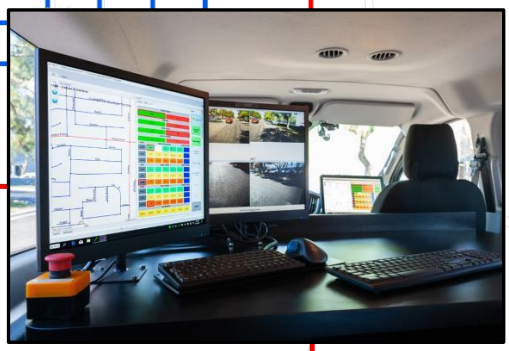
Upland, CA

Sidewalk and Curb Ramp Management Report

June 2024



CITY OF UPLAND CALIFORNIA

IMS
POWERED BY ICC

TABLE OF CONTENTS

1.0 PROJECT OVERVIEW

1.1 Project Summary

In 2023 IMS Infrastructure Management Services, LP (IMS) was contracted by the City of Upland to conduct a condition assessment and analysis update on approximately 343 miles of City maintained sidewalks and 4406 curb ramps.

IMS mobilized our Sidewalk Surface Tester (SST) to conduct an objective condition assessment of the sidewalks and ramps using industry standard pavement distress protocols, which were modeled similar to those found in ASTM D6433. The data was then loaded into IMS' proprietary spreadsheet software, known as Easy Sidewalk Analysis (ESWA), for analysis and given a Sidewalk Condition Index (SWCI). A full inventory of sidewalk and ramp assets are included in Appendices A and B.

1.2 Sidewalk Survey Results Summary

The Upland network has an average SWCI of 55, with most of the network landing in the Poor to Fair SWCI range as seen in **Figure 1**.

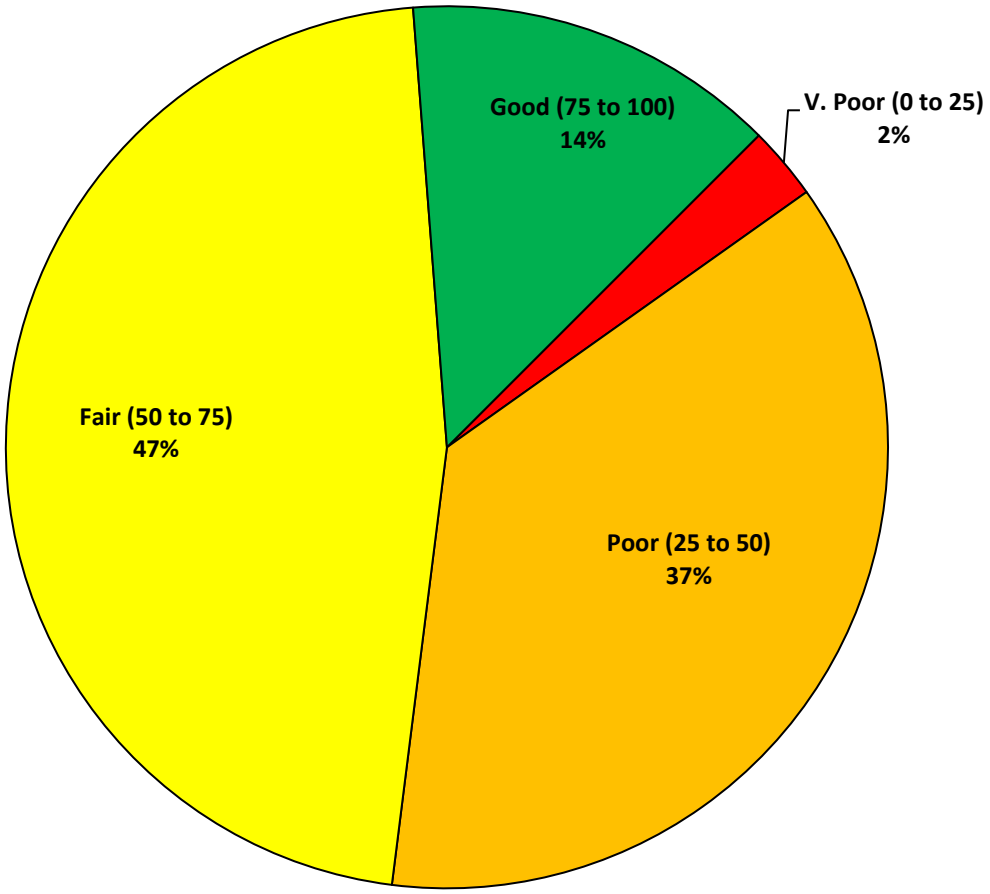


Figure 1 – Sidewalk Network Condition

2.0 SURVEY METHODS

2.1 Survey Process

The IMS approach to sidewalk and pedestrian curb ramp assessments is comprehensive in nature. Every mile of every road must first be driven with a vehicle that has high-definition cameras (LiDAR vehicle in this case) to allow for the extraction of sidewalks and curb ramps from the imagery. Then, each extracted sidewalk and curb ramp must be inspected. These locations are provided to IMS' field crew. The field crew then mobilizes to the asset locations and surveys each with IMS' Sidewalk Surface Tester (SST).

2.2 LiDAR & Sidewalk Surface Tester (SST)

The IMS LiDAR Survey vehicle was first deployed in Upland. This unit was chosen specifically for the purposes of collecting high-definition imagery and yielding accurate and consistent measurements of Americans with Disabilities Act (ADA) accessible curb ramps throughout the City.

The mobile LiDAR unit used in the Upland survey is pictured below in **Figure 2.**

Figure 2 – LiDAR Survey Unit

The mobile LiDAR unit is equipped with a RIEGL VMQ-1HA High-Performance LiDAR Sensor designed specifically for mobile mapping and data collection. It is capable of capturing measurements with 5mm

accuracy in a 360-degree field of view. The frequency of these measurements is 250 scan lines per second, so the Mobile LiDAR unit can function completely without impeding the flow of traffic.

Some highlight specs of the IMS LiDAR equipment are as follows:

- 5mm level relative accuracy
- 1 million individual measurements or 250 scan lines per second
- Travels at marked speed limit
- GIS linked data collection
- LiDAR point-cloud ideal for geometric measurements for ramps/landings/flare/slope

Once the LiDAR vehicle pass was complete, IMS' SST was deployed. The SST employs IMS' in-house Drive data collection software that integrates the survey inventory (sidewalk and curb ramp GIS shapefiles), field maps, GPS, and field data collection into a single platform. Drive may be customized for virtually any type of survey ranging from trails, parking lots, sidewalks, and ramps to full sign surveys. Multiple SST units may be deployed depending on the complexity and size of the project.

