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Utility Cut Repair Inspections
City of Toronto Case Study

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Rival Solutions

ARA

TORONTO

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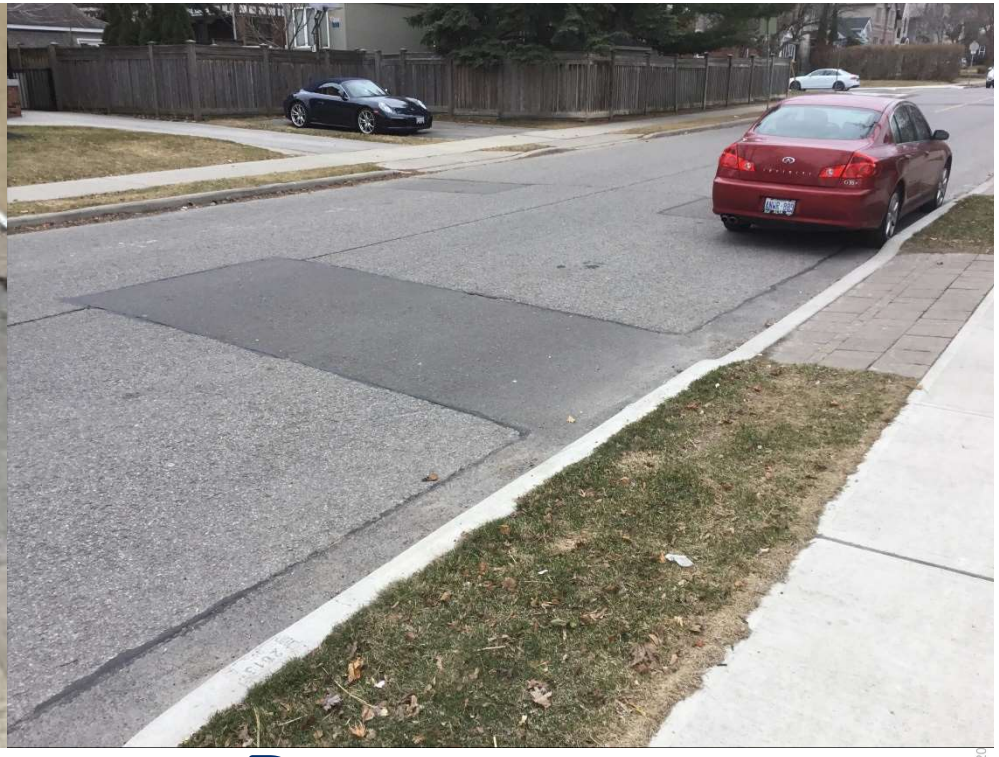
Background

- What is a Utility Cut?
  - Any excavation or cutting of roadway or roadside within the city right of way for the purpose of utility work.

Temporary vs Permanent Repair?

- Temporary repair completed by the Utility.
- Permanent repair carried out by the City.

Temporary



Permanent

Background

- City of Toronto (CoT) issues > 50,000 permits for utility cuts annually.
- The utility completes a “temporary” restoration and monitors for up to 18 months.
- Permanent repairs are then carried out by CoT.
- CoT recovers: Repair costs, overhead expenses, and a pavement degradation fee from the Utility.

Background

- CoT staffing required to keep up with the backlog of permit inspections currently exceeds capacity.
- Over 18,000 permits (2008-2014) required condition verification and inspection.
- Permit restoration backlogs can extend back for a number of years.
- Verification and restoration backlog completion is not unique to the City of Toronto and quite common for many major metropolitan cities.

