SIDEWALK and CURB RAMP CONDITION SURVEY

Prepared For:

Town of Carrboro

July 2019

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Sidewalk & Curb Ramp Condition Survey

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I. INTRODUCTION

This report describes the results of the sidewalk condition survey that was conducted by the staff of **Labella Associates, P.C.** for the Town of Carrboro. The Town of Carrboro has recognized the need for an inventory of the sidewalks within their street system to provide an organized approach for addressing maintenance needs. LABELLA surveyed the location and condition of all concrete sidewalks along Town streets by means of a walking survey. Sidewalk locations were initially developed using aerial and street view images, and compared to the Town's sidewalk locations in GIS. In addition to the collected sidewalk data, curb ramp locations were identified that included basic condition information. The sidewalk field data information was placed into a database, which was analyzed to define maintenance needs and generate a sidewalk condition rating (SCR). Unit costs reflecting local area averages were used to estimate the costs for replacing unsuitable sections of the sidewalks.

The management system for sidewalks is designed as another part of LABELLA's total roadway management system. The street inventory segments used for the Sidewalk Management System are primarily the same as those used by LABELLA's pavement management system. Some block segments were split at business drives in which the sidewalk was not continuous. The GIS layer created and the databases used for sidewalks will allow the Town of Carrboro to maintain and update sidewalk data on a periodic basis.

Sidewalks are integral parts of a municipal street system. They serve pedestrians in and around the central business district, shopping centers, schools, churches, and residential areas. Sidewalks provide a safe travel way for pedestrians that are separate from vehicular traffic. Aesthetically, sidewalks should be clean, neat, and add to the attractive appearance of a neighborhood or business district. Sidewalks should also have a smooth even surface that is safe and negotiable for all pedestrians.

Virtually all of the sidewalks within the Town of Carrboro are constructed of Portland cement concrete. Over a period of time they begin to deteriorate due to aging, wear due to usage, poor construction, inadequate drainage, and damage caused by other forces such as tree roots, heavy loads, or chemicals. Their surfaces can become cracked (Cracking), uneven (Faulting), or show surface deterioration (Surface Wear). It is important to maintain sidewalk conditions at an

acceptable quality to avoid the unsightly and unsafe conditions associated with these distress types.

The Town of Carrboro maintains approximately 41.5 miles of sidewalks along the street system and located within the right-of-way of Town streets. The average sidewalk condition rating is 96.9, which is above average for municipalities of similar size. Based on the sidewalk condition survey results, approximately 0.5% of the total sidewalk length is recommended for replacement due to poor conditions identified in this report. Approximately 4.4% of the sidewalk system exhibits some level of distress. Total replacement needs will require approximately 508 square yards of concrete at an estimated cost of $35,600. Unit costs used for estimating the replacement need were based upon the current local cost. The unit cost for replacing a typical sidewalk is estimated at $70.00 per square yard (for 4" thickness). This estimated cost is for sidewalk replacement only and does not include repairs to curbs, pavement, tree root removal, horizontal or vertical alignment adjustments due to tree root encroachment and upheaval, or landscaping. The Town may also incur other costs related to construction administration, inspection, and mobilization.

Curb Ramps were also surveyed within a separate GIS point layer and database. It should be understood that this survey did not locate intersection points in which no ramp was present, but was needed. It should also be understood that this survey noted the general condition of ramps, but did not determine whether ramps were in compliance with any standard. A total of 872 curb ramps were located within the Town limits. Of these 872 curb ramps, 864 (99.1%) were rated as being in 'Good' condition, 7 (0.8%) were rated as being in 'Fair' condition, and only 1 (0.1%) was rated as being in 'Poor' condition.

II. SURVEY PROCEDURES

The sidewalk condition survey was conducted by a trained LABELLA evaluator to ensure accurate and consistent survey data. Visual inspections were used to collect survey data. Three different distress types were evaluated during the survey: cracking, faulting, and surface wear. Conditions were evaluated in accordance with the distress definitions shown in Appendix A of this report. Each distress type has three severity levels: light, moderate, and severe.