The sidewalk and curb ramp condition survey that was performed for Upland was completed using one IMS SST. Images of the SST units can be seen in **Figure 3.**

The SST is a purpose-built field data collection unit designed primarily for surveying municipal sidewalks, curb ramps, trails, right-of-way, and parking lots. The SST is equipped with the following:

- Front and rear 12MP Basler HD cameras
- Drive collection system (fanless computer and ADAS in environmentally sealed enclosure)
- Hemisphere DGPS
- 3x Gocator point lasers
- 5g Accelerometers
- 250 Hz MEMS IMU
- 5,000 CPR wheel encoder
- Target sensor
- High contrast monitor
- Event keyboard
- Tow Vehicle and Trailer

Figure 3 - Sidewalk Surface Tester (SST)

Using the Drive platform, the SST operator inputs GPS-tagged events for distresses that are observed on sidewalks and curb ramps. These distresses and their different categories can be found in **Table 1.**

Table 1 – Distress Ratings

Code	Distress	Moderate	Severe
1	Vertical Displacements (including faulting, sag/heave, etc)	1/4" - 1/2"	> 1/2"
2	Separation (including cracking, joint spalling, etc)	>1/2" - 1"	>1"
3	Excessive Cross Slope	>2% - 8%	>8%

Figure 5 shows what these events look like within the Drive software.

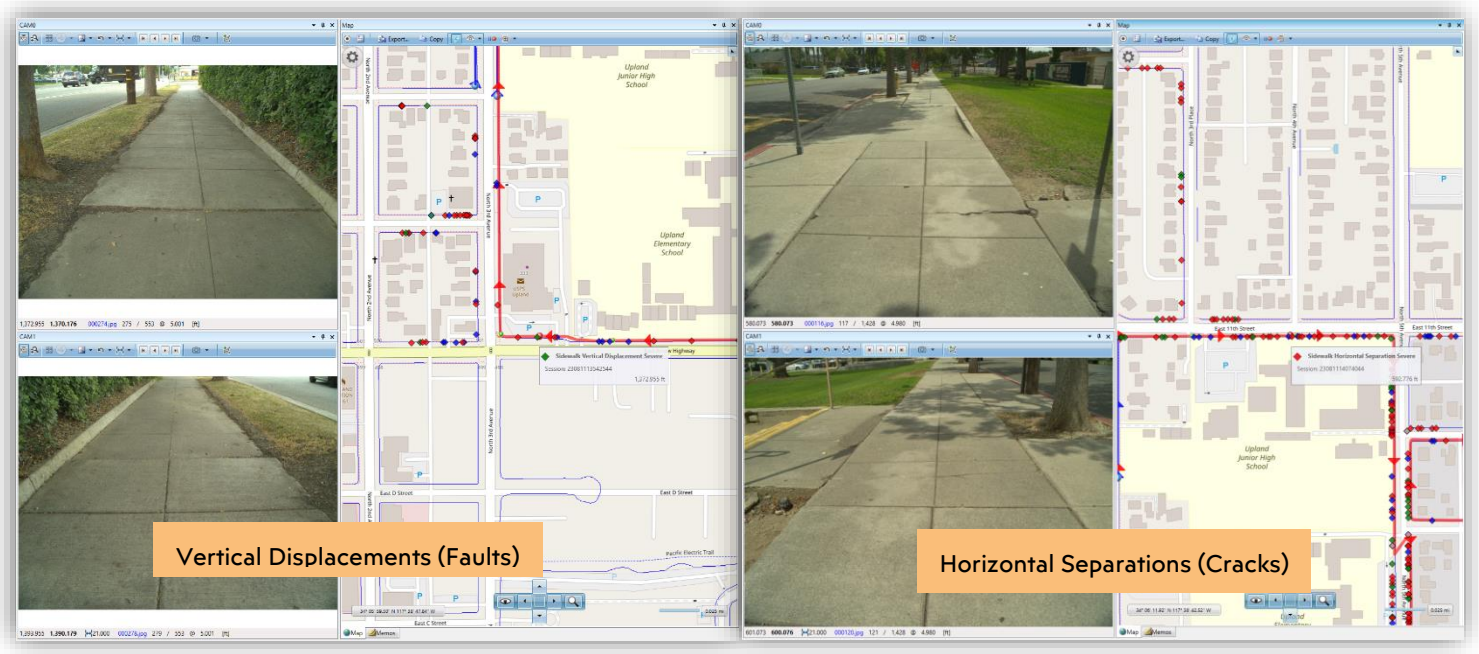


Figure 4 - Distress Rating in Connect

2.3 Distress and Condition Rating in Connect

Once the imagery and distress events were collected with the SST and imported to Connect, it was then matched to the GIS shapefiles. This allowed for the City's shapefile attributes, such as sidewalk and curb ramp names, identifiers, etc. to be carried throughout IMS' process. Then, after matching was completed, IMS' trained raters extracted the remaining asset attributes (obstructions,

protrusions, widths, etc.) from the calibrated imagery. To illustrate this process, **Figure 5** shows points that were marked on the front-facing imagery in the Connect software.