Project Purpose

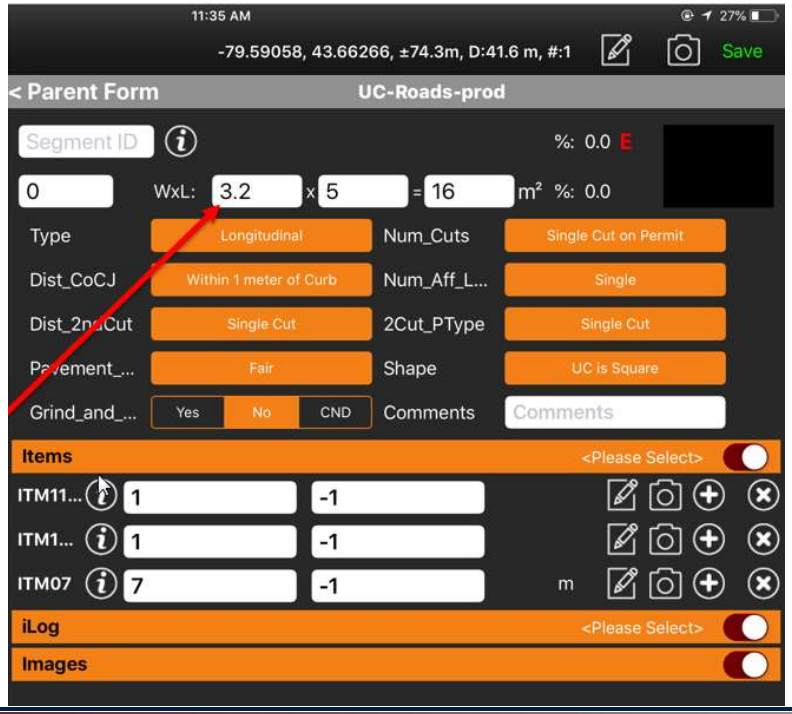
- Inspect cuts, determine if utility work was completed:
  - ***Yes?*** → Indicate "No Work Required."
  - ***No?*** → Mark repair area and obtain repair quantities.
- Update City's database with gathered information.
- Develop a 2-year work program to eliminate the backlog.

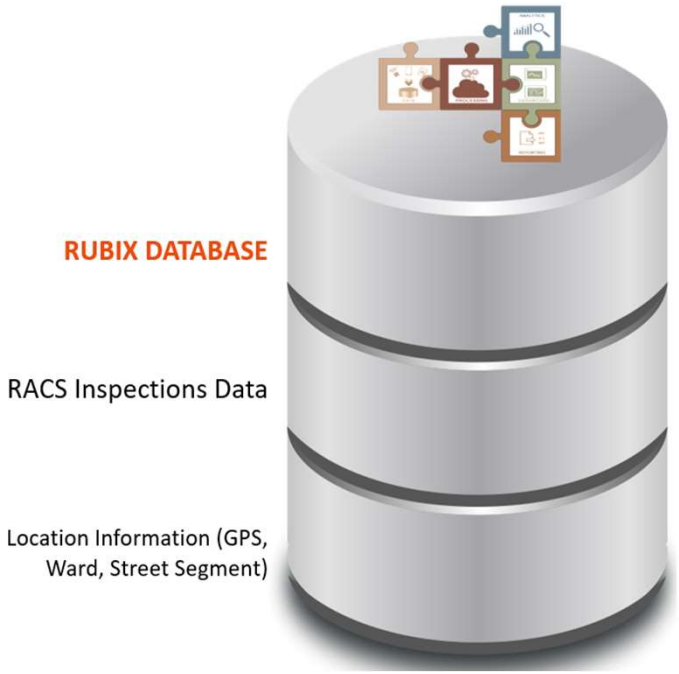
Key Issues

- **Volume of Data:** > 18,000 permits.
- **Project Schedule:** Aggressive Schedule (6 months).
- **Staff Availability:** Several Field Inspectors required.
- **Repeatability:** Each inspection may require several tasks.
- **Communication:** Real-time communication between office and field staff was required to identify issues.
- **Productivity:** Work progress needed to be monitored daily.
- **Quality:** Quality assurance was of utmost importance.

Solution

- Semi-automation of inspection and reporting process.
- Tablet cloud-based technology platform using Rival Solution's RUBIX system.



