

# Case Study: Transportation Asset Management

Roads and Sidewalks in St. Albert

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Presented by:

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*City of St. Albert*



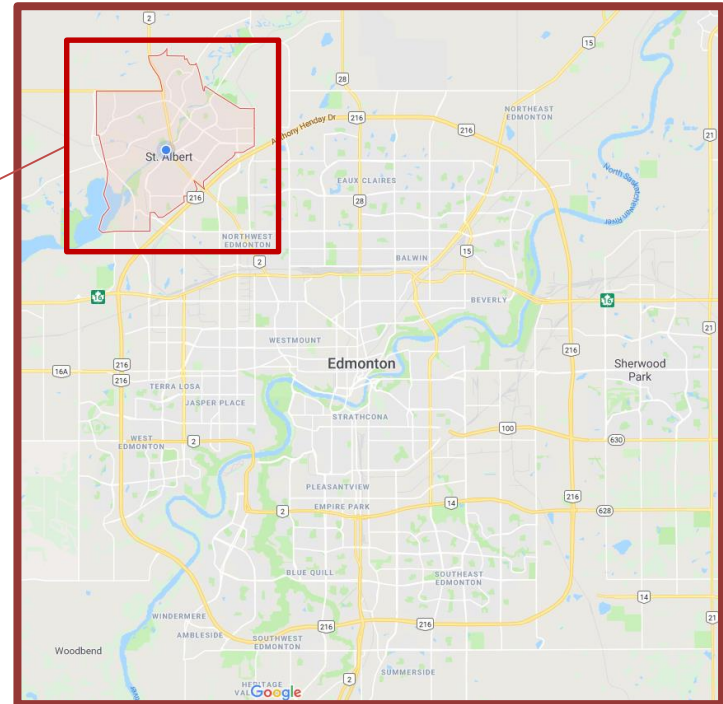
# Overview

- Introduction
- History
- Roads
- Sidewalks
- Close



# Introduction

- St. Albert – Located just North of Edmonton



# Introduction

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- Like most agencies, the City of St. Albert owns and maintains a variety of different transportation infrastructure.
  - Roads (~780 Lane km's)
  - Sidewalks/Trails (~480 CL kms)
  - Bridges (22)
  - Parking lots (41)

# Introduction

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- The City has been managing this infrastructure in some fashion over many years:
  - Infrastructure Branch (2003-2015)
  - Dedicated ownership in separate branches, Eg: Utilities, Transportation, etc... (2015+)

# Introduction

- St. Albert used to Publish its infrastructure Report in local news Papers (2004)

St. Albert City News • November 12, 2004 www.stalbertcitynews.com Page 29

## How long will our infrastructure last?

OUR INFRASTRUCTURE ASSETS have a range of lifespans. For example, a trail that was built 10 years ago is expected to last another 10 years. Drainage pipes built 30 years ago won't need to be replaced for about another 45 years.

Regardless of when they will need to be replaced, they all need ongoing maintenance. Figure 2 shows the average age and average remaining effective life of City infrastructure.

**Condition of Assets**

As one would expect, as infrastructure gets older, its condition deteriorates. With all assets, we get to a point where this deterioration is unacceptable.

At this point, it needs to be repaired or replaced. We refer to these issues as our maintenance backlog and long-term annual maintenance.

**Figure 2: Average age and average remaining effective life (years)**

## What infrastructure needs attention?

BECAUSE OF OUR careful approach to long-term planning, St. Albert is ahead of most other municipalities in understanding the inventory and condition of our infrastructure. As part of the Infrastructure Review Phase 1, the City has identified many of its assets and found out how much they are worth and how long they are expected to last. (Table 1)

Type	Buildings	Parks	Trails	Roads	Traffic Signals	Sidewalks	Bridges	Traffic Vehicles	Public Works Equip.	Water	Wastewater	Stormwater
Inventory	61	10	26 km	600	65	430 km	10	42	136	288 km	209 km	231 km
Value (million)	500.2	55	\$2.0	\$209	1.7	\$45.5	\$18.9	\$18.9	\$4.4	\$27.1	\$240	\$227
Utilization (percent)	48%	83%	52%	45%	74%	43%	88%	40%	57%	52%	62%	62%

**Table 1: Infrastructure snapshot**

**Maintenance Backlog**

The City is constantly maintaining its infrastructure to keep it in good condition. This is balanced by the reality of fiscal limitations. Because of the high cost of maintaining infrastructure, some work that is required has to be deferred until adequate funding can be secured. This, of course, has to be carefully weighed against the cost of deferral.

At the moment, the City of St. Albert has a \$46.8 million backlog of maintenance it has not yet been able to fund. This is a pressing issue (Figure 3).

**Long-term Annual Maintenance**

In order to manage and reduce the maintenance backlog into the future, we need to properly fund our long-term annual maintenance needs, otherwise our backlog will continue to grow.

**Infrastructure Growth**

Not only do we have to address our maintenance backlog and our long-term annual maintenance, we also have to prepare for the maintenance of new infrastructure that's required as the City grows.

Municipal and Federal programs may be able to assist in funding the work. While we cannot depend on this funding, we certainly will use it when it becomes available. By keeping a list of necessary maintenance projects we can act quickly when those funding opportunities arise.

**Figure 3: Maintenance Backlog (\$46.8 million)**

**Funding from other levels of government**

Because property taxes alone aren't likely to address the gap between the cost of responsibly managing infrastructure and the amount of available funding, we are working to convince other levels of government to help cover the cost.

**Avoid a knee-jerk reaction**

The City of St. Albert believes it's far more sensible to plan for the future now to avoid a knee-jerk reaction to the infrastructure challenge some time down the road.

For further information on the City of St. Albert Infrastructure Review, please contact General Manager of Planning and Engineering, Guy Bolton at 459-1654 or Infrastructure Manager, Todd Wyman at 459-1744.

**THE CITY OF**  
**St. Albert**  
Cultivate Life

# Introduction

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- Today most infrastructure condition is presented internally and through project charters.
  - Condition data is presented in relevant programs alongside program needs
- City is currently working towards a more comprehensive asset management plan

# Introduction

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- Today will be presenting St. Albert's experience with 2 systems
  - Pavement Management
  - Sidewalk/Trail Management



# Pavement Management



# Pavement Management

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- The City maintains several road asset types
  - Highway
  - Arterial
  - Collector
  - Local
  - Lanes/Parking lots

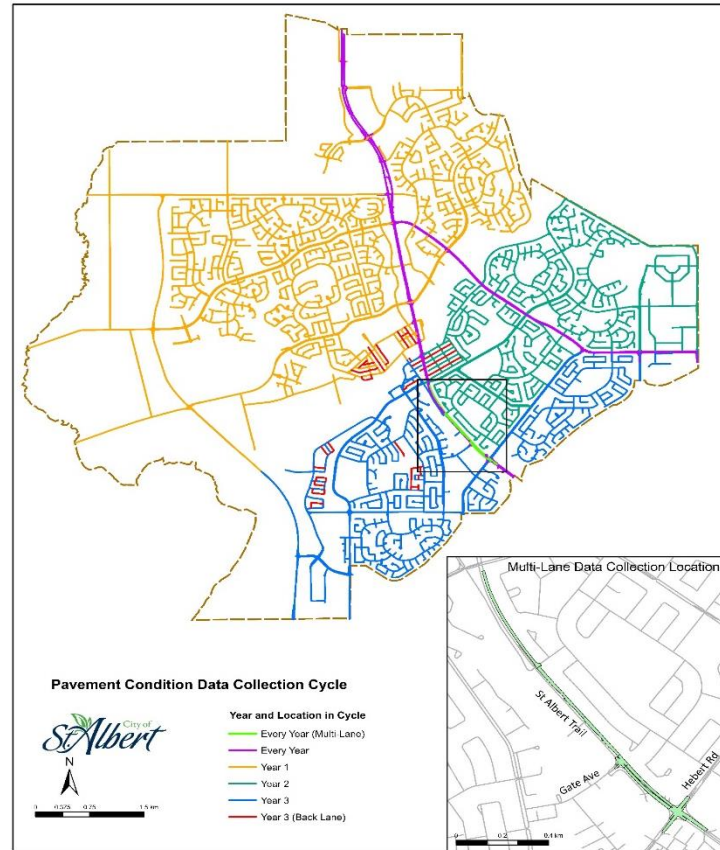
# Pavement Management

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- These assets have a variety of different needs and levels of service.
- To manage this, the City utilizes a pavement management program (Road Matrix)