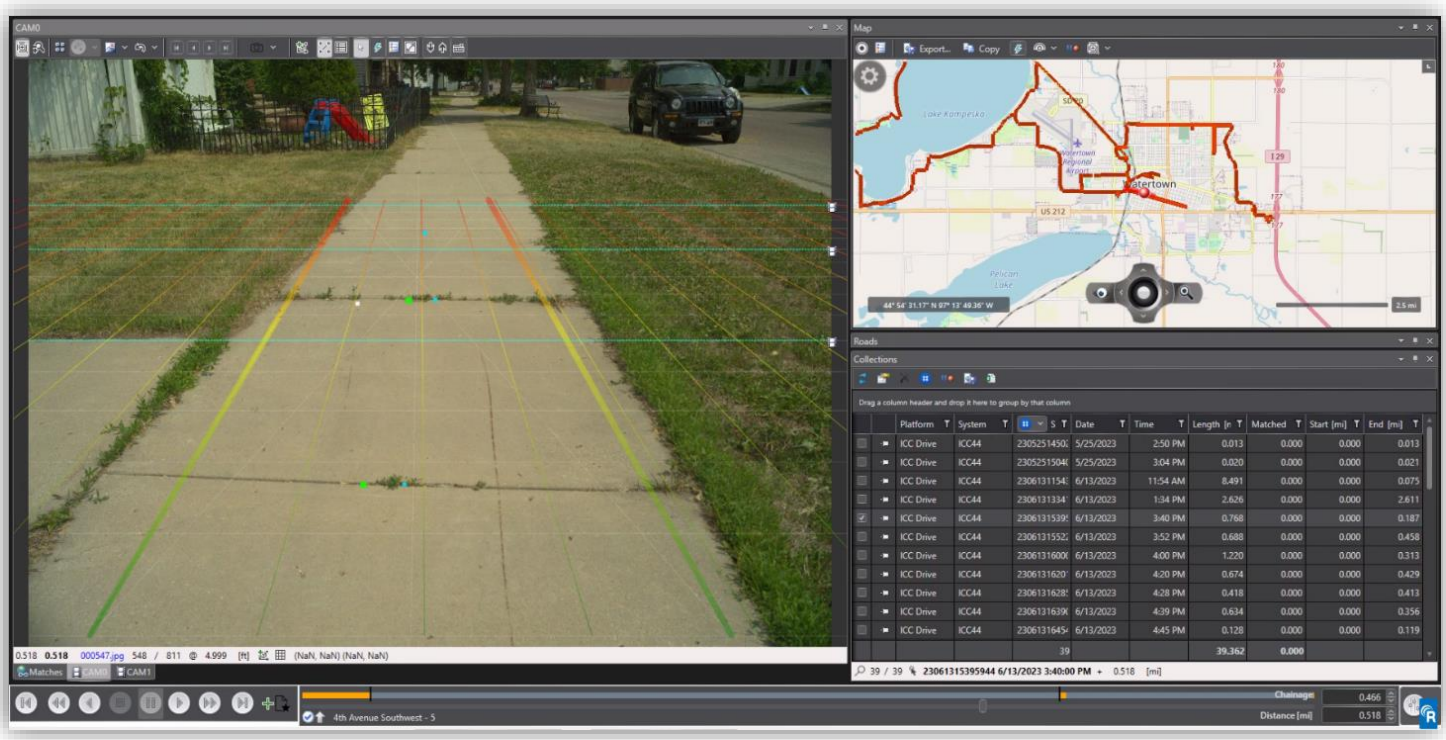


Figure 5 - Distress Rating in Connect

3.0 PAVEMENT CONDITIONS

3.1 Sidewalk Conditions Overview

The Sidewalk Condition Index (SWCI) considers the sum of a variety of distresses. The SWCI calculation has been developed by IMS and is modeled after the Pavement Condition Index (PCI) calculation used in ASTM D6433 to assess the condition of paved roads. It is important to note that sidewalk obstructions do not factor into the SWCI score, however, the cost for the specific rehabilitation method based on obstruction type is factored into the cost to repair a sidewalk segment. **Figure 5** illustrates the general process for calculating SWCI. SWCI is a 0-100 scale, with 100 representing a sidewalk in excellent condition. A deduct curve is defined for each distress, and the percentage area of distresses will determine the number of deduct points. Deducts are subtracted from 100 to determine SWCI. If a sidewalk segment has more than 4 distresses, the 4 largest deducts will be used to calculate SWCI.

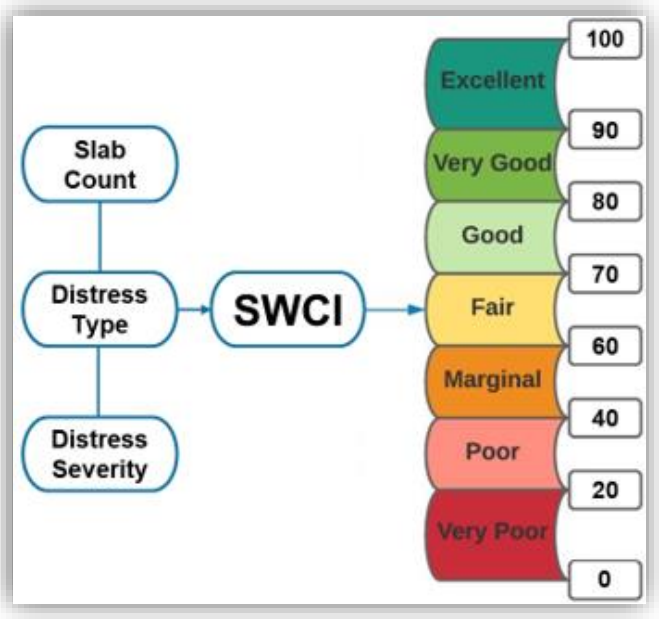


Figure 6 - Distress Rating in Connect

The following **Figure 7** shows the breakdown of the SWCI for the entire sidewalk network. The City sidewalk network has a SWCI of 55, putting the sidewalk network in the Fair category.