The sidewalk survey was a walking survey. The sidewalk on each side of an individual street block is evaluated separately and is distinguished as either left or right side of the street. The left and right convention is determined by the direction of the beginning to ending descriptions of the street segment where the sidewalk is located. Sidewalk was located geographically (beginning, ending, and horizontally) by LABELLA creating a GIS shape file of existing sidewalk prior to the walking survey. LABELLA supplemented the GIS shape file by locating and entering sidewalk that we found in the field. All of this data is included in the supplied GIS shape file.

Each block of sidewalk was also classified based on usage. Class A sidewalks are primarily located in residential areas and typically receive low usage. Class B sidewalks receive more pedestrian traffic and are generally located in the central business district, near shopping centers, or schools.

Sidewalks are generally segmented into square or rectangular panels formed by tooled or constructed joints. During the survey, each panel was evaluated according to the highest ranking distress on the priority list shown on the next page in Table 1. Therefore, each panel is only counted in one distress category. For example, if a panel exhibits light cracking and moderate faulting, it would be counted under moderate faulting since that distress has a higher priority.

Table 1 – Distress Priority

Priority	Distress	Severity
1	Faulting	Severe
2	Faulting	Moderate
3	Cracking	Severe
4	Surface Wear	Severe
5	Cracking	Moderate
6	Faulting	Light
7	Surface Wear	Moderate
8	Cracking	Light
9	Surface Wear	Light

During the field review, we also noted locations where "Tree Roots" were present and have or could potentially cause distresses to the sidewalk from tree root damage. Tree roots can cause faulting and/or cracking of sidewalks. This separate field within the database was used to inventory those sidewalk segments that may be damaged by the roots of nearby trees. The survey found that approximately 6.2% (30 segments) of the sidewalk segments had some level of tree root intervention. In many of these locations, the tree roots have already damaged the sidewalk. In others, the tree roots are adjacent to the sidewalk and could lead to future damages. Thus, the Town can use this data to address tree root issues before they damage the sidewalk in those locations.

The survey also noted physical "Obstructions" along sidewalk segments that significantly impair normal walking. These obstructions included mailboxes, utility poles, signs, fire hydrants, and trees. Approximately 0.82% (4 segments) of the sidewalk segments had at least one obstruction. The Town can use this data to possibly relocate some of these obstructions to provide better clearances.

In addition to distress information, other data collected during the survey included sidewalk dimensions. This information is listed in Appendix B - Alphabetical and Sidewalk Condition Rating (SCR) Listings. All dimensions are recorded in feet. This data includes the following:

- Sidewalk Length. This length is generated from the starting and ending points of the sidewalk segment as provided by the GIS shape file.

- Sidewalk Width. In some cases, the sidewalk may be more than one panel in width.

- Panel Width. This is the width of an individual panel. A panel is defined by a tooled or constructed joint in the sidewalk. The predominant panel width exhibited on the block is recorded for the entire block.

- Panel Length. The predominant panel length exhibited on the block is recorded for the entire block.

- Curb Distance. The distance in feet from the back of the curb to the front edge of the sidewalk. If the distance from the edge of the sidewalk to the back of the curb varies, then the most predominant distance along the block is recorded. A '0' in this field indicates that the sidewalk at the back of curb.

III. Data Analysis

The purpose of the data analysis is to identify sidewalks in poor condition that need replacement. This analysis also calculates replacement concrete quantities, which are then used to estimate repair costs.

Prior to calculating the square yards of concrete needed for replacement, it is necessary to identify the distress types that require the replacement of sidewalk panels. The replacement matrix shown below in Table 2 identifies the criteria used to determine the need for replacement.

Table 2 – Replacement Matrix

Magnitude	Cracking	Faulting	Surface Wear
Light	No	No	No
Moderate	No	Yes	No
Severe	Yes	Yes	Yes

The number of sidewalk panels recommended for replacement was summed for each side of a street block. The number of square yards needed for replacement of sidewalk was determined using the following procedure:

$$\text{Panel Quantity (square yards)} = \frac{\text{Panel Width (ft) x Panel Length (ft)}}{\text{(9 square feet / square yard)}}$$

Total Quantity (square yards) = Panel Quantity x Number of Panels with "Yes" category

Using this procedure, the replacement quantity calculated for the Town of Carrboro's sidewalk system is approximately 508 square yards of concrete.