# Pavement Management

- The City has a consultant collect data across the City in thirds



# Pavement Management

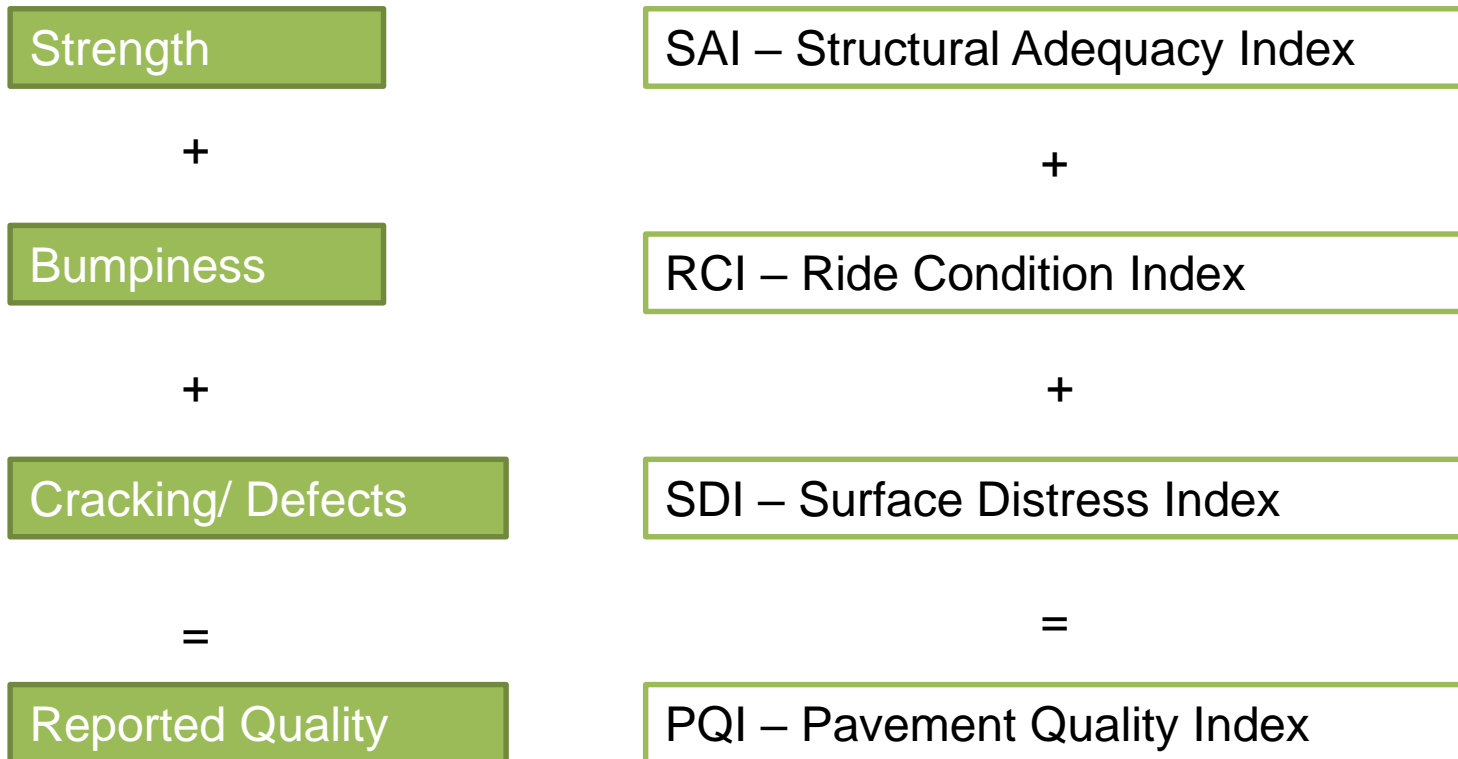
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- This data that is collected is loaded by the consultant into the City's system.
- The resulting data is analyzed to produce 3 different indicators and one over all quality index

# Pavement Management

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## Quality Metrics



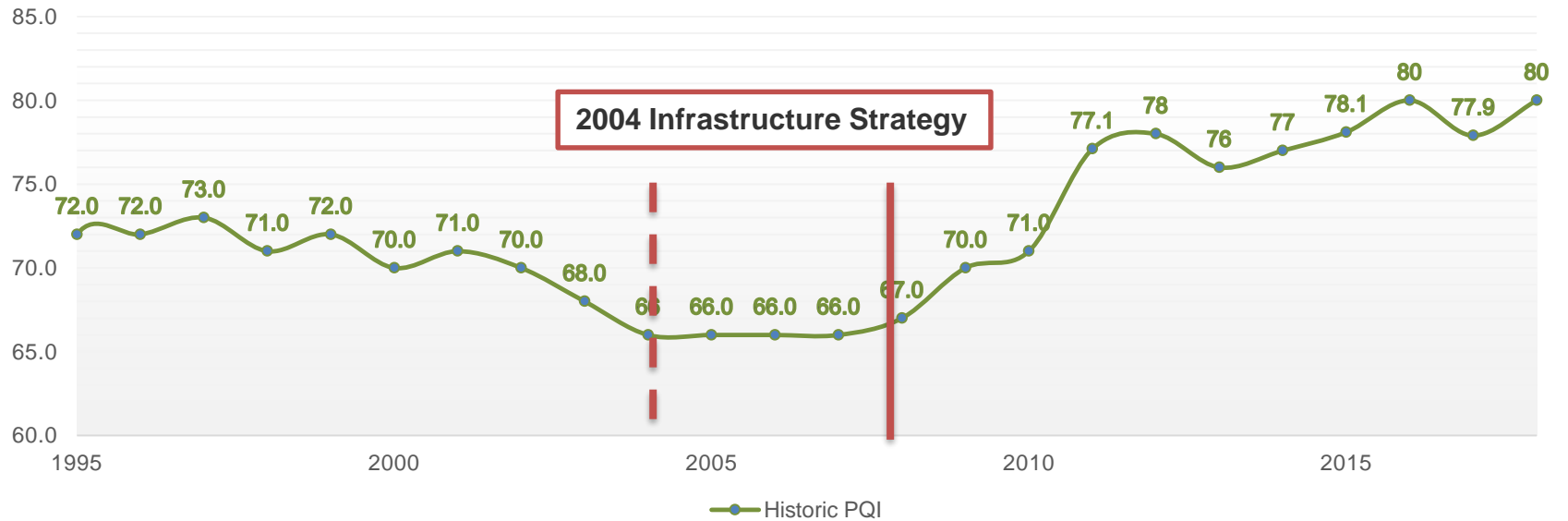
# Pavement Management

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- The City has been collecting this data for many years
- This historical data has allowed the City to track the progress of its programs in great detail and use targeted investments and locations

# Pavement Management

St. Albert Historic Network PQI  
1995-2018





# Pavement Management

- For comparison, the Alberta Pavement Managers User Group conducted a voluntary survey of pavement indices across the province

Alberta Pavement Condition Comparison [1]

Metric	PQI	RCI	SDI	SAI
Average	64.9	51.7	65.3	66.7
Median	63.9	50.7	64	63.6

# Pavement Management

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- This showed that a deliberate, planned and coordinated effort on pavement and roadway improvements could yield an improved network PQI.
- The current St. Albert PQI as of 2018 is 79.8 excluding back lanes and parking lots.