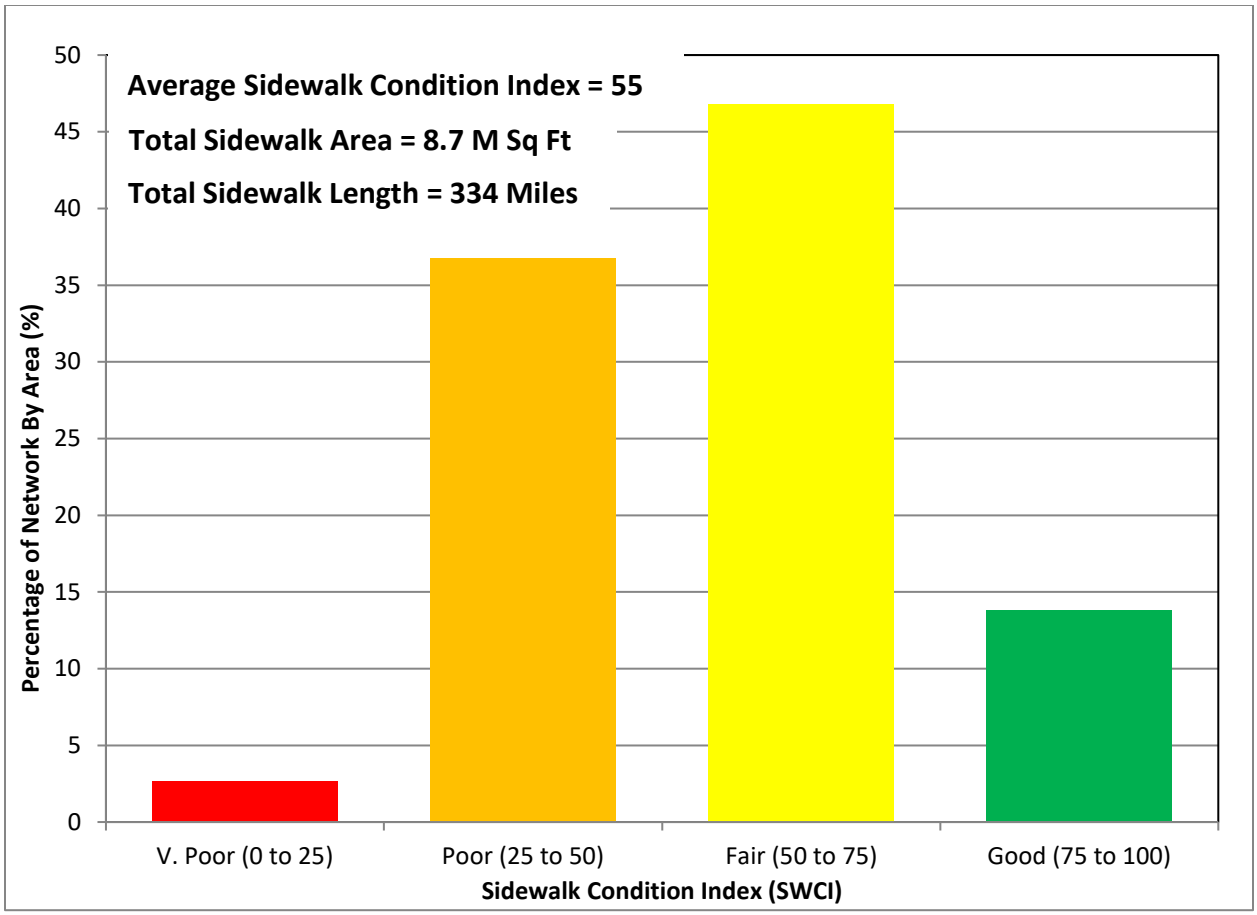


Figure 7 - Sidewalk Condition

- Fourteen percent (14%) of the network can be considered in "Good" condition and should be closely monitored to ensure timely application of early localized preventive measures.
- Forty-seven percent (47%) of the network falls into the SWCI range considered "Fair".
- Thirty-seven percent (37%) of the sidewalks are rated as "Poor".
- The remaining two percent (2%) of the network is rated as "Very Poor".

3.2 Sidewalk Condition Images

The SWCI categorizes sidewalks based on the sum and severity of distresses present. Below is an example of Upland sidewalk sections that fall within these categories.

Very Poor (0-25)

Arrow Route (SWCI = 6 SWID = 103351) – Several severe and moderate horizontal separations are present. This portion of sidewalk is flagged as an immediate priority should receive a complete remove and replacement. Areas where vegetation is growing within the cracks indicate that water is seeping into distressed areas and contributing to increased deterioration. Only 2% of the Upland network presents similar conditions.

Poor (25-50)

Randy Street (SWCI = 37 SWID = 104448) – This segment displays significant cracking. This image shows only the most distressed portion of the sidewalk. The distresses are not present along the entire length of the segment, so only a partial remove and replace with partial base replacement is suggested. Portions of this sidewalk have deteriorated to the point where it is now deterring ADA travel, notably the vertical displacement present in the above photo. The analysis has prioritized this particular segment as a "High Priority Rehab". Segments displaying similar characteristics represent approximately 37% of the Upland sidewalk network.

Fair (50-75)

Buffington Street (SWID-102687 SWCI= 68) - This segment of sidewalk is in mostly serviceable condition with a few exceptions. There is a small amount of cracking between several panels but it is mostly low in severity. The largest concern is the severe vertical displacement shown in the image above. This is considered a severe tripping hazard and contributes very strongly towards the overall distress deducts calculated for this section of sidewalk. Approximately 47% of upland sidewalks fall into the Fair category.

Good (75-100)

Palm Avenue (SWID-105918 SWCI = 96) - This segment of sidewalk is rated as “good” and displays no significant distresses. The analysis has determined this segment to be a low priority rehab. Around 14% of the Upland sidewalk network is in this condition category.

The following **Figure 8** presents a breakdown of the needed rehabilitation activities on the overall sidewalk network.

- The largest rehab need will fall into the Local Rehab/AC Taper category. This represents 68% of the overall sidewalk area.
- Grind + AC Taper accounts for 21% of the sidewalk area.
- The non-distressed area (area with no current rehab need) accounts for 10% of the overall sidewalk area.
- The remaining sidewalk areas are recommended for remove and replace, crack filling and Joint rehab, protrusion control, and relay pavers with base.

