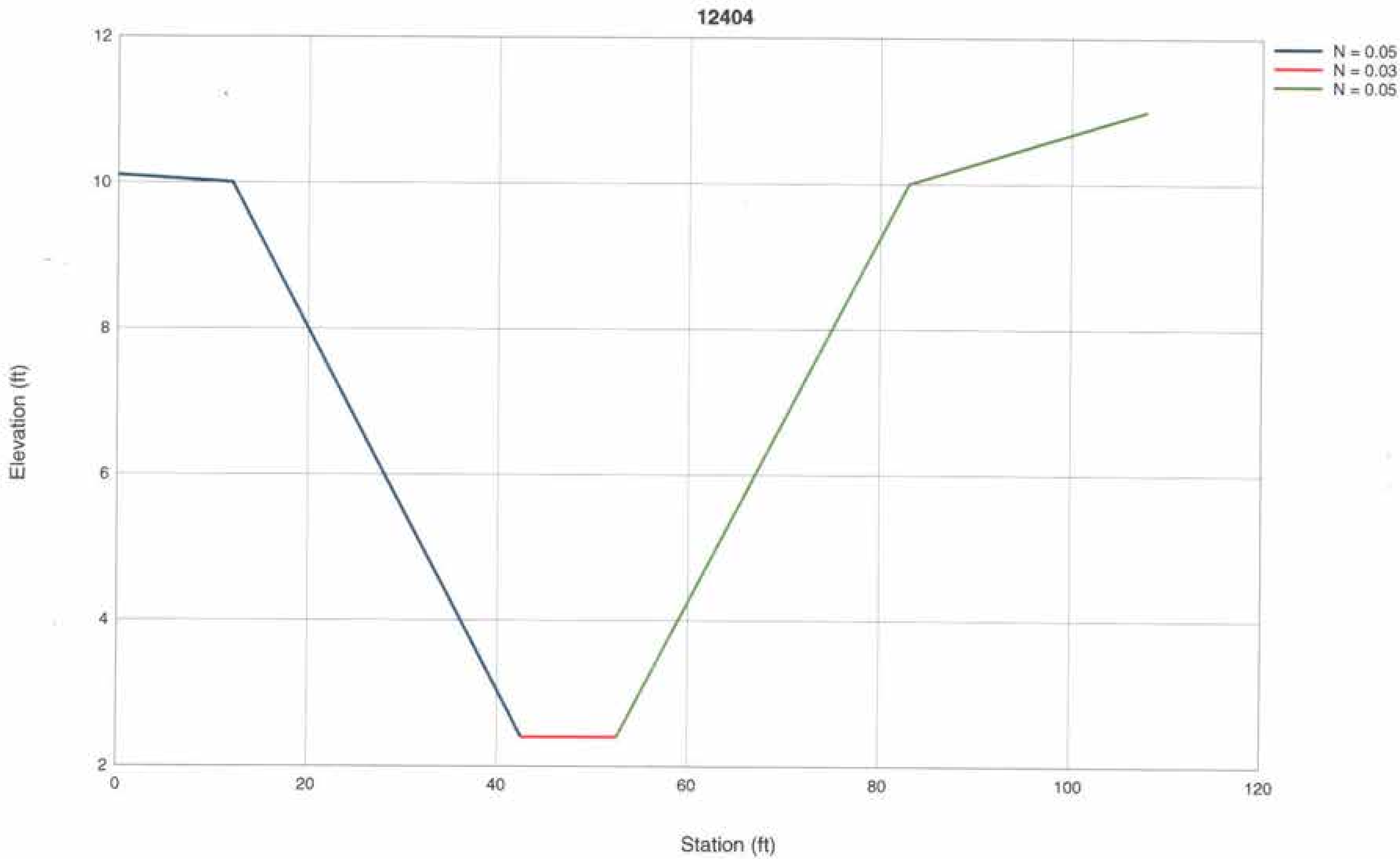


ALLIGATOR CREEK
PROPOSED CONDITIONS MODEL
PROPOSED CROSS SECTIONS