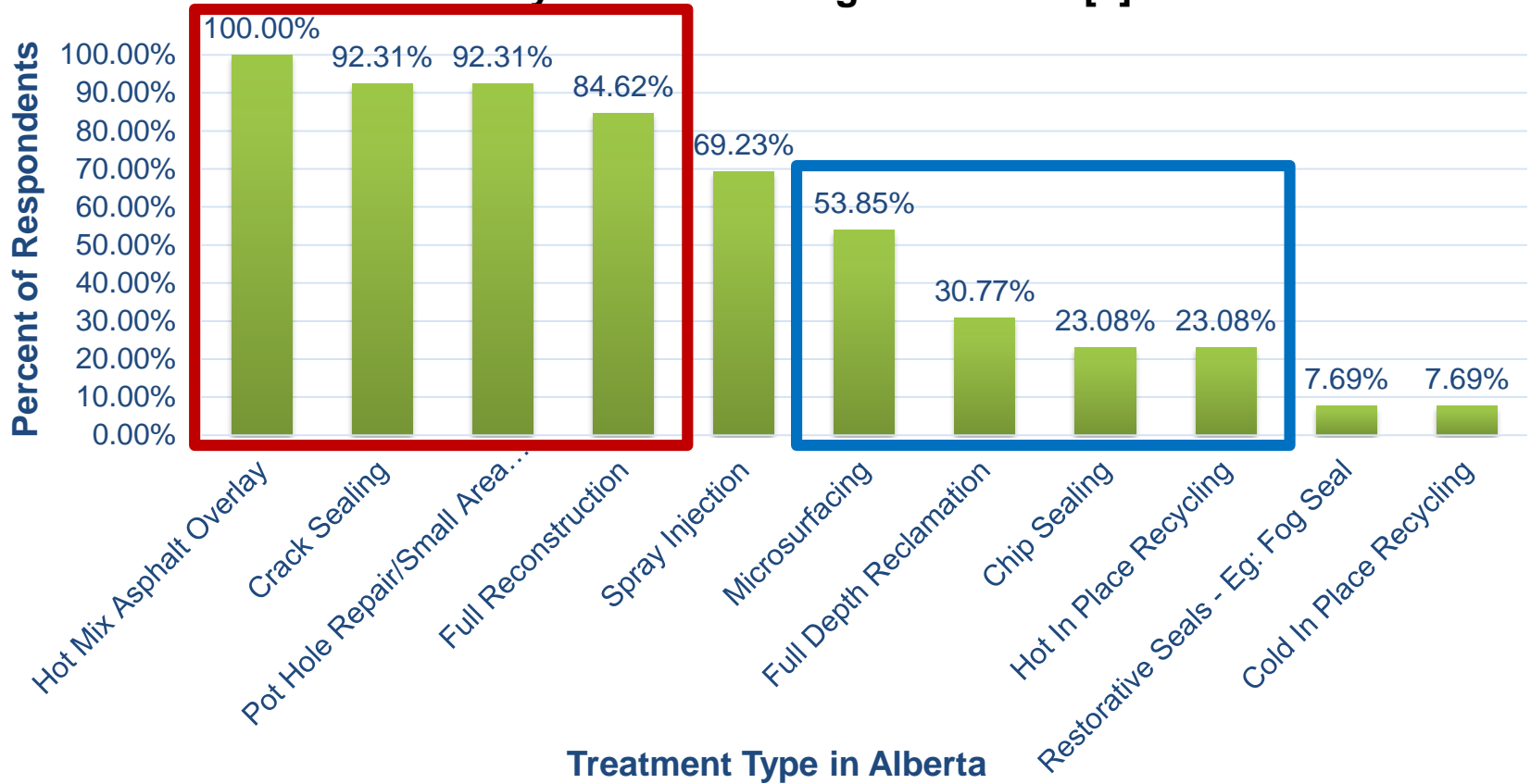
# Pavement Management

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- From 2008 to 2015, the city invested heavily in 3 major treatments
  - **Mill & Inlay**
    - Where a specified depth of asphalt is removed and replaced
  - **Reconstruction**
    - Complete road structure is replaced
  - **Crack Sealing**
    - Where cracks are sealed
- Additionally, new developments were built to better engineered specifications

# Pavement Management

## Roadway Treatment Usage in Alberta [1]



# Pavement Management

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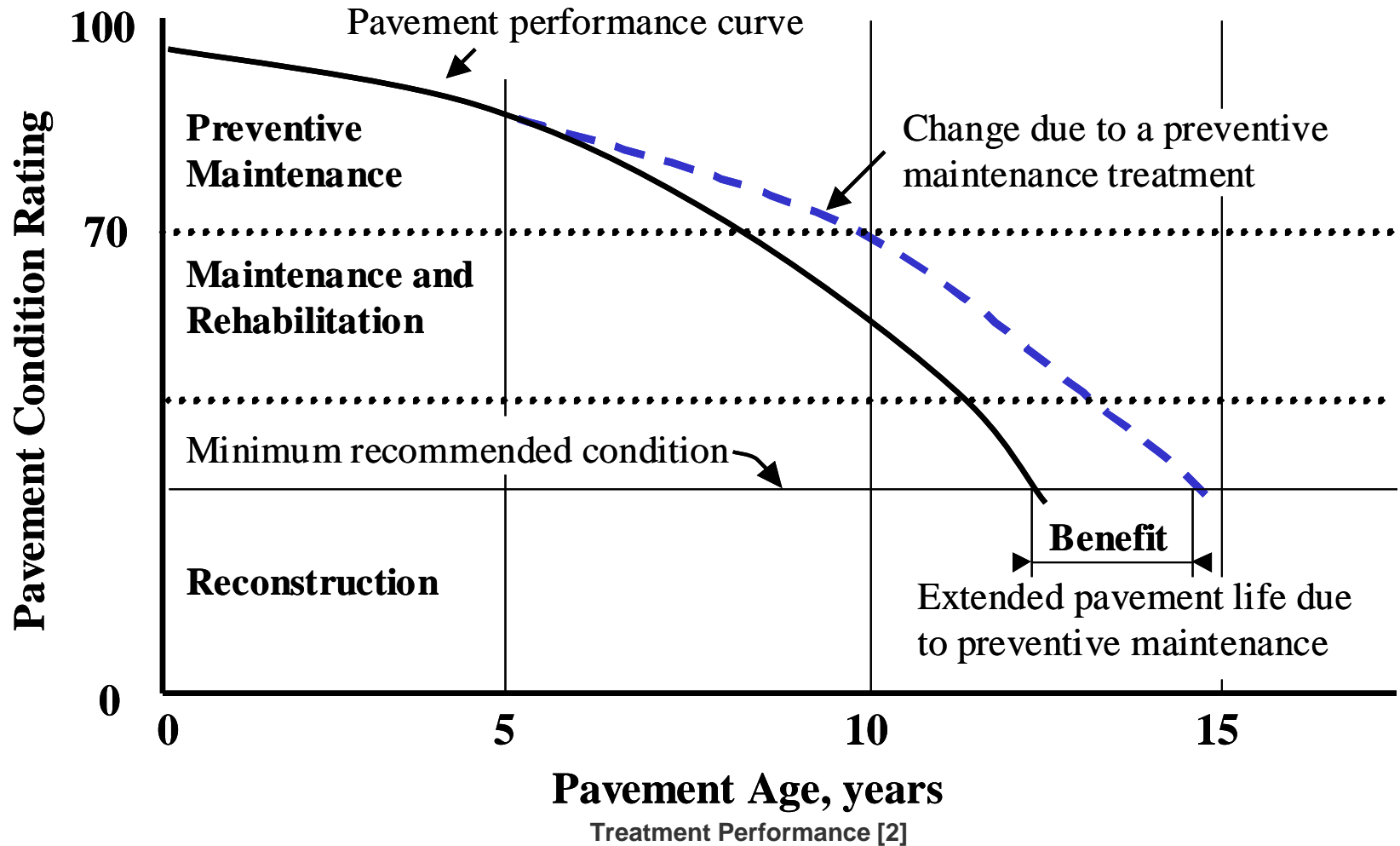
- With the steady increase of PQI and investment in roadways, the City began to look at new techniques and materials to maximize life of roads
- These included
  - Polymer Modified Asphalts
  - Microsurfacing
  - Stone Mastic Asphalts
  - Reclamation and Recycling Technologies