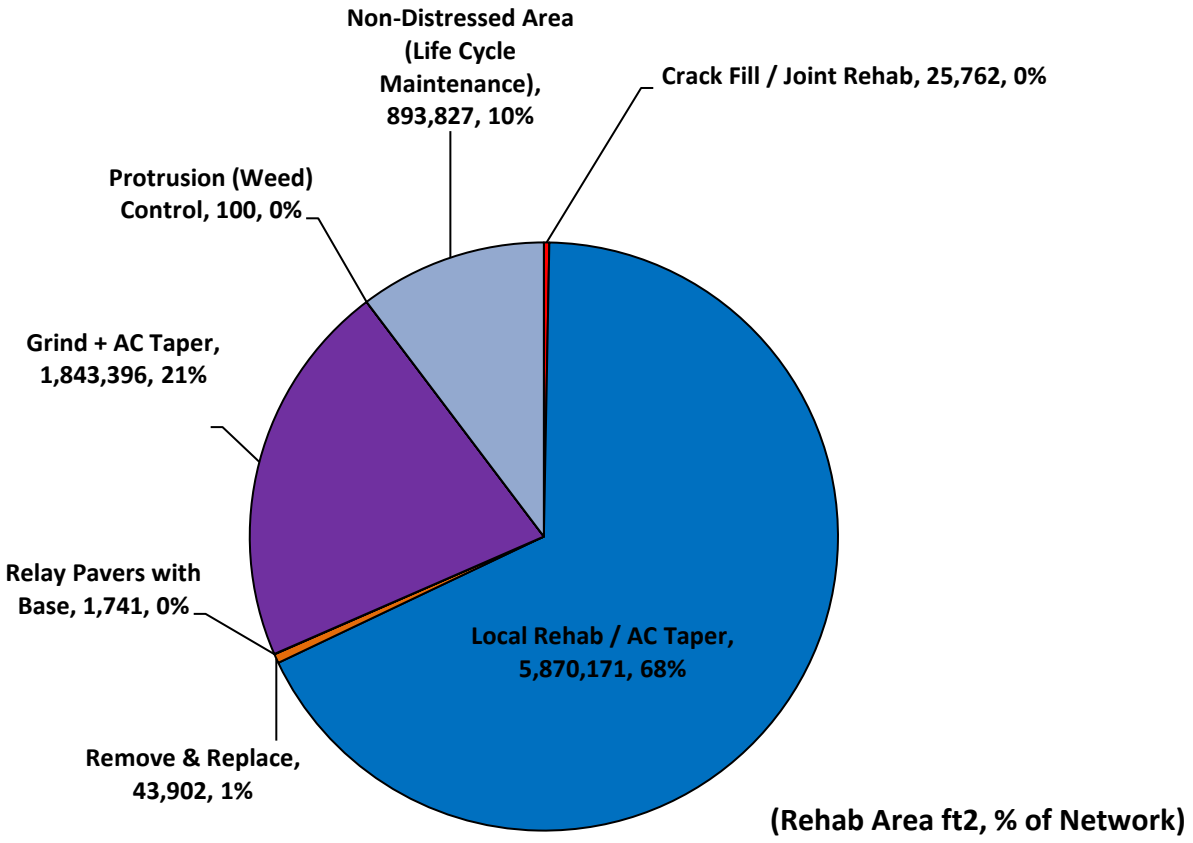


Figure 8 – Rehab Distribution by Area

3.3 Observed Obstructions

Obstructions are calculated and considered separately from the SWCI and should rank high on the priority for the City to fix. There are two reasons for this. First is the consideration of ADA liability, where even a single obstruction on an overall Excellent SWCI-rated sidewalk will count the entire segment as a failure to comply with ADA regulations. Next is the cost consideration; a majority of obstructions are inexpensive and easily fixed problems. Foliage can be trimmed back, garbage and recycle receptacles can be repositioned so that they do not block the sidewalk and tripping hazards can often be smoothed over without spending a lot of capital. **Figure 9** shows a breakdown of Sidewalk Obstruction type by Cost.

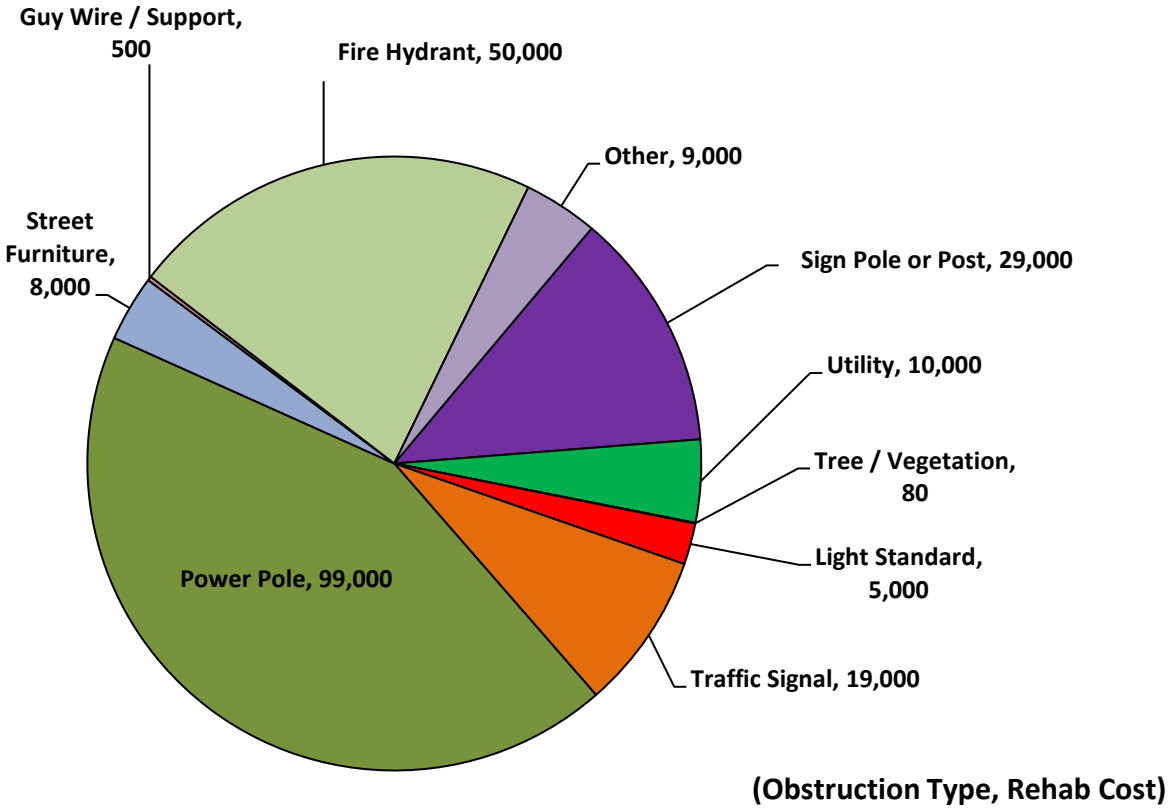
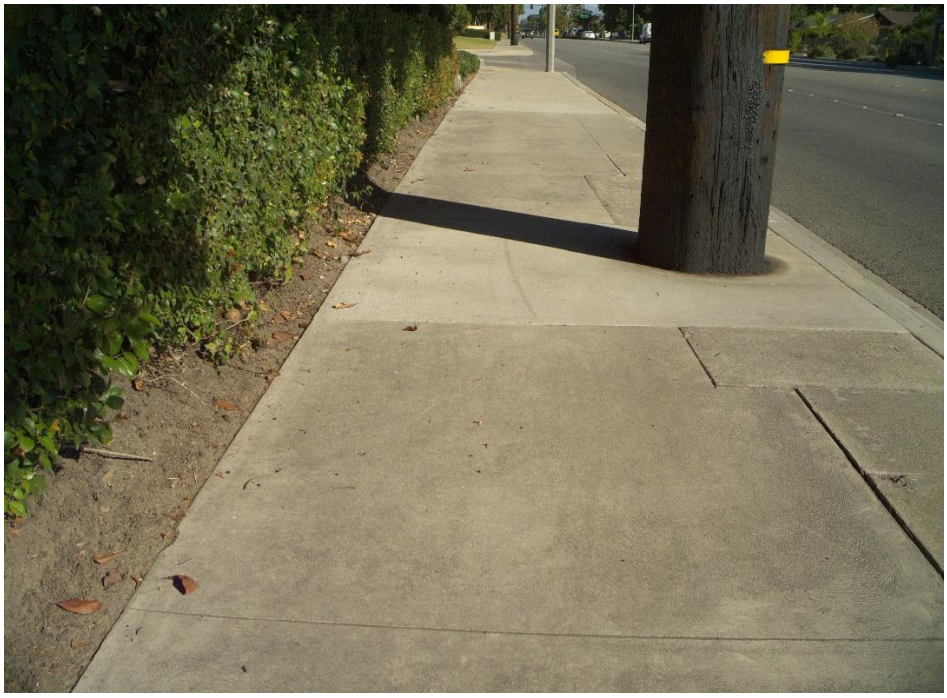