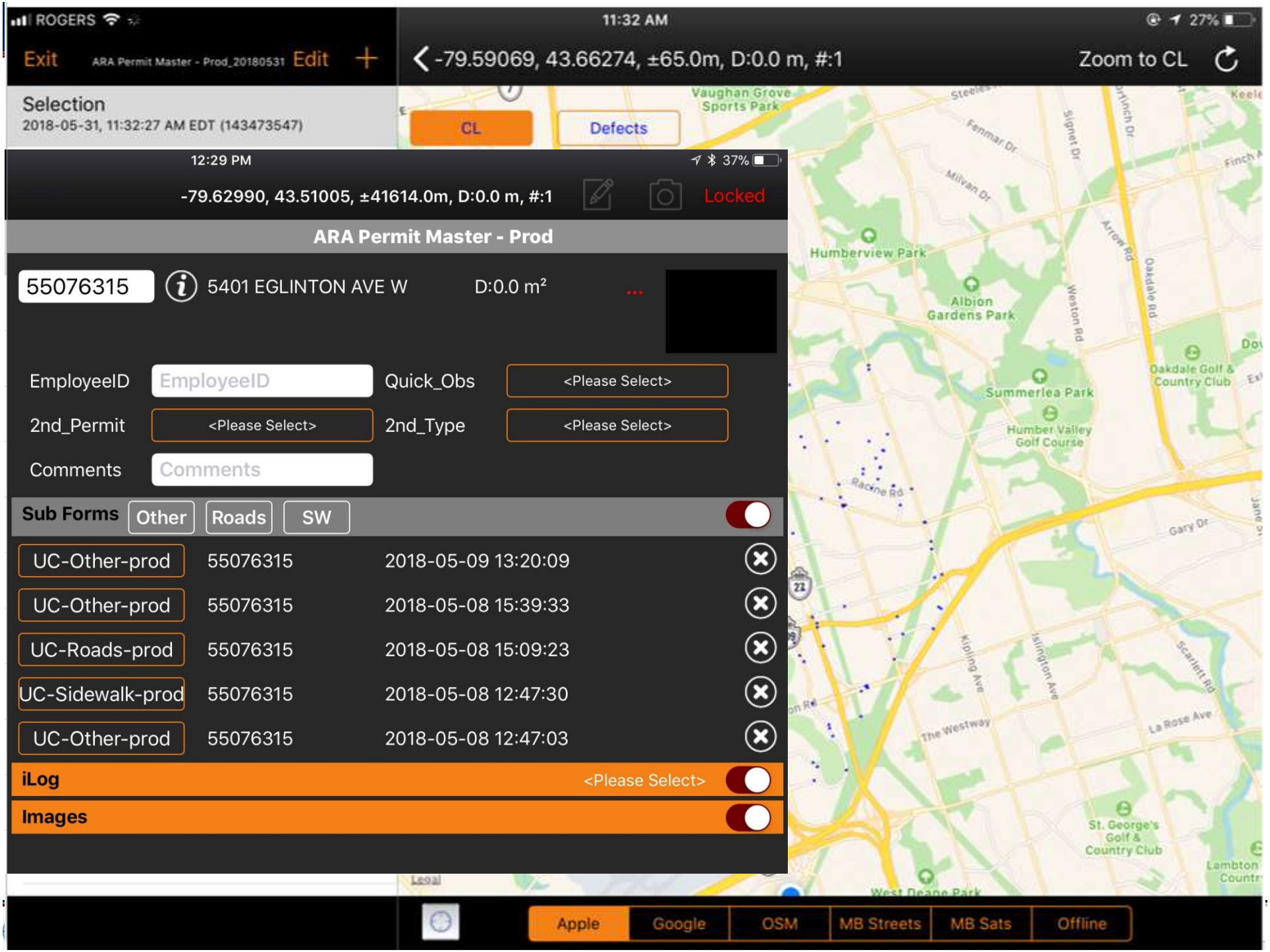


RUBIX

- Flexible cloud-based technology platform.
- Used to store condition information and quantity measurements.
- Uses basic rule-based decision methods.
- Integration of mobile mapping, cloud computing, and web dashboard reporting.
- Used to determine repair costs.