# Pavement Management

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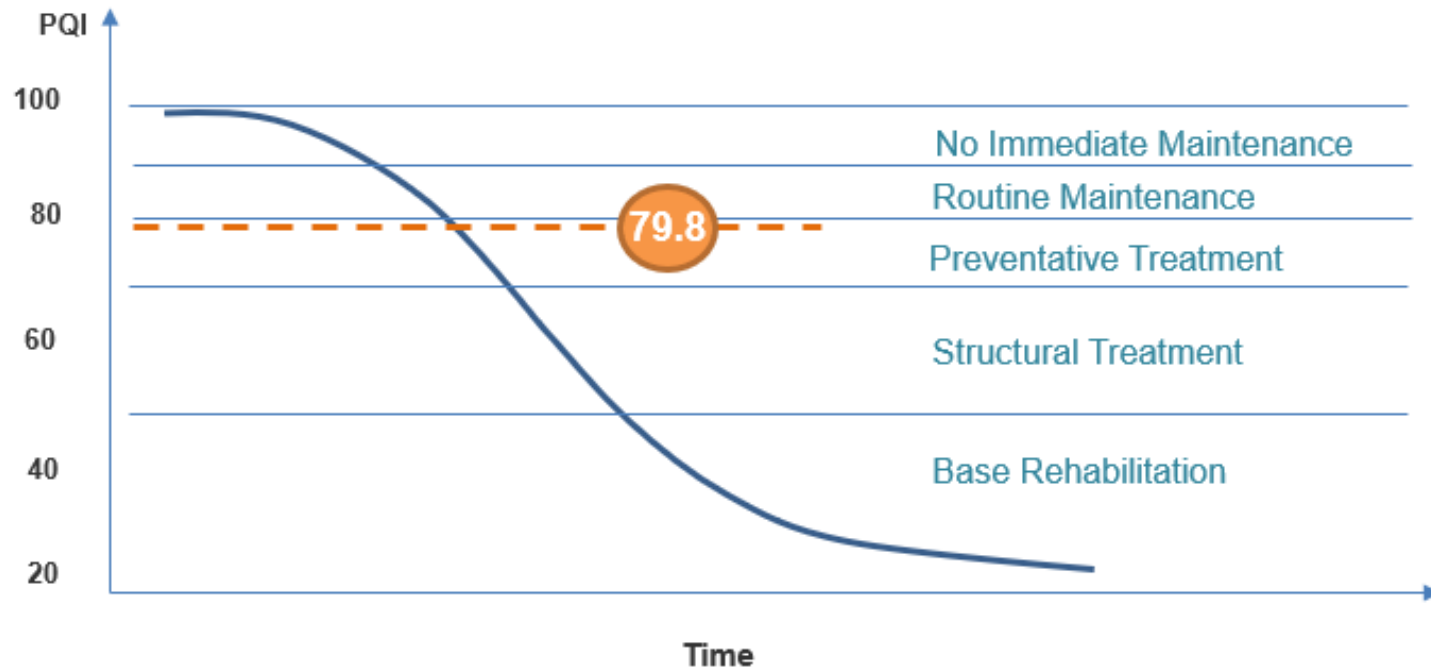
- Currently, the City is working towards a stronger emphasis on preservation
  - Keeping good roads in good condition
  - Following more iterative, less expensive preservation techniques
  - Building new roads so they are recyclable and reclaimable

# Pavement Management



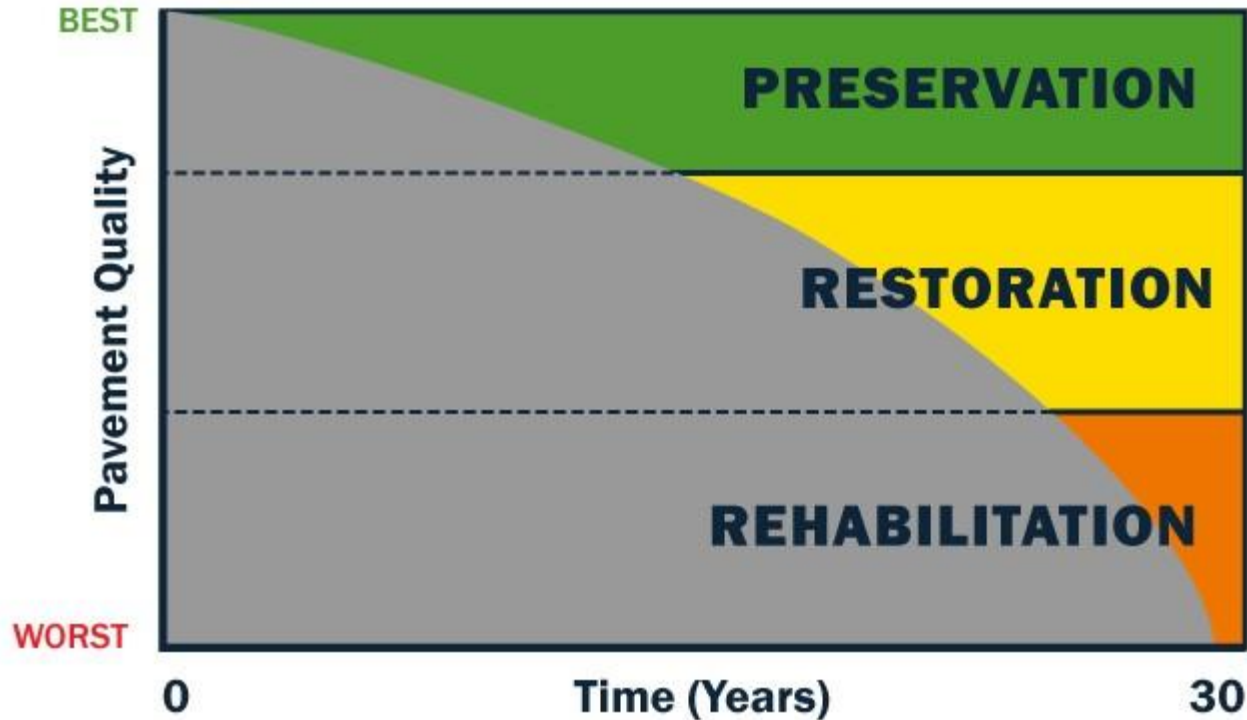
# Pavement Management

St. Albert PQI and Treatment Ranges





# Pavement Management



St. Albert Treatment Chart [3]

# Pavement Management

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- In conjunction with the City's improvements to its pavement management approach; the City began researching additional properties associated with the new materials:
  - Stone Mastic Asphalt (SMA)
  - Microsurfacing
  - High Traffic (HT) Asphalt

# Pavement Management

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**Aged Asphalt**



**HT Asphalt**



**SMA Asphalt**

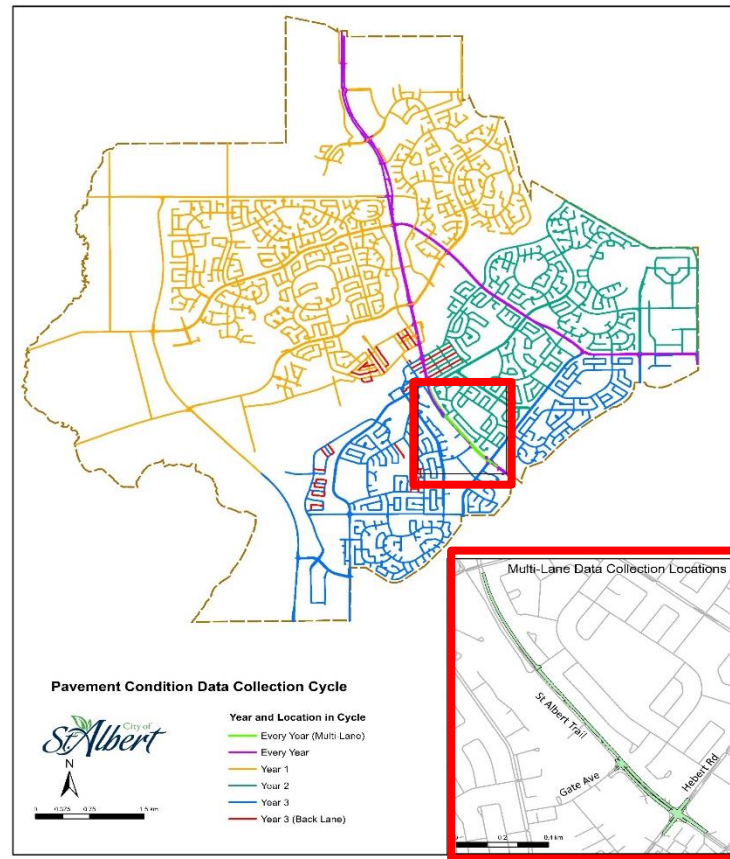


**Microsurfacing**



# Pavement Management

- This was done by creating a test section for materials



# Pavement Management



# Pavement Management

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# Pavement Management

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- Condition Results
- The following results show the PQI, RCI, SDI before and after

Multi Lane Condition Assessment Results [4]