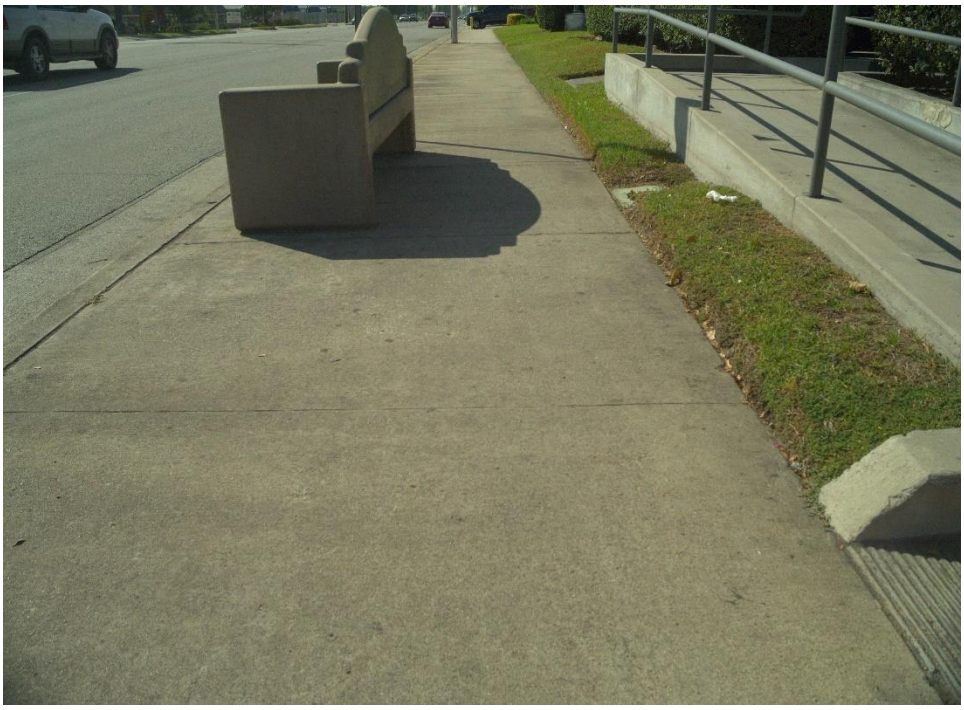
Figure 9 – Sidewalk Obstruction Type by Cost

The greatest costs associated with obstruction removal involves the removal of power poles and other utilities. It is common for utility companies that manage these assets to assist the City in the costs associated with the movement of their utility assets. This may significantly reduce the overall costs associated with obstruction removal.

Example Obstructions:

In these examples, the power poles and street furniture restrict the width of the sidewalks. This negatively affects the traversability of the sidewalk by wheelchairs and other similar assisting devices. These obstructions should be removed or additional infrastructure should be built to allow the public to traverse the sidewalks with ease.





3.4 Pedestrian Curb Ramp Summary

Every ramp is assigned attributes ranging from ramp/landing/flare slopes to an assessment of the visual impairment facilities (VIF). In addition, the SST operator collects the same distresses as for sidewalks on every ramp and rates them by severity (see section 2.2).

Figure 10 shows how the LiDAR point cloud data was used to measure values from the curb ramps in Upland. Smart cells of typical curb ramp configurations were placed on top of the ramps in the point cloud. This smart cell then automatically extracted and populated the parameters of interest.

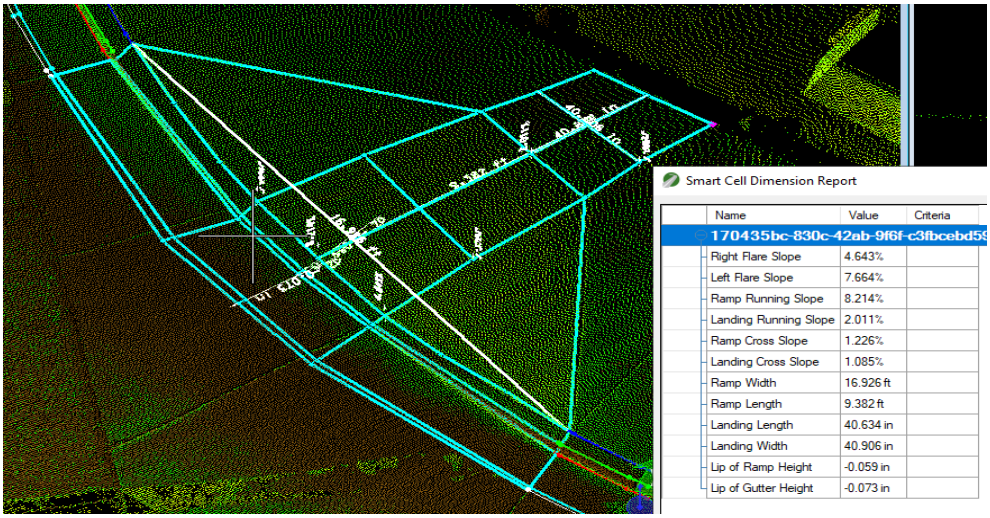


Figure 10 – LiDAR Point Cloud Slope Measurement

3.5 Pedestrian Curb Ramp Conformity Level Images

In the absence of a nationally recognized system, IMS has developed a scale that categorizes curb ramps based on their conformance with the relevant Americans with Disabilities Act (ADA) standard. The scale attempts to categorize the ramps based on features that would be of concern from an ADA compliance perspective. It's important to acknowledge that the final verdict of compliant or non-compliant is not the objective. Instead, these categories are designed to help the City understand their needs and begin prioritizing remediation of potential compliance violations. Essentially, the number of ADA-related issues observed/measured on a given ramp corresponds to an ADA Conformity Level. These levels are "ADA Conformity Level 1", "ADA Conformity Level 2", "ADA Conformity Level 3", "ADA Conformity Level 4", "ADA Conformity Level 5", and "Ramp Required". The following images show examples of each category.