rInspector

- Mobile tablet condition rating application:
  - Configured for CoT repair rules to collect and map cut repair attributes.
  - Enabled effective and timely data collection and delivery.
- Provided a GPS location and digital records of all findings for each inspection.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Summerlea Park
Humber Valley Golf Course
Oakdale Golf & Country Club
St. George's Golf & Country Club
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OSM
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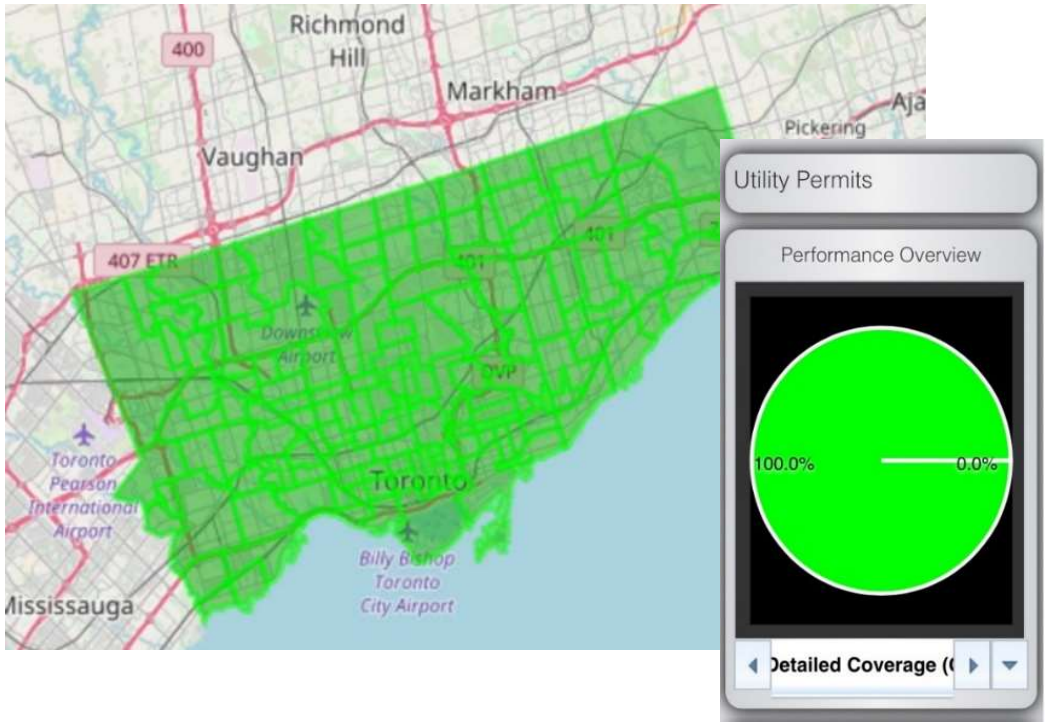
MB Sats
Offline

rDash

- Web-based dashboard that summarized and presented inspection data collected from the field.
  - Production reporting
  - Quality assurance



Study Methodology

1. Permit database review and geo-referencing
2. RUBIX configuration
3. Inspector training
4. Inspections and dynamic quality assurance
5. Database update and reporting

Permit Review and Geo-Referencing

- Permit Database Review was completed of electronic database information for completeness.
- Permit Geo-Referencing.
  - All permits required geo-referencing in order to be located in the field.
  - Addressing system used to obtain locations for approximately 75% of permits.
  - 5,000 permits had to be manually screened to obtain geo-reference.
  - All permits referenced and located in the field using rInspector.

RUBIX Configuration

- City rules for utility cut repairs were used to configure RUBIX and rInspector.
- Prototype testing and validation was completed by senior team members.
- Field testing ensured the system was capable of geo-referencing permits and collecting the information in a simple and efficient manner.