Average of Entire Test Section		
Metric	Pre Construction	Post Construction
PQI	69.06	87.83
RCI	61.71	72.83
SDI	53.25	95.91

# Pavement Management

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- By using the pre/post survey results, improvements to roadways can be measured

Pavement Metrics Improvements [4]

<b>Metric Improvement by Material</b>			
<b>Material / <u>Metric</u></b>	<b>SMA</b>	<b>HT</b>	<b>Microsurface</b>
<b><u>PQI</u></b>	19	21.5	14.2
<b><u>SDI</u></b>	46.4	34.6	45.5
<b><u>RCI</u></b>	11.9	14.7	3.8



# Pavement Management

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- Additionally work flow and work history tracking is becoming a greater importance
  - Work history is the basis of benchmarking performance
  - Many agencies rely on “in house” memory, but don’t always write things down

# Pavement Management



Data Work Flow Chart

# Pavement Management

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- Closing Remarks
  - Pavement Management Systems, when properly implemented and maintained, help to:
    - ID best candidates with funding
    - Strategically select candidates that don't conflict with other capital projects (eg: Utilities)
    - Ensure treatments match conditions
    - Make efficient use of tax dollars and grow utility
  - Understanding material performance and properties is important to proper pavement management and practices

# Pavement Management

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- Good White Paper/Technical References
  - AASHTO Pavement Management Guide
  - “Long Term Cost Benefit Analysis of Pavement Management System Implementation” – *Lynn Cowe Falls*
  - “You’ve got the data, now what?” – *Al Cepas*
  - “The 2% Solution” – *Al Cepas*

# Sidewalk Management



# Sidewalks

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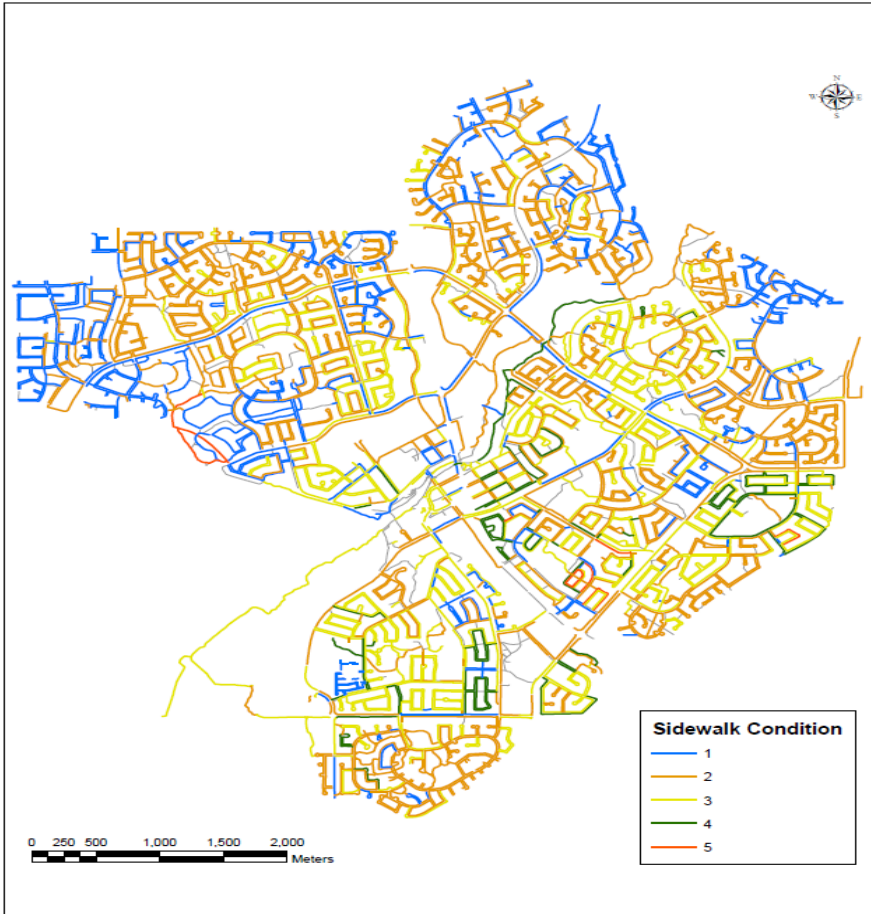
- Assessing sidewalks can seem like a daunting task:
  - Similar scope to that of a road pavement management project
  - Conflicts with funding for assessment
  - Often downloaded to maintenance/public works departments to triage
  - Lack of cohesive standard(s) across Canada

# Sidewalks

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- The City of St. Albert began doing complete assessments of it's sidewalks in 2011.
  - Hired a consultant to assess the network
  - Consultant provided background on issues that were collected
  - Result was a map of City and it's sidewalk conditions
  - Assessment took 2 months and collected 11,000 points

# Sidewalks



2011 Sidewalk Assessment Sections



# 2013 Assessment

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- In 2013, the City opted to develop their own internal guidelines and data collection methods
  - Would help develop consistency in rating across organization
  - Create an in-house knowledge set
  - Done using previously purchased “off the shelf” technology and software

# Sidewalks

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Figure 8: Sample Photo of Data Collector (2013)

# Sidewalks

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- This assessment had two main phases:
  - Research and develop the criteria
  - Assess the network before end of summer
- Was able to complete the work by August 2013

# Sidewalks

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- **Criteria of Issues:**
  - **Distortions**
    - Distortions are when the slabs have begun to move independently from one another. This may include joint displacements, heaves or dips, crack displacements or tree roots.
  - **Defects**
    - Defects are when loss of material from the slabs has been noticed. This may include potholes, popups, edge loss or presence of utilities (such as valves).
  - **Surface Conditions**
    - Surface conditions are when an issue is affecting the walking surface itself. These include spalling, vegetation cover or pooling of water.
  - **Cracking**
    - Cracking is when a slab has broken or failed. The types of cracks that were assessed were longitudinal, transverse and corner cracks.

# Sidewalks

- Condition assessment ranges were also created

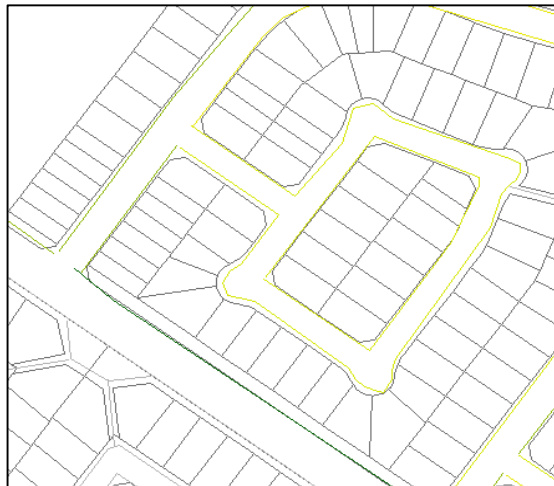
Table 4: Sidewalk Assessment Condition Ratings

Condition Rating	Description
1	New and uniform
2	Slightly used, weathered, fairly uniform
3	Issues may be present, aged, weathered – acceptable state
3.5	Imminent Repairs – acceptable state
4	Repairs required in section
5	Priority repairs in section

# Sidewalks

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- Foundation of current program
- Trimble GPS device
- Condition rating assigned to each street



2013 Sidewalk Assessment Condition rated Street

# 2013 Assessment

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- This data was used for capital planning for next 3 years
  - Was able to send capital work to appropriate locations
  - City had complete access to all data and methods for later review and inquiries

# Sidewalks

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- Limitations
  - While locations were highlighted, scope and how much work was difficult to assess from data alone
  - Work history was difficult to upload and assess whether it improved the condition of the sidewalk section
  - Section lengths varied from small to large



# Sidewalks

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- In 2016 the City opted to do a full reset of it's data with lessons learned from the 2013 data collection