ADA Conformity Level 1 are ramps **(Figure 11)** that have minimal (if any) ADA issues – they have a protective back curb (if necessary for the design style), the slopes appear to be within a reasonable range, and for applicable design styles, the ramp has a landing. The ramp will also usually have truncated domes.

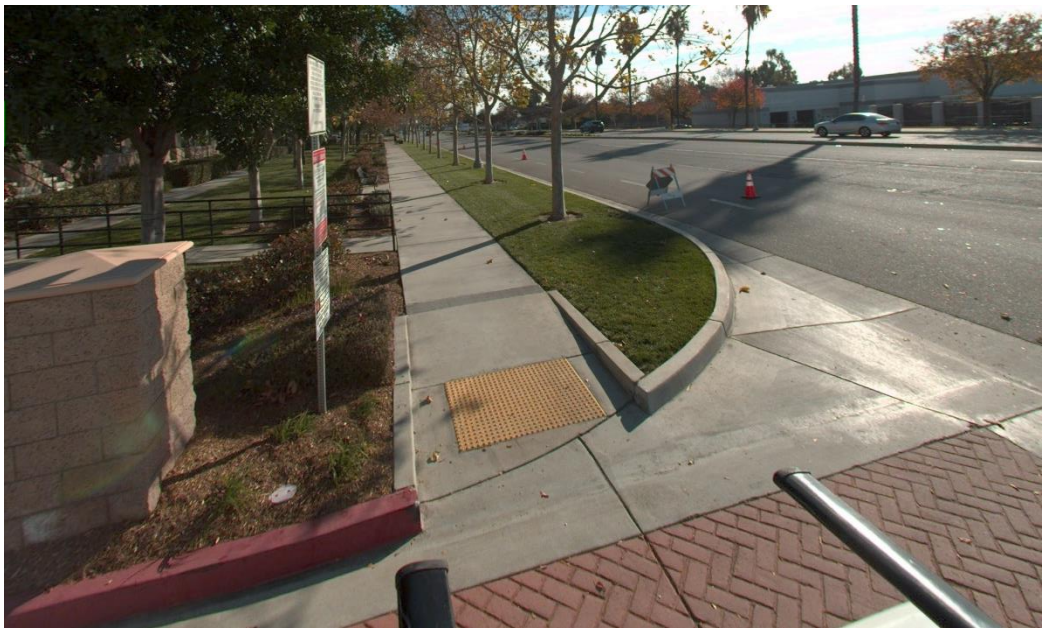


Figure 11 - ADA Conformity Level 1 Ramp

ADA Conformity Level 2 ramps **(Figure 12)** have slightly more ADA issues than ADA Conformity Level 1, i.e. the ramp may be missing a back curb, but is otherwise fine, in terms of slope, landing design, and presence of truncated domes. This type represents the most common ramp type in the City.

Figure 12 - ADA Conformity Level 2 Ramp

ADA Conformity Level 3 ramps **(Figure 13)** have two or more issues. For example, they may be missing a back curb and a truncated dome plate or have some sort of non-compliant visual impairment facility instead.

Figure 13 - ADA Conformity Level 3 Ramp

ADA Conformity Level 4 ramps **(Figure 14)** have several ADA issues that need to be addressed, including slope issues, lack of landings, and/or missing/non-compliant facilities.

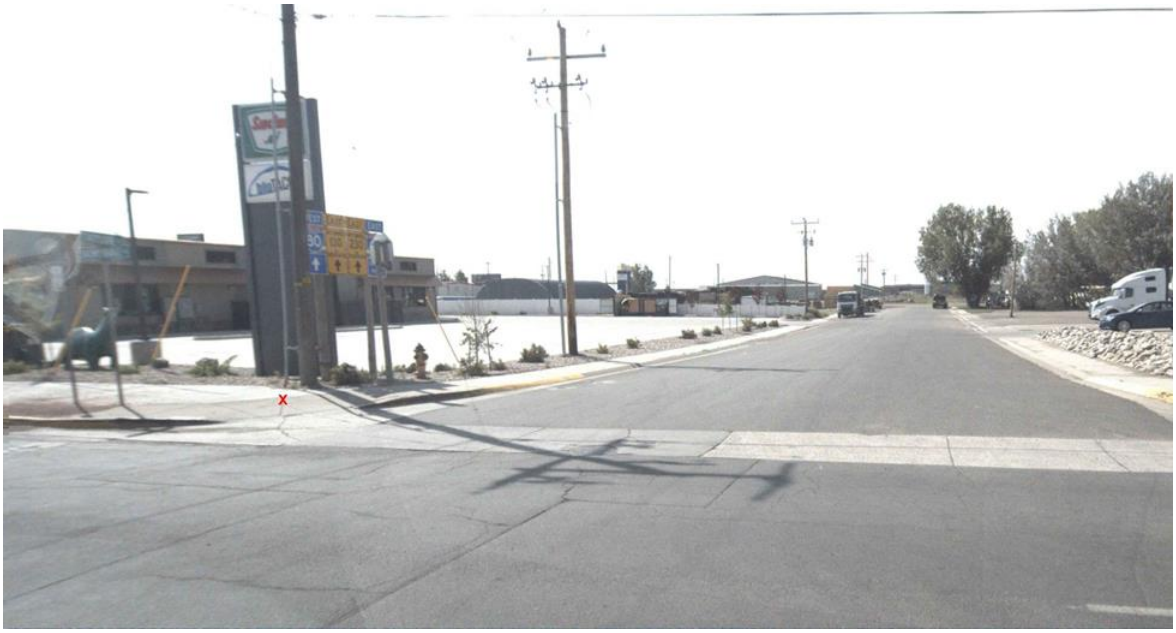


Figure 14- ADA Conformity Level 4 Ramp

No ADA Conformity Level 4 ramps were found in Upland. The above image is from another city and is provided here solely to give a comprehensive overview.