Another analysis tool developed for the Sidewalk Management System is the Sidewalk Condition Rating (SCR). The function of this rating is very similar to the Pavement Condition Rating (PCR) used by the LABELLA pavement condition survey. The SCR is a rating between 0 and 100. The SCR is used to provide an overall assessment of the sidewalk's condition and to prioritize repair

needs. The key element used to calculate the SCR is the amount of each distress severity. The SCR is calculated as follows:

$$SCR = 100 - [(\%\ \text{Severe Panels} \times SDF) + (\%\ \text{Moderate Panels} \times MDF) + (\%\ \text{Light Panels} \times LDF)]$$

Where: SDF = Severe Distress Factor = 300
MDF = Moderate Distress Factor = 100
LDF = Light Distress Factor = 40

The formula accounts for the amount of light, moderate, and severe distressed panels. The Town may want to consider a level of use factor when prioritizing maintenance needs. Factors for each distress level in the sidewalk program may be adjusted by the municipality.

As indicated previously, approximately 4.4% of the sidewalk system exhibits some level of distress. A graphical breakdown of the panel distress by severity is shown in Figure 1 on the next page.

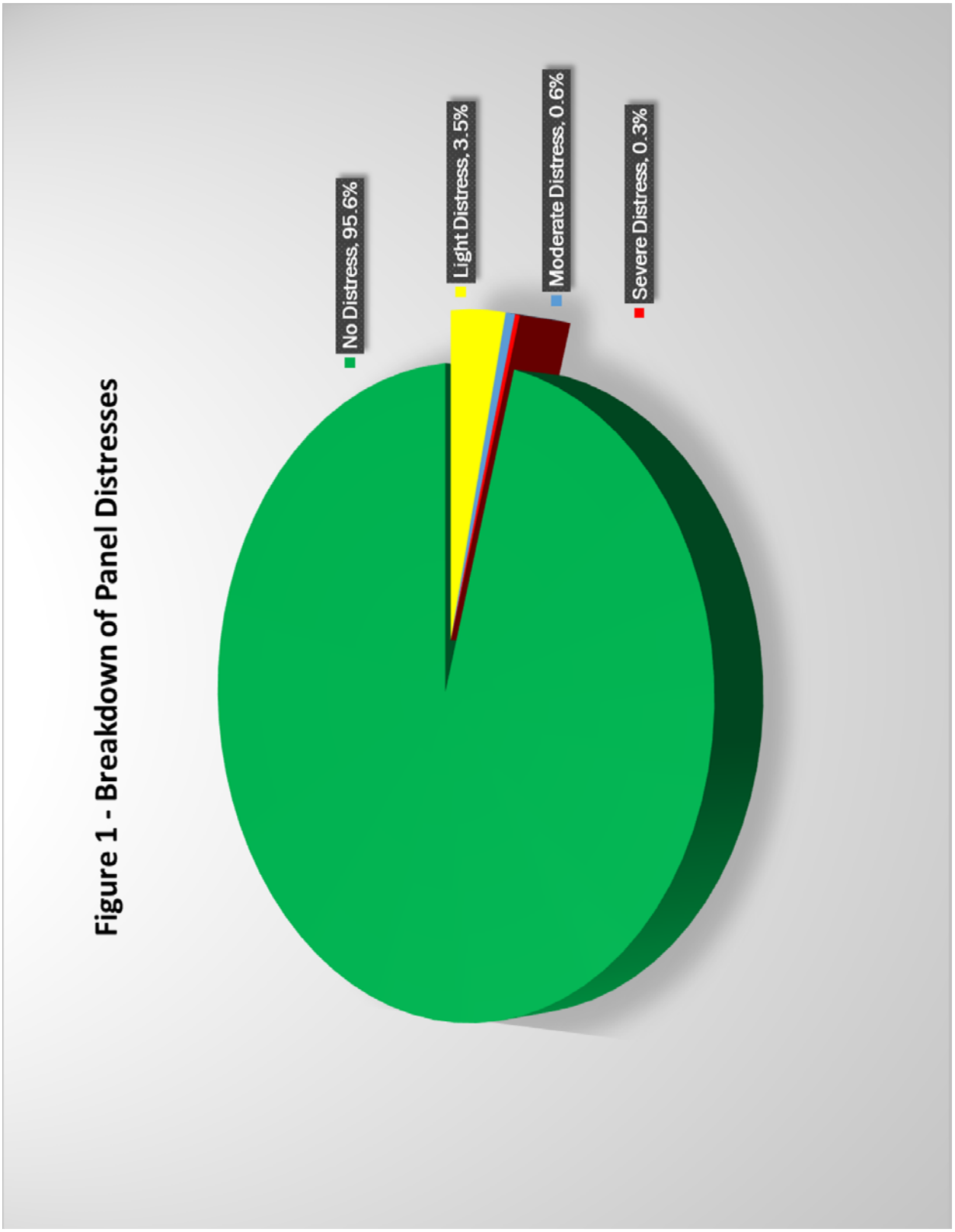


Figure 1 - Breakdown of Panel Distresses
No Distress, 95.6%
Light Distress, 3.5%
Moderate Distress, 0.6%
Severe Distress, 0.3%

Grouping SCR values into the four categories shown below in Table 3 will provide a general assessment of the sidewalk conditions in the Town of Carrboro. A lower SCR will indicate an increased need for sidewalk repairs and replacement. The percentage of sidewalk within each category is graphically shown on the next page in Figure 2. Approximately 99.8% of the sidewalks in Carrboro were found to be in 'good' or 'fair' condition (SCR = 51-100), and only about 0.1% were rated in 'poor' or 'very poor' condition (SCR = 0-50).

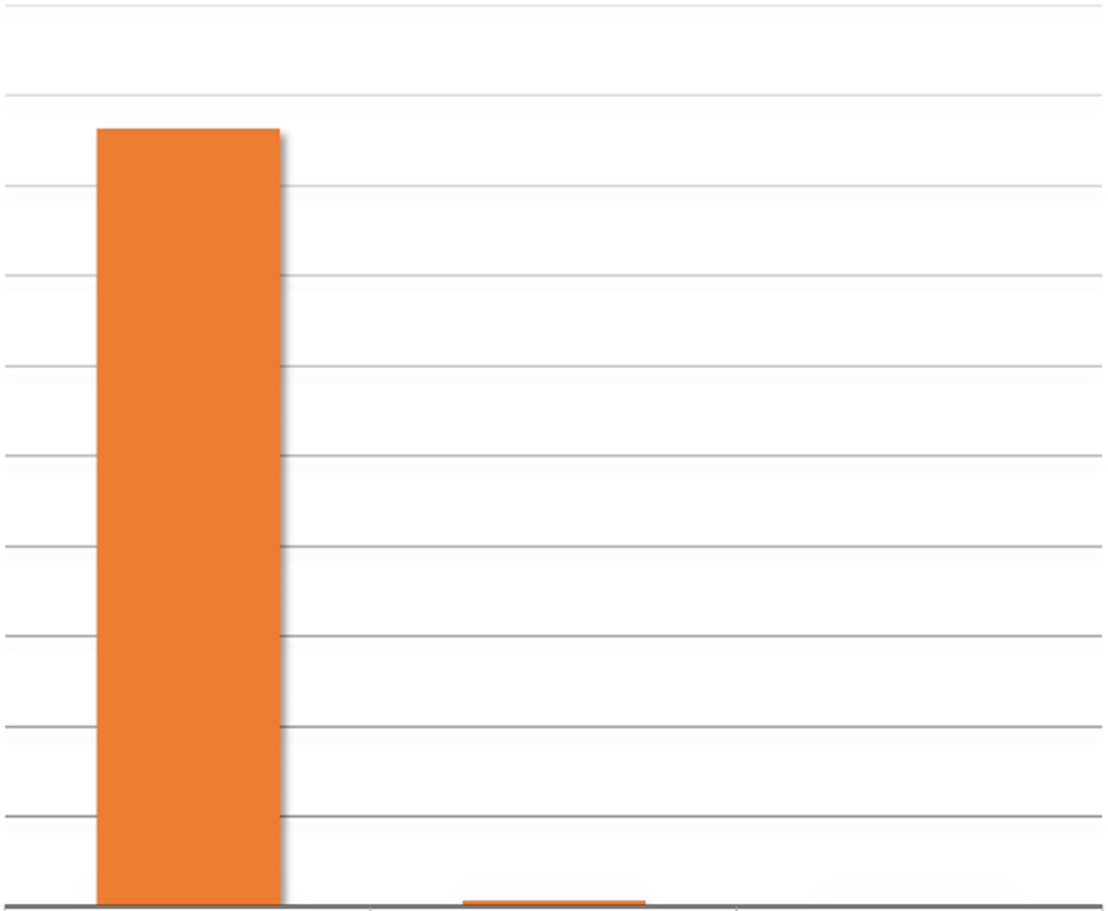
Table 3 – Sidewalk Condition Rating (SCR)