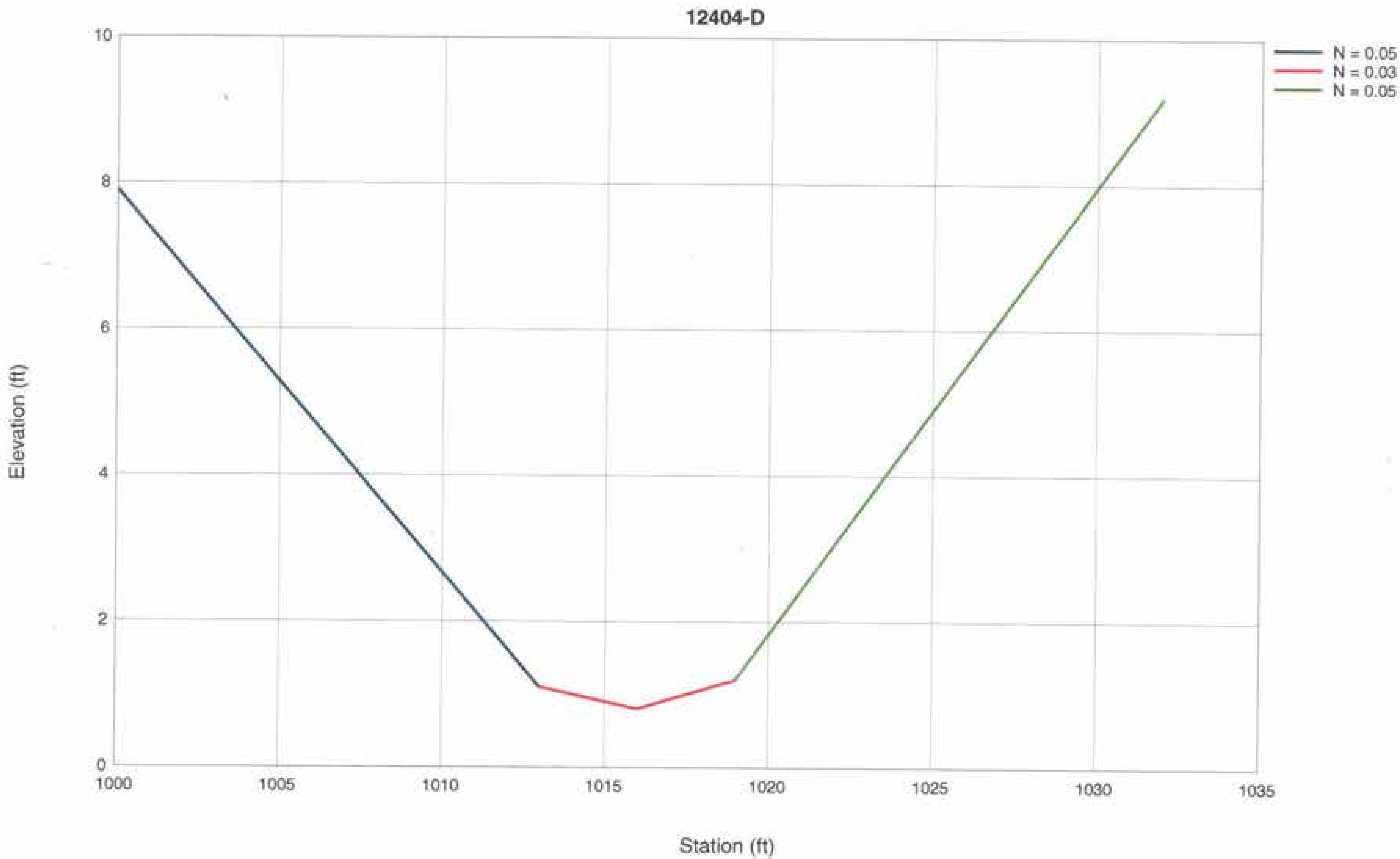



12240-X
Elevation (ft)
14
12
10
8
6
4
0
20
40
60
80
100
120
Station (ft)
N = 0.05
N = 0.03
N = 0.05

