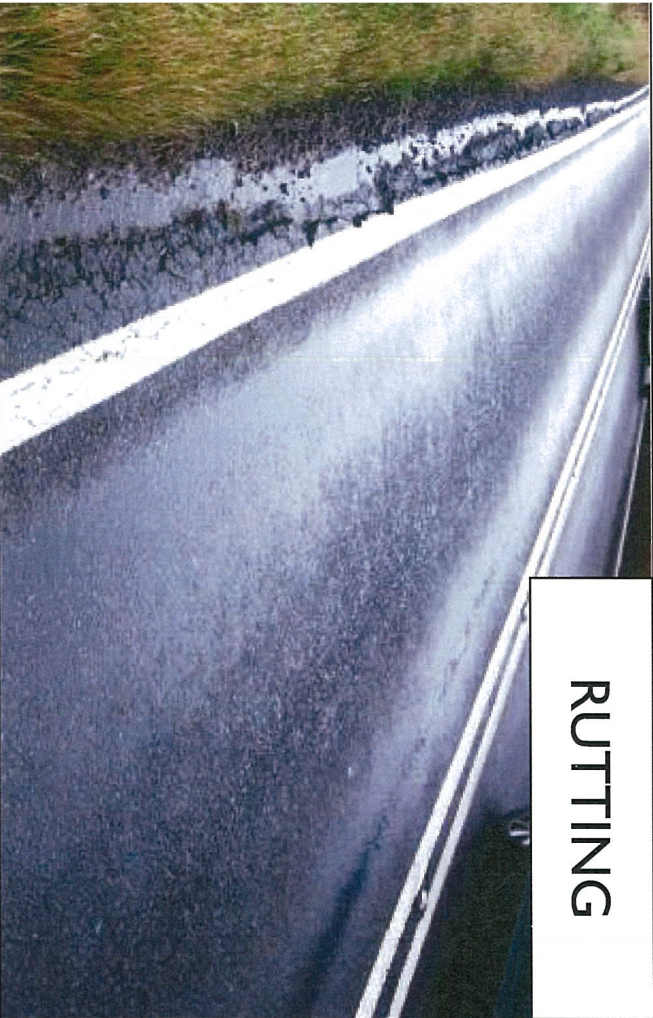# City of Houston – Street Surface Assessment Vehicle Overview

Presented – June 1, 2012
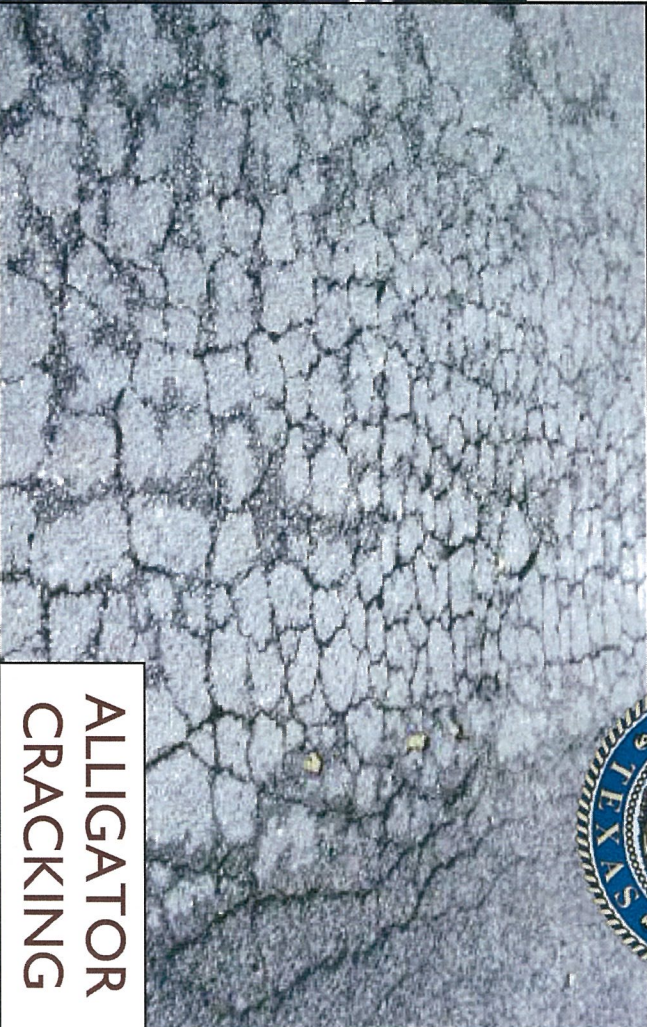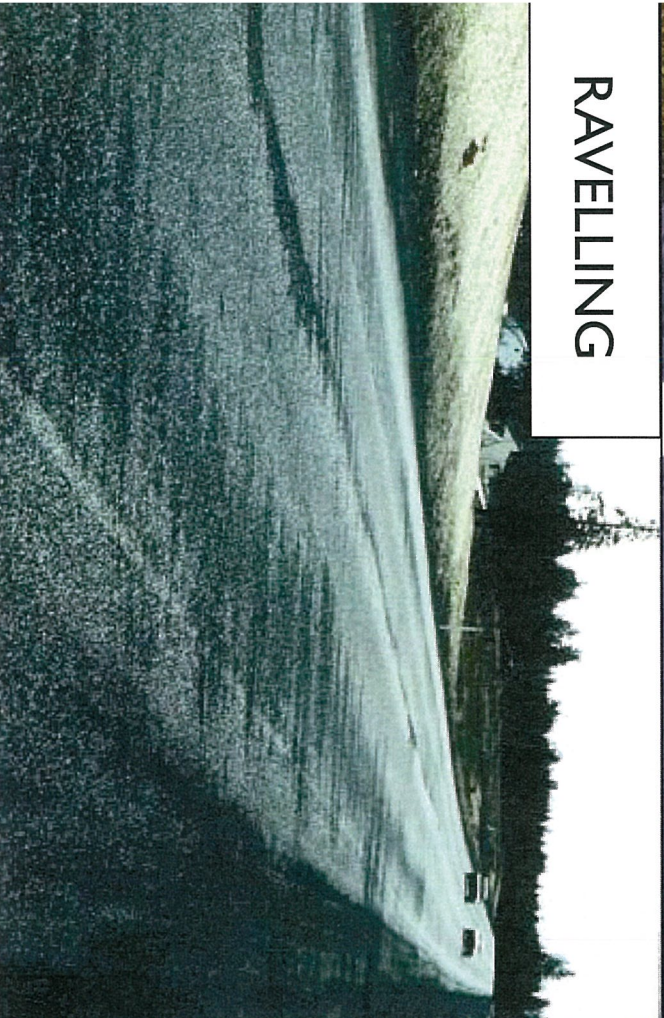
Typical Roadway Conditions