SCR Values	Condition
76 - 100	Good
51 - 75	Fair
26 - 50	Poor
0 - 25	Very Poor

As mentioned previously, we also located the Town's existing curb ramps and assessed their general condition as 'Good', 'Fair', or 'Poor'. A breakdown of the curb ramps into those rating categories is shown in Figure 3 on page 11. Please note this assessment does not address the need to add or replace detectable warning strips at curb ramps.

Figure 2 - Breakdown of Sidewalks into SCR Categories
Percent of System
100
90
80
70
60
50
40
30
20
10
0
98.7
1.1
0.2
0
Good
76-100
Fair
51-75
Poor
26-50
Very Poor
0-25
Sidewalk Condition Rating (SCR)

Figure 3 - Breakdown of Curb Ramps into Rating Categories



	Good	Fair	Poor
Percent	99.1%	0.8%	0.1%
Count	864	7	1

IV. Replacement Costs

The unit cost for estimating the sidewalk replacement cost was determined by current local costs. Quantities estimated for replacement needs were multiplied by the unit cost of $70/square yard to obtain the sidewalk repair costs. This unit cost does not include factors such as tree root manipulation or pavement / curb and gutter repair.

The unit replacement cost used in this report is $70.00 per square yard for typical sidewalk repair. The total cost estimate for sidewalk replacement on each block was calculated by multiplying this unit cost by the respective quantities. However, some sidewalks may have a large percentage of panels that are in need of replacement. There is a cost-effective breakpoint where it is less expensive to replace the entire length of sidewalk instead of most of the individual panels. The breakpoint traditionally used is 70%. Therefore, when a sidewalk requires 70% or more replacement, the Town should consider replacing the entire section of sidewalk. This survey indicated that there are not currently any sidewalk segments that this criteria applies to. As a matter of fact, the largest replacement percentage for any sidewalk segment was approximately 16.7%. The estimated cost for sidewalk replacement needs in the Town of Carrboro is approximately $35,600. See Table 5 on page 14 for a breakdown of these costs.

For Curb Ramps, the following unit replacement costs were used:

- Replace Curb Ramp $2,000/each
- Add Detectable Warning Strip $250/each
- Replace Detectable Warning Strip $300/each

Using the units costs described above, the total cost estimated to address curb ramps (replacement or detectable warning strips) is approximately $101,000. See Table 6 on page 14 for a breakdown of these costs. Curb ramp repairs or replacement can be programmed into the Town's ongoing maintenance program. At a minimum, curb ramp repairs need to be performed in conjunction with adjacent work, such as street resurfacing, intersection improvements, or sidewalk construction.

V. REPORTS

Listings containing survey data, results from the data analysis, and cost estimates were compiled for each block of sidewalk. These listings, an Alphabetical and a Sidewalk Condition Rating (SCR) listing, are provided in Appendix B. When using this information, it is important to understand the analysis described in Section III of this report. The results presented are intended to be guidelines for planning maintenance activities and are estimates only. The quantities and costs provided are not intended for contract specification purposes.

A. Needs Summary

The Needs Summary for sidewalks is shown below in Table 4. Of nearly 41.5 miles of sidewalk in Carrboro, approximately 0.5% is recommended for replacement. The total quantity of this replacement is about 508 square yards with an estimated cost of $35,600. Considering Carrboro's entire sidewalk system, this is an average of approximately $858 per sidewalk mile.