Inspector Training

- Basic field data collection (traffic control, health and safety).
- rInspector tablet data collection.
- Specific CoT rules for utility cut inspections and repairs.
- In-class and in-field training.

Inspection Types

- Regular – Field inspectors completed inspection.
- Send to Supervisor – Supervisors completed inspections or provided detailed instructions on how to complete inspection.
- Traffic Control – Inspections requiring lane closures to complete inspections.

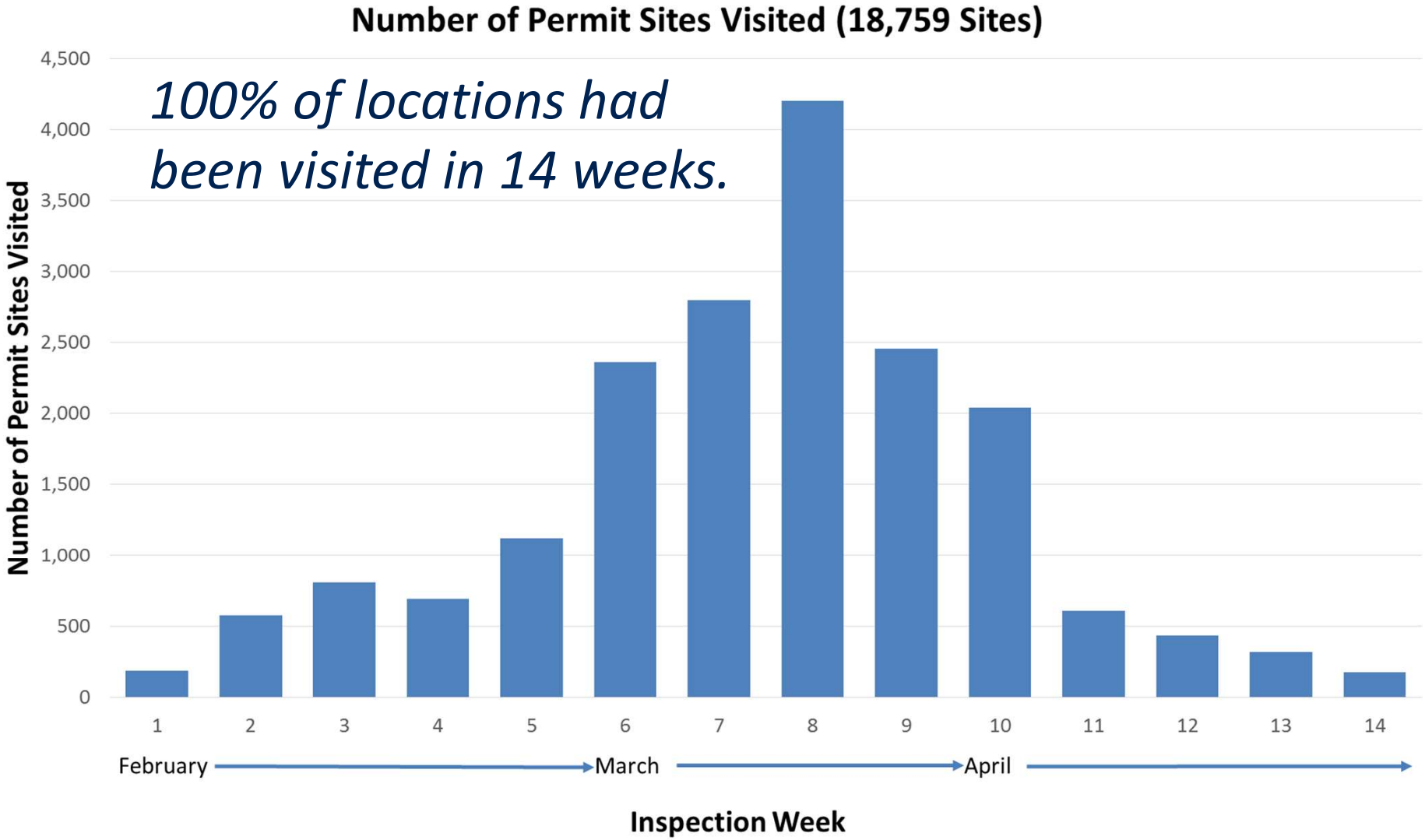
Inspection Outcomes

- No work required – No additional repair required.
- Work required – Inspection completed and cut was marked out for permanent repair and attribute data collected.
- Send to CoT – Inspection could not be completed or utility cut could not be located and was sent to City for assistance.