# Sidewalks

Table 7: Comparison between 2013 and 2016-18 sidewalk assessment programs

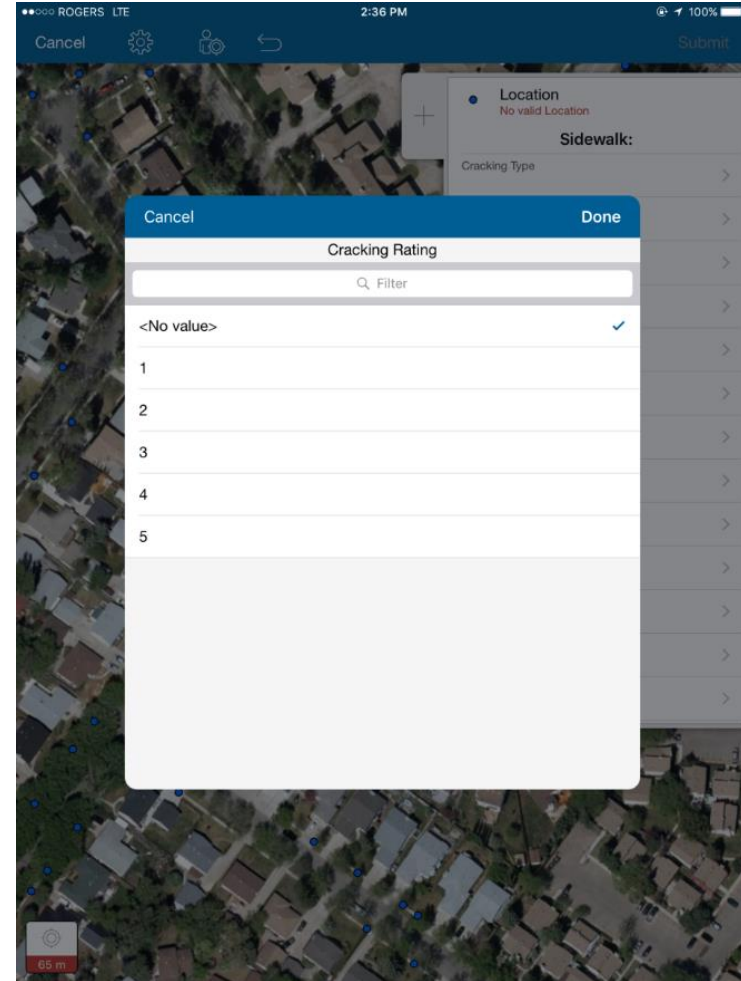
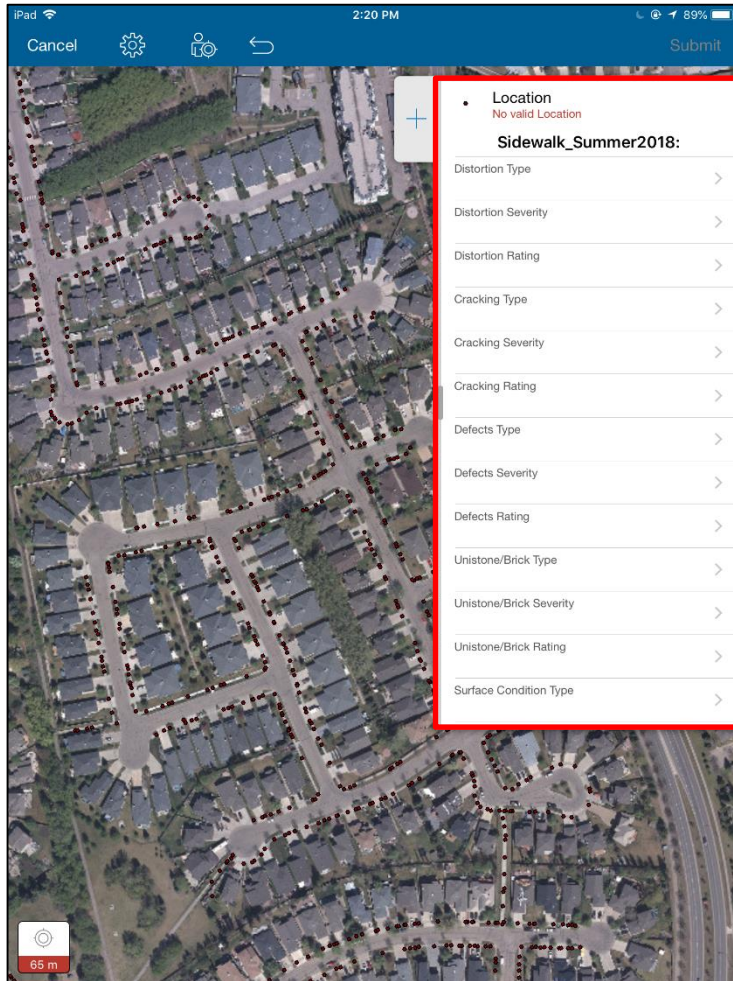
2013	2016-2018
1 Year	3 Years
Quick review of entire city	Detailed analysis
Less data	More data
Entire street given condition ratings	10 m segments given condition ratings
Trimble GPS device	iPad Mini 4

# 2016 – 2018 Assessment

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- ArcGIS collector app on iPad Mini 4
- Data points describe condition of a sidewalk panel
  - Uploaded to ArcGIS online then ArcMap

# Sidewalks



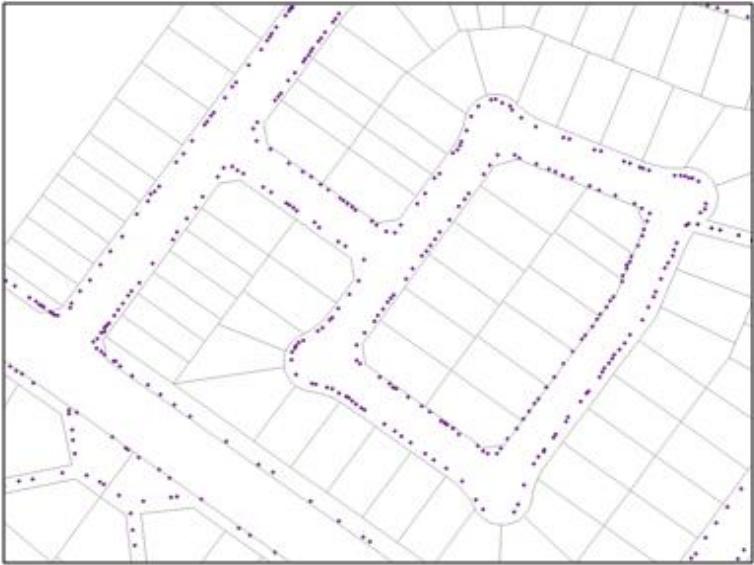
Screenshot of ArcGIS Collector App

# Sidewalks

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- Analysis
  - 10 meter sidewalk segments (6 panels)
  - Points grouped by nearest 10 meter segment
  - ArcMap points transferred to Excel
  - Algorithms condition rate (1-5) the segments

# Sidewalks



Individual points



Conditioned line segments



# Sidewalks

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- The following are sample results of what the City can now export in detail:
  - Overall Neighborhood Statistics
  - Overall City Condition Map
  - Trip Hazard Maps
  - Google Earth Files