RAVELLING

RUTTING

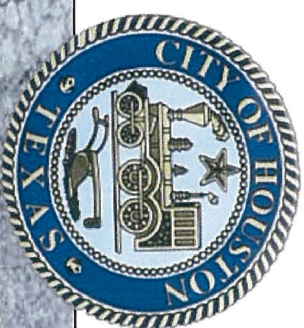TRANSVERSE CRACKING

ALLIGATOR CRACKING

PW **Typical Roadway Conditions**
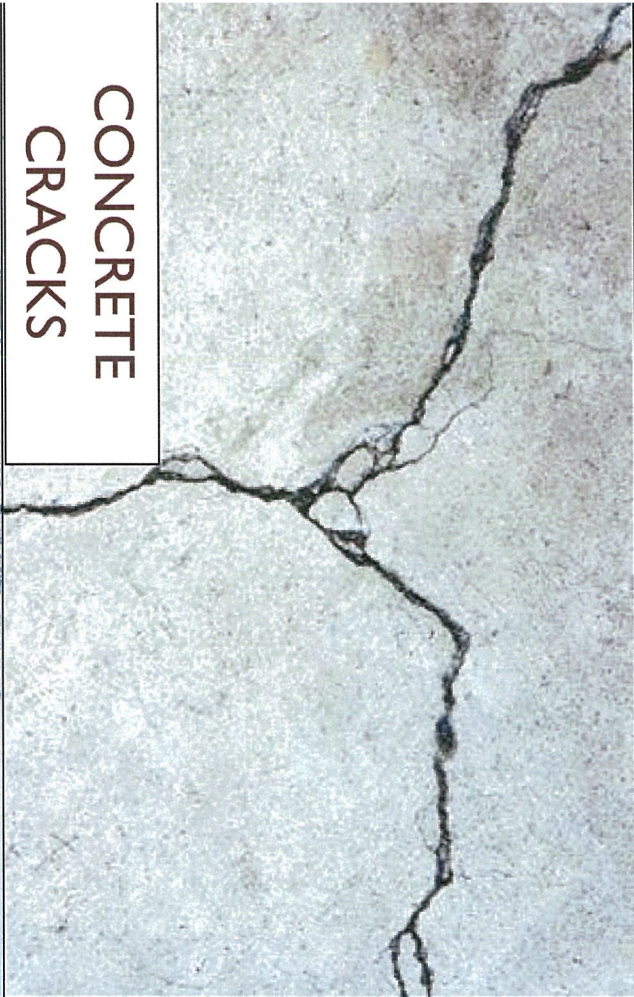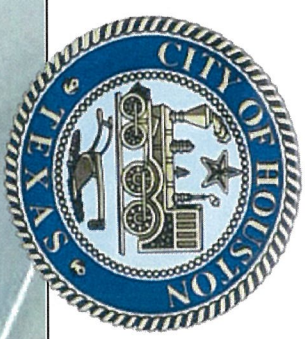
SLAB/PANEL
REPLACEMENT

CONCRETE
CRACKS

JOINT SEAL

LONGITUDINAL
CRACKING