Data Collected

- Photographs
- Repair cut dimensions/quantities:
  - Road cuts
  - Sidewalks
  - Curbs
  - Driveways/Aprons
  - Boulevards
  - Adjustments (catchbasins, handwells, utility covers, valves, etc.)
  - Paint markings
  - Tactile walking surface
- All attributes were geo-referenced

Production


Number of Permit Sites Visited (18,759 Sites)
100% of locations had been visited in 14 weeks.
Number of Permit Sites Visited
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
February
March
April
Inspection Week

Quality Assurance (QA)

- RUBIX software validation reports generated:
  - 100% of all permits. Checked for human input errors/missing information.
- Supervisor checks completed to validate correct cut, location, mark out requirements, etc.
- Desktop QA checks included Google Streetview reviews.
- Field QA checks included random supervisor re-inspection.

Quality Assurance (QA)

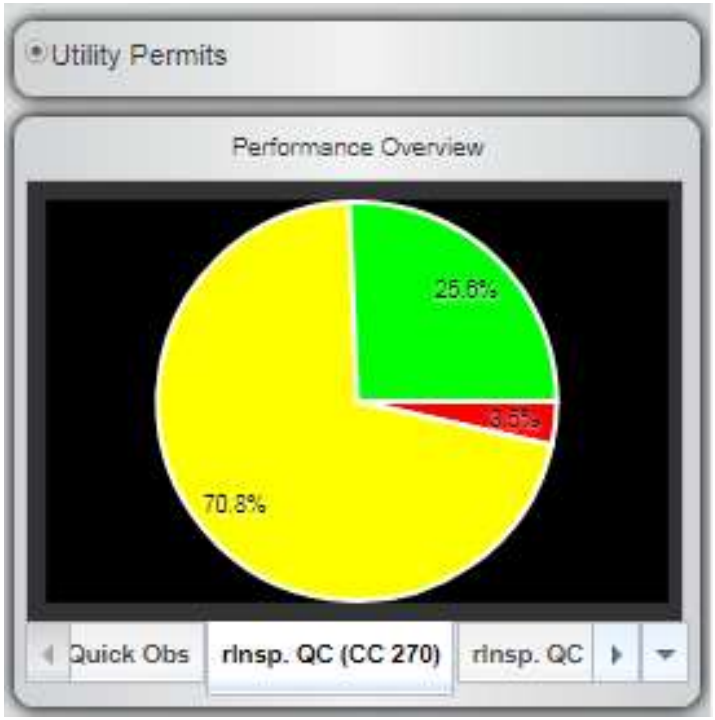
- All reviewed were either “Accepted” or “Rejected”
- All “Rejected” permits were sent back to the inspector for corrective action.
  - These permits remained in the QA cycle until the auditor was satisfied that corrective measures were taken.
  - Corrected permits were updated to “Accepted”.