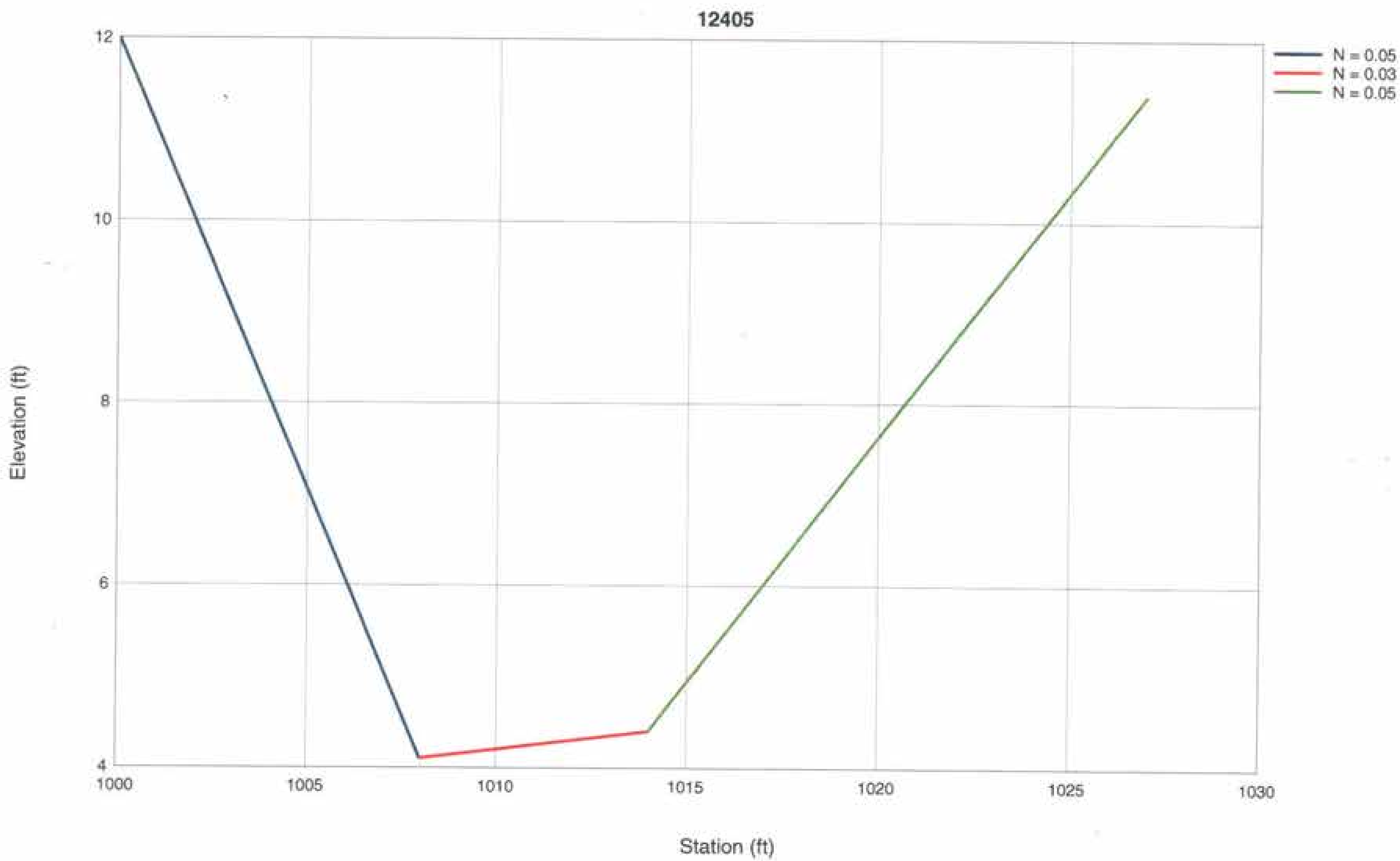
ALLIGATOR CREEK
PROPOSED CONDITIONS MODEL
PROPOSED CROSS SECTIONS



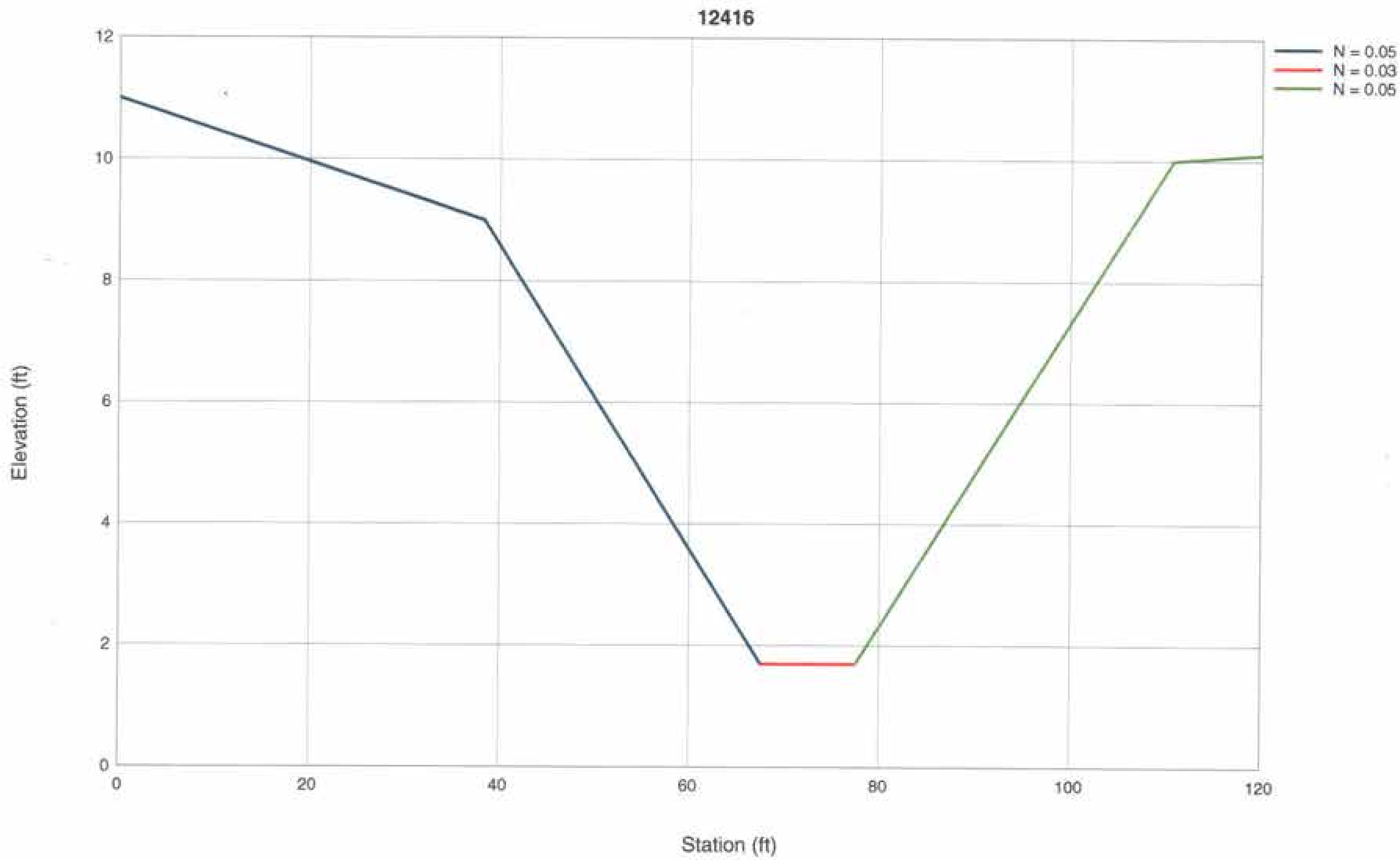
ALLIGATOR CREEK
PROPOSED CONDITIONS MODEL
PROPOSED CROSS SECTIONS



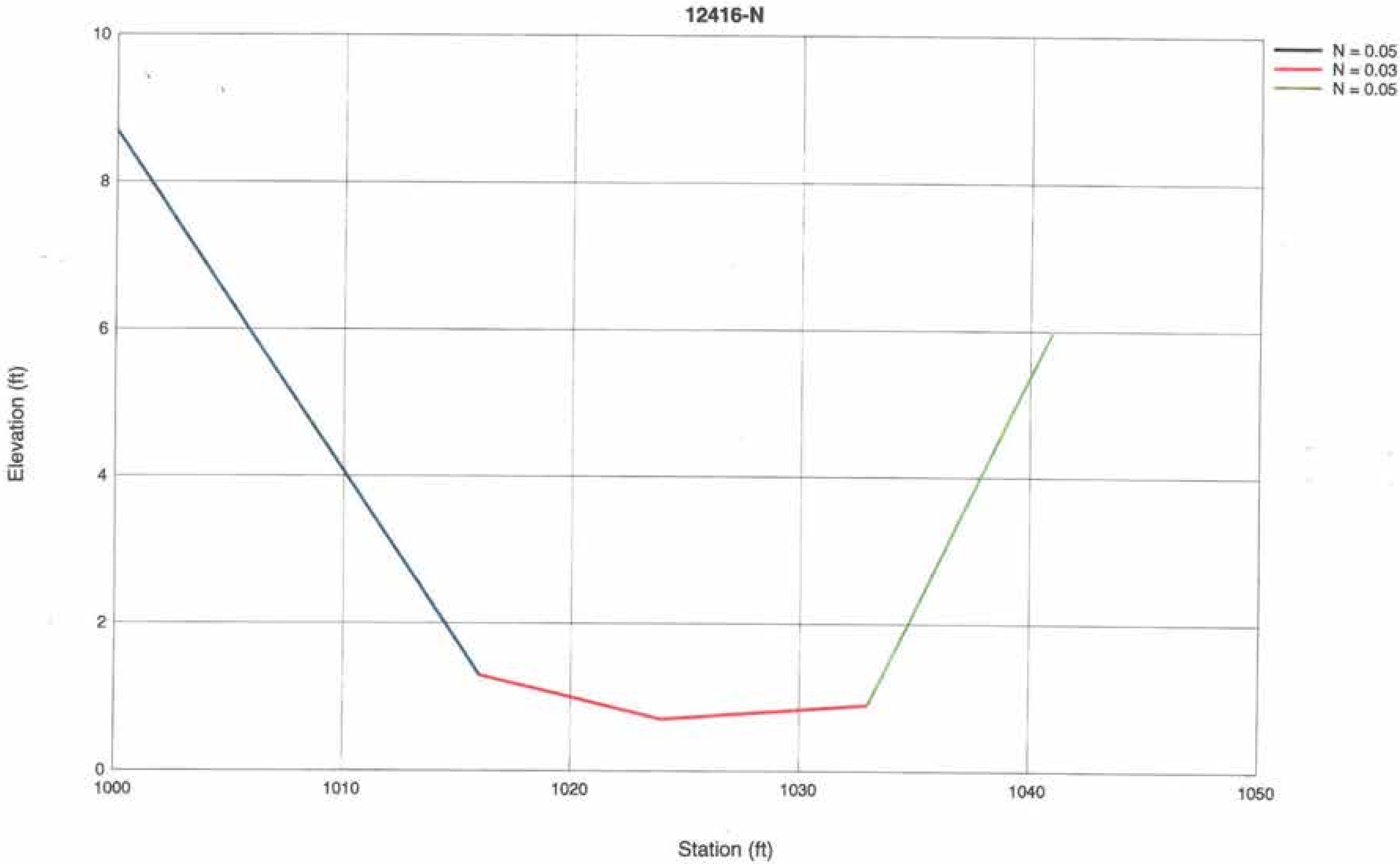
ALLIGATOR CREEK
PROPOSED CONDITIONS MODEL
PROPOSED CROSS SECTIONS



ALLIGATOR CREEK
PROPOSED CONDITIONS MODEL
PROPOSED CROSS SECTIONS



ALLIGATOR CREEK
PROPOSED CONDITIONS MODEL
PROPOSED CROSS SECTIONS



APPENDIX C
Itemization of Estimated Treatment Costs

System	Segment	Length (ft)	Channel Alterations			Bank Stabilization		Vegetation			Total	Maintenance	Grand Total
			Slope Reduction	Bottom Widening	Stream Realign.	Erosion Control Blankets	Gabion Baskets	Nuisance & Exotic Species Removal	Brazillian Pepper Removal	Reveg.			