# Sidewalks

- Sample Neighborhood

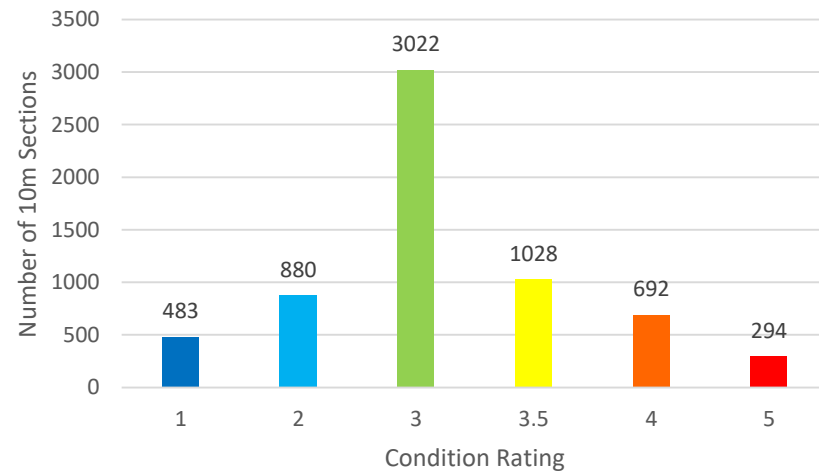


Condition Map of Sample Neighborhood

- 1
- 2
- 3
- 3.5
- 4
- 5

Average condition rating: 3.0

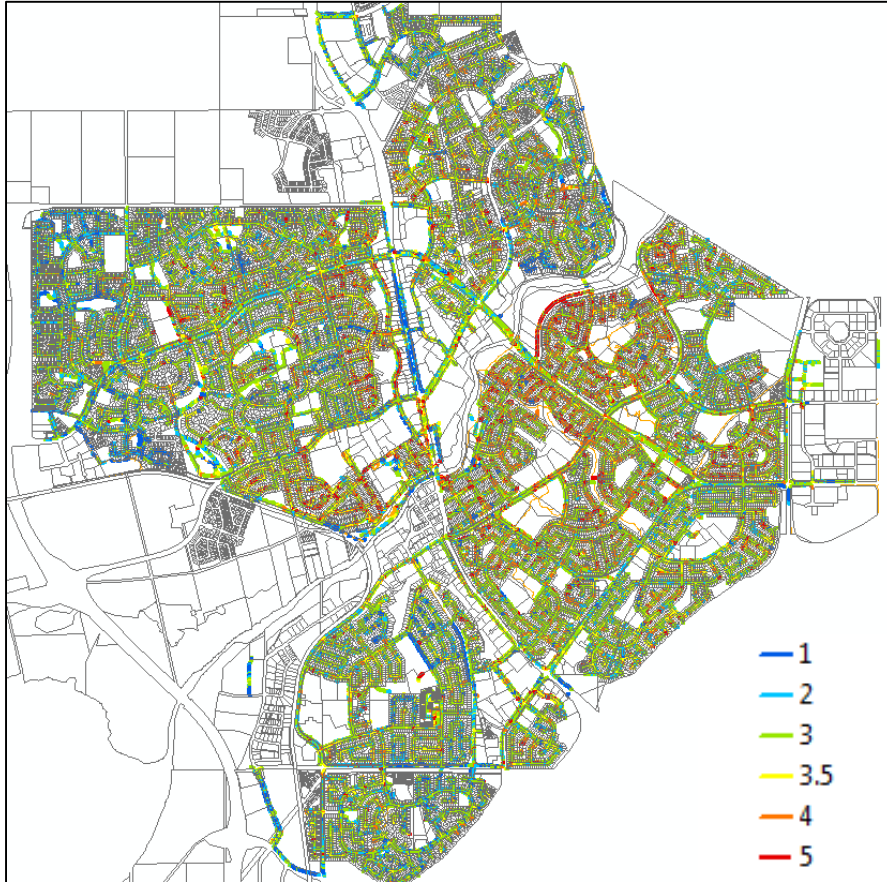
Example Condition distribution



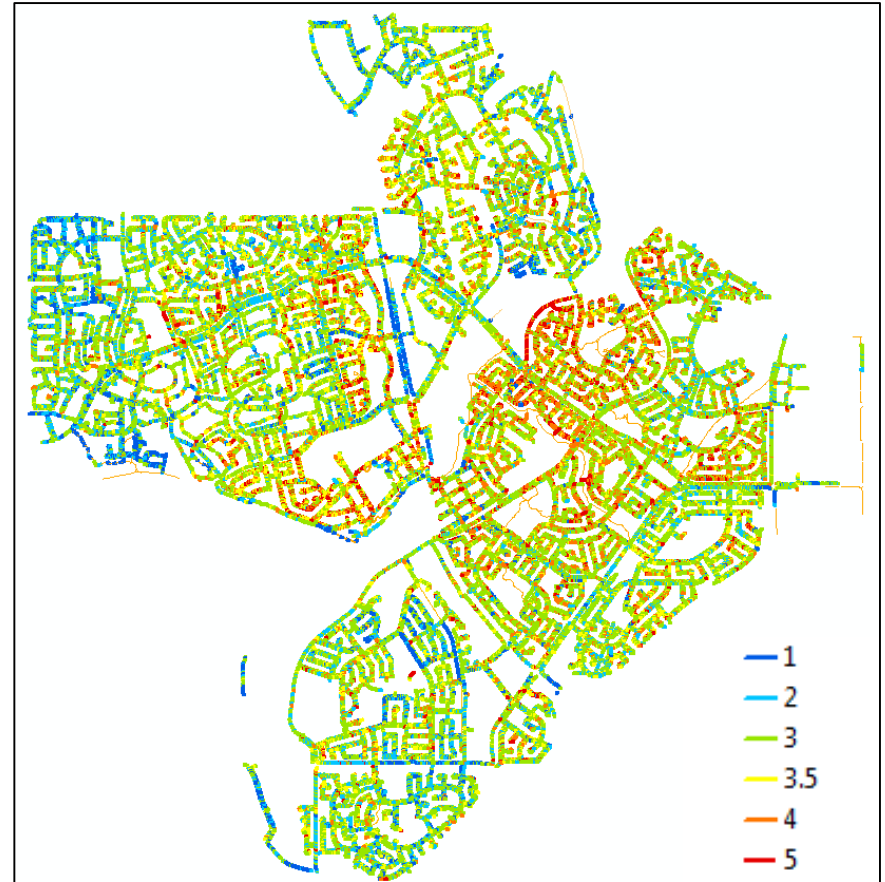
Condition Distribution



# Sidewalks



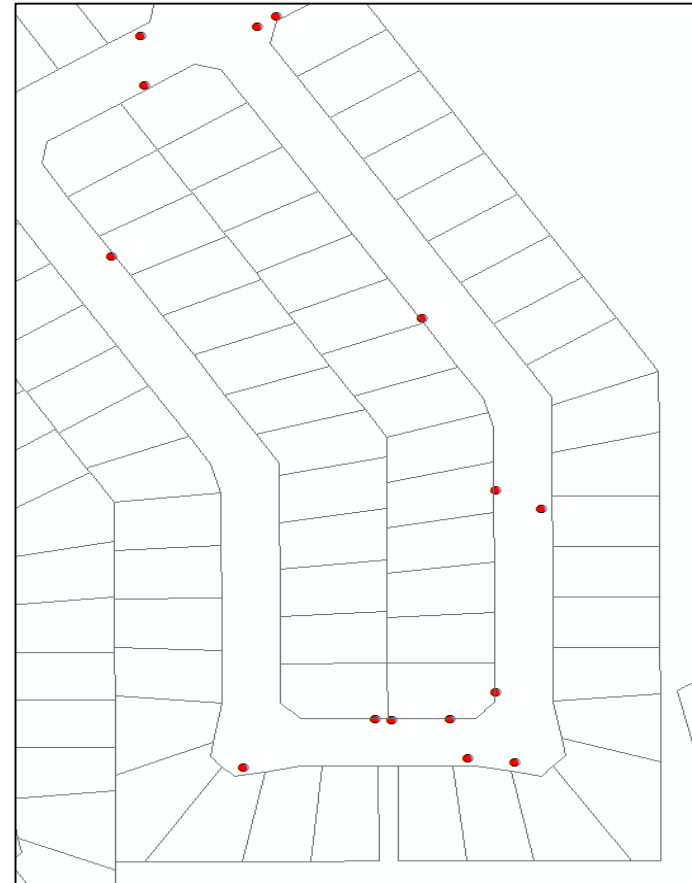
Condition rating of St. Albert with parcels