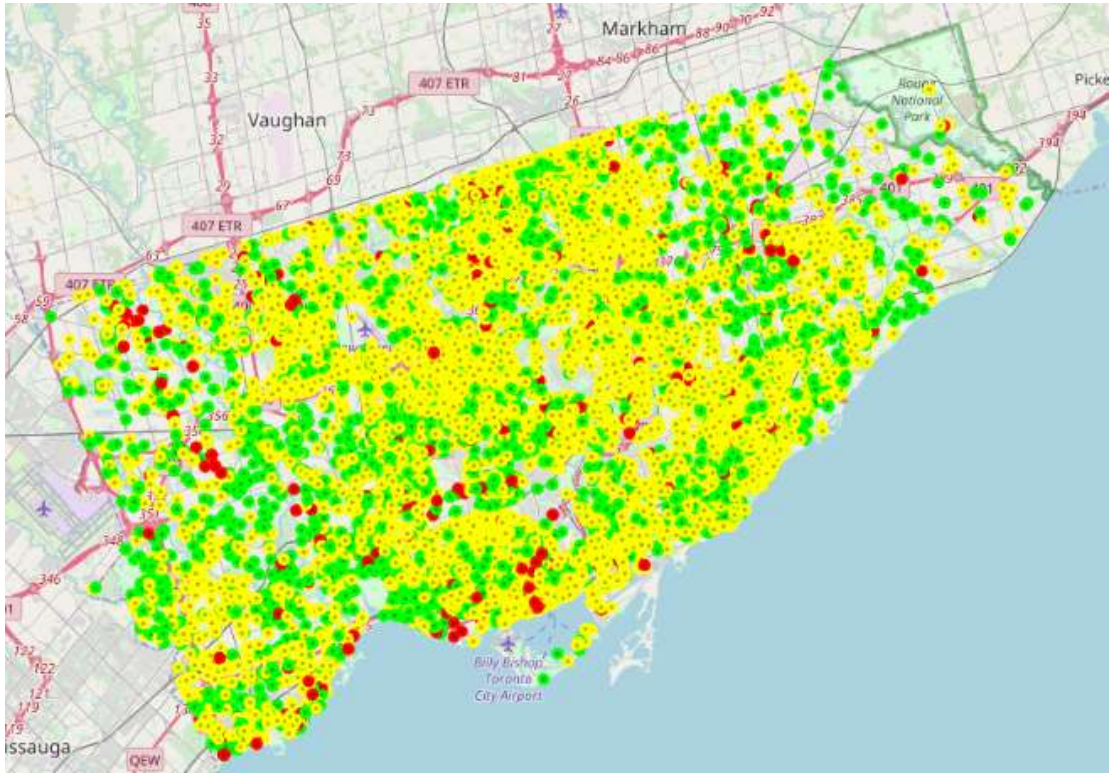
Quality Achievements

- 100% of permits were field inspected.
- 100% of permit inspections were software checked.
- 30% of permits were reviewed by a quality auditor
  - Combination of desk and/or field audits.
  - The majority of ‘failed’ audits were a result of:
    - Interpretation of City repair rules.
    - Interpretation of temporary vs. permanent repair.
    - Identification of the correct utility cut.
    - Photograph protocol.

Quality Assurance (QA)

- Audit Tracking
  - Goal – 15% of permits
  - Achieved – 29% of permits





Database Update and Reporting

- RUBIX performed quantity and costs computations.
  - Manual validation was completed.
- Pavement material type and functional class data incorporated from City's pavement management system.
- Cost included:
  - Adjustments for functional class and district.
  - Overhead charges.
  - Pavement degradation fee.
- Database updated and a 2 year work plan was developed.

Challenges

- Permit Location
  - Geo-referencing was required. Automated addressing provided approximately 75% of permits with GPS coordinates.
- Permit Information – variable information provided.
  - Some Utility companies provide more information than others on permits.
- Permit Information Accuracy
  - Accuracy of permit information versus actual field conditions varied significantly.

Challenges

- Urban Development Areas
  - Large construction projects.
  - New urban developments.
- Weather Conditions
  - In-field training in winter months.
  - Winter weather conditions.
  - Wet conditions not conducive to marking paint.
  - Rain/Fog – Traffic control inspections delayed.

Lessons Learned

- Inspection rate is dependent on:
  - Geo-referencing
  - Permit information accuracy
  - Weather
- Clear and concise business rules are required prior to implementation.
- Utility Cut Management Integration
  - Pavement/Asset Management System
  - Quality Management


THANK YOU!