Unit			Linear Foot									Project	
Cost per Unit			$ 12	$ 3	$ 65	$ 4	$ 280	$ 1	$ 5	$ 2		10%	
1	1	710	$ 8,520	$ 2,130		$ 2,840		$ 710		$ 1,420	$ 15,620	$ 1,562	$ 17,182
	2	3,300				$ 9,900	$ 231,000	$ 3,300		$ 6,600	$ 250,800	$ 25,080	$ 275,880
2	1	470			$30,550				$ 2,350	$ 1,410	$ 34,310	$ 3,431	$ 37,741
	2	350		$ 1,050		$ 1,400		$ 350		$ 700	$ 3,500	$ 350	$ 3,850
	3	1,430									$ -	$ -	$ -
3	1	1,120	$ 13,440	$ 3,360		$ 4,480				$ 2,240	$ 23,520	$ 2,352	$ 25,872
4	1	1,170	$ 14,040	$ 3,510		$ 4,680				$ 2,340	$ 24,570	$ 2,457	$ 27,027
	2	4,570				$18,280				$ 9,140	$ 27,420	$ 2,742	$ 30,162
	3	1,350				$ 5,400				$ 2,700	$ 8,100	$ 810	$ 8,910
5	1	920					$ 257,600			$ 1,840	$ 259,440	$ 25,944	$ 285,384
	2	4,740					$ 1,327,200			$ 9,480	$ 1,336,680	$ 133,668	$1,470,348
6	1	4,500	$ 54,000			$18,000			$ 11,250	$ 9,000	$ 92,250	$ 9,225	$ 101,475
	2	3,150	$ 37,800			$12,600				$ 6,300	$ 56,700	$ 5,670	$ 62,370
	3	3,730	$ 44,760			$14,920				$ 7,460	$ 67,140	$ 6,714	$ 73,854
Basinwide		**31,510**	**$ 172,572**	**$ 10,053**	**$30,615**	**$92,504**	**$ 1,816,080**	**$ 4,361**	**$ 13,605**	**$60,632**	**$ 2,200,050**	**$ 220,005**	**$2,420,055**

Notes:

Generalized costs w/ qualifying assumptions as discussed (five-foot high banks, five-foot wide bottom of creek, decent access, and enough project size to have some economy of scale).