Condition rating of St. Albert excluding parcels

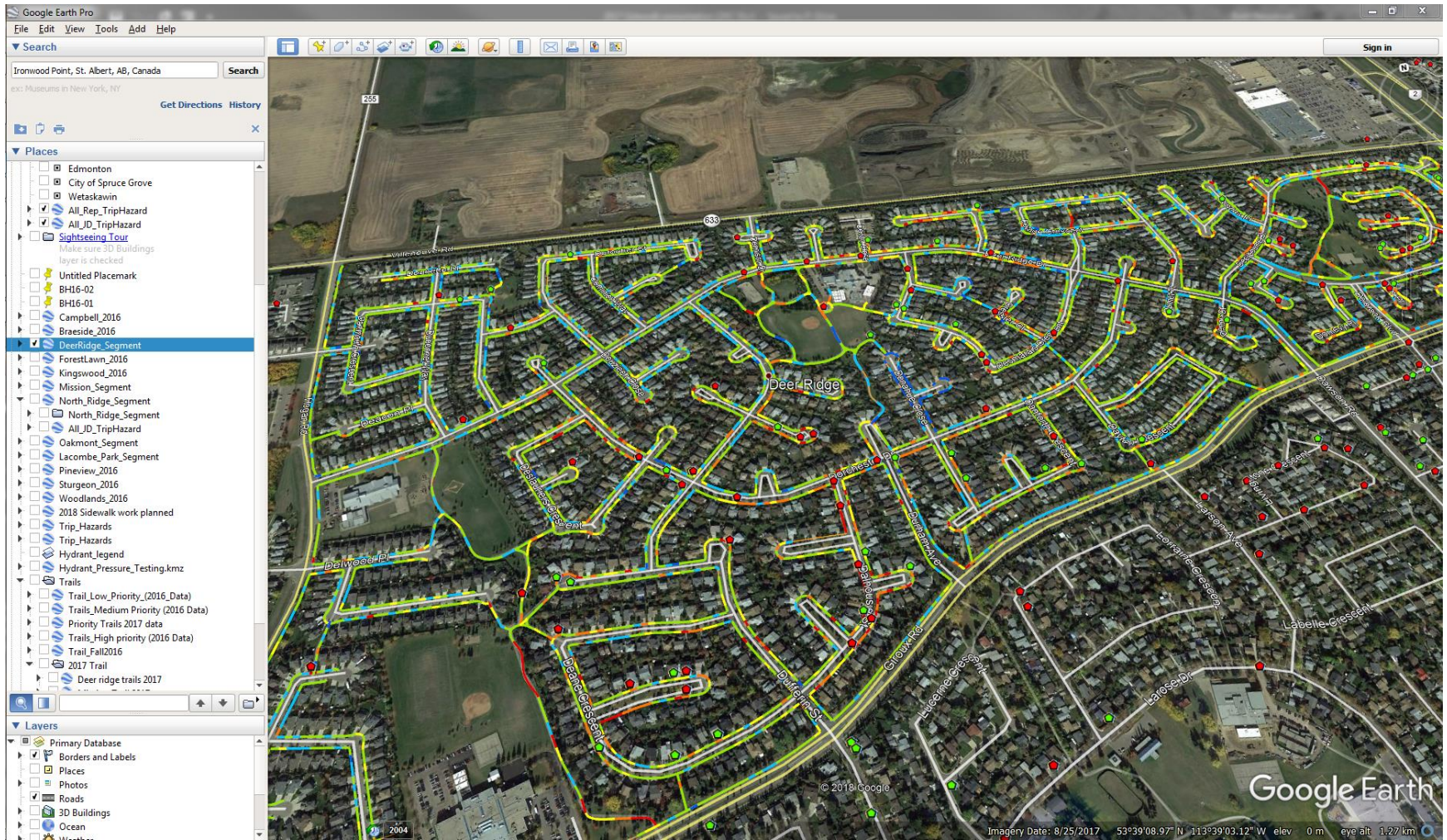
# Sidewalks

- Number of shave-able trip hazards: 1013
- Number of trip hazards: 2035
- Percentage of shave-able trip hazards: 49.8%



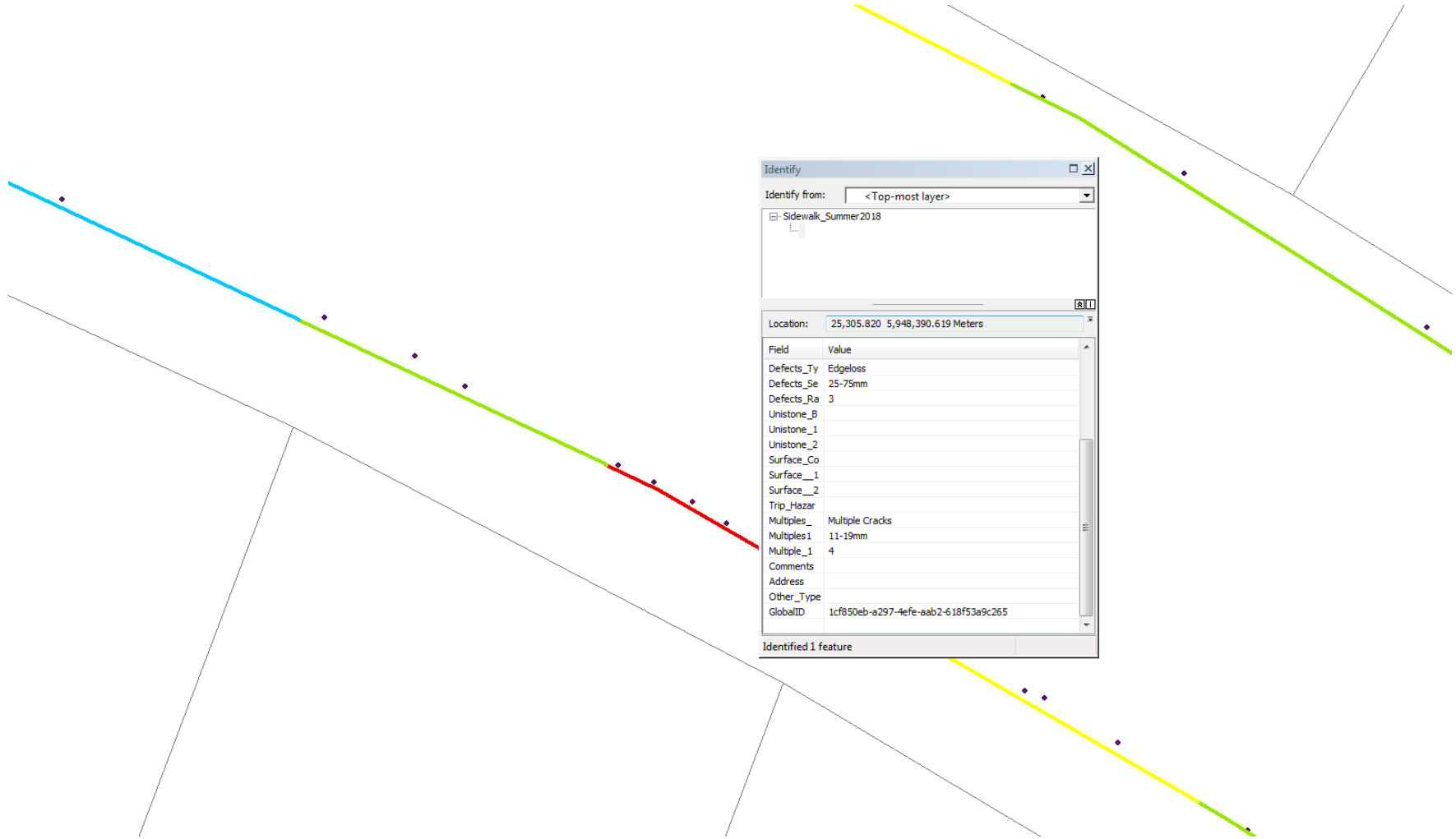
Trip hazards in a neighborhood

# Sidewalks





# Sidewalks



# Sidewalks



# Sidewalks

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# Close

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- The City of St. Albert has built it's own internal rating system using GIS
- While the results are promising and provide condition data around the network more work is needed in the following areas:
  - Continued ground truthing and calibration
  - Continuous accumulation of work history data
  - Development and Implementation of a “priority” index to complement and direct condition data



# Acknowledgements

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- Special thanks to all students that surveyed and researched network:
  - Mathew Woo
  - Gavin Cribb
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  - Nathalie Hajek
  - Nicholas Stuhec
  - Gabriel Bonot
- Thanks to GIS specialists: Alyson Lendzion and Brieanne Anderson
- Thanks to Al Cepas for his guidance and experience early in the program

# Questions?

Thank you for your time.



# References

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- [1] “A Study on Pavement Network Condition and Reporting in the Province of Alberta Through a Questionnaire Survey”, *Newstead, Hashemian, Bayat*, TAC, Regina SK, 2018
- [2] Hein, D. 2008. Life-Cycle Costing for Innovative Pavement Preservation Treatments—How to Know if the Investment Is Worth It. 2008 Pavement Rehabilitation and Preservation Workshop. Ontario Good Roads Association, Ontario
- [3] City of St. Albert, “Road Treatments”, 7 June 2019 [Online], Available: <https://stalbert.ca/dev/construction/transportation/road-repairs/>
- [4] “Investigation of Pavement Management Practices and Pavement Material Performance in Alberta, Canada”, *Newstead*, Education and Research Archive, University of Alberta, 2018