Table 4 – Needs Summary for Sidewalks

Total Length	**41.5 miles**
Replacement Needs	0.46%
Replacement Area	508 square yards
Replacement Cost	**$35,600**

A further breakdown of the Needs Summary is provided in Table 6 on the next page. This table shows the amount and cost associated with each of the sidewalk distresses that require sidewalk replacement as outlined in Table 2 on page 6. Severe and Moderate Faulting account for approximately 69.4% of the projected sidewalk replacement cost. This information is also shown graphically in Figure 4 on page 16.

The Needs Summary for Curb Ramps is shown in Table 5. Curb ramps were identified and assessed relative to a general condition, such as Good, Fair, or Poor. While most of the curb ramps were in Good condition, other deficiencies were also noted. Nearly 40% of the curb ramps did not have a detectable warning strip, and another 2.4% have a strip that needs to be replaced. Detectable warning strips are required to meet the requirements of the Americans with

Disabilities Act (ADA). Please understand that this study was not focused on an ADA compliance review or transition plan. Curb ramp slopes and cross slopes were not physically measured in the field. However, approximately 2.9% of the curb ramps have some other potential compliance issue based on visual observation.

Table 5 – Needs Summary for Curb Ramps

Issue	Number	Percent
Need to Replace Curb Ramp	4	0.5%
Need Detectable Warning Strip for Curb Ramp	347	39.8%
Replace Detectable Warning Strip	21	2.4%
Other Potential Compliance Issues for Curb Ramp	25	2.9%
Total Curb Ramps With Some Type of Issue	**397**	**45.6%**
Total Curb Ramps	**872**	**100.0%**

Table 6 – Sidewalk Replacement Summary

Distress	Area (SY)	Area %	Cost	Cost %
Severe Faulting	114.0	0.10	$7,980	22.5
Moderate Faulting	238.3	0.22	$16,681	46.9
Severe Cracking	148.0	0.13	$10,360	29.2
Severe Surface Wear	7.3	0.01	$511	1.4
Total Repair	**508**	**0.46**	**$35,600**	**100.0**
No Repair	109,287	99.54	$0	0.0
Total System	**109,794**	**100.00**	**$35,600**	**100.0**

Table 7 – Curb Ramp Replacement Summary

Issue	Number	Cost	Cost %
Need to Replace Curb Ramp	4	$8,000	7.9%
Need Detectable Warning Strip for Curb Ramp	347	$86,750	85.8%
Replace Detectable Warning Strip	21	$6,300	6.2%
Other Potential Compliance Issues for Curb Ramp	25	TBD	TBD
Total Repair	**397**	**$101,050**	**100.0%**

B. Alphabetical Listing

The Alphabetical Listing, provided in Appendix B, lists sidewalk blocks in alphabetical order by street name. The sidewalk location, length, results of the analysis, and estimated costs of repair are provided in this listing.

C. Sidewalk Condition Rating Listing

The Sidewalk Condition Rating (SCR) Listing is also provided in Appendix B to assist in planning and budgeting future sidewalk repairs. The information shown on the Sidewalk Condition Rating Listing is identical to that in the alphabetical listing. However, sidewalk segments are listed in order by SCR. The sections are listed from lowest SCR (0) up through the highest (100).

FIGURE 4 - SIDEWALK REPLACEMENT SUMMARY

VI. SUMMARY

The Town of Carrboro has recognized the importance of sidewalks as an integral part of the Town wide street system. It is important that timely maintenance be performed on sidewalks for aesthetic and safety reasons. An inventory and evaluation of existing conditions is imperative for a well-planned repair and improvement program.

The databases and programs developed by LABELLA are intended to assist in the planning, prioritization, and budgeting of maintenance activities. Data gathered during the condition survey and the analysis of that data provides a useful tool for managing the maintenance programs for sidewalks and curb ramps.

LABELLA appreciates the opportunity to provide this technical assistance for the Town of Carrboro. We also wish to thank Daniel Snipes and members of the Town's staff for their cooperation in the performance of this project. LABELLA would be pleased to provide any other technical assistance that might be needed by the Town of Carrboro.