ADA Conformity Level 5 ramps **(Figure 15)** have several ADA issues and have many and/or excessive issues that need to be addressed, including slope issues, lack of landings, and/or missing/non-compliant facilities.

Figure 15 - ADA Conformity Level 5 Ramp

No ADA Conformity Level 5 ramps were found in Upland. The above image is from another city and is provided here solely to give a comprehensive overview.

Ramp Required points **(Figure 16)** are locations where ramps are not installed, but they should be.

Figure 16 - Ramp Required Point

3.6 Current Sidewalk Ramp Conditions Overview

The following figure **(Figure 17)** offers a summary breakdown of the City's ramps by type. The majority of the ramps in the City fall within the Conformity Level 2 designation, indicating there are some minor flaws in the design which may not meet the updated ADA standards, but are otherwise functional and easily serviceable.

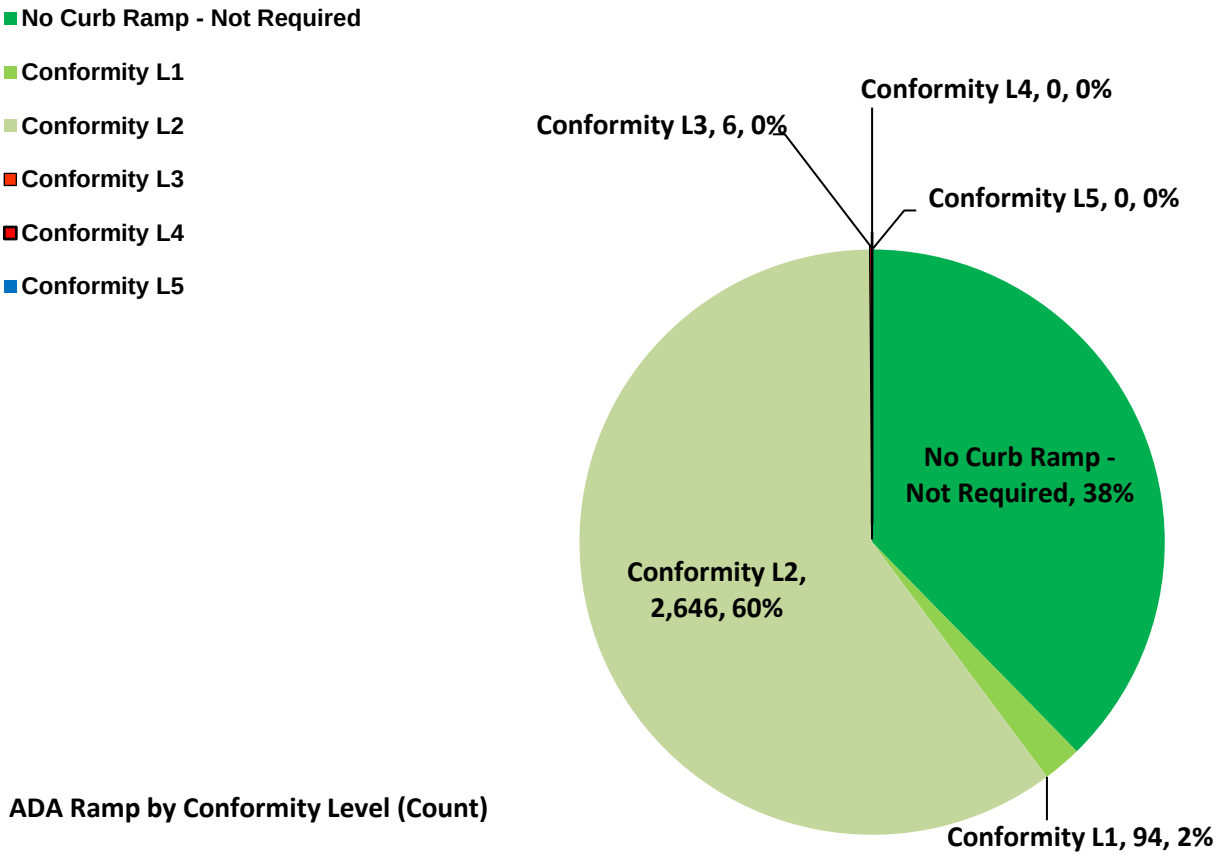


Figure 17 - Ramp Overview by Type

4.0 PROJECT RECOMMENDATIONS AND COMMENTS

4.1 Project Summary and Recommendations

In 2023, a condition survey was performed on the full City sidewalk and curb ramp networks. The results of the condition survey were aggregated into the Easy Sidewalk Analysis (ESWA) sidewalk and curb ramp management system. This system was used to organize a georeferenced sidewalk and curb ramp inventory, determine accurate conditions for the assets, and provide cost estimates for rehabilitation of the assets.

The following broad recommendations are presented to the City as an output from the sidewalk and curb ramp analysis and must be read in conjunction with the previous sections.

- The City should make efforts to keep the ESWA spreadsheet up to date.
  - By maintaining and updating the rehabilitation unit rates, work history of the segments, and accuracy of the inventory, the City will be able to reliably forecast funding needs for future years. This allows the City to be proactive in maintaining the condition of the sidewalks and curb ramp networks at an acceptable level.
- The City should periodically resurvey the sidewalk and curb ramp network.
  - Sidewalk and curb ramp performance over time involves many variables, such as traffic volumes, environmental factors, maintenance timing, and design standards. As these variables change, the rate at which they deteriorate will change with them. The periodic resurvey of conditions allows the City to track these changes and update the spreadsheet accordingly to ensure that appropriate rehabilitation measures are being planned.
- The City should investigate new and additional rehabilitation activities.
  - As technology progresses, improvements in sidewalk and curb ramp rehabilitation are constantly being made. When possible, the City should refresh the rehabilitation activities planned in ESWA to ensure these advances are used to the City's advantage.
- The City should strive to maintain or better its current condition if possible.
  - Generally, it is more cost effective to maintain a condition than it is to regain ground lost to deterioration. The City currently maintains an overall network SWCI of 55.

4.2 Closing

The IMS Team greatly appreciates the opportunity to work with the City on this sidewalk and ramp management implementation. Over the course of this project, it has become clear that the City staff demonstrates a strong commitment to providing the highest level of service that they can to their community. IMS stands ready to assist the City with training and technical support as necessary, and we welcome the opportunity to work with the City on future pavement and asset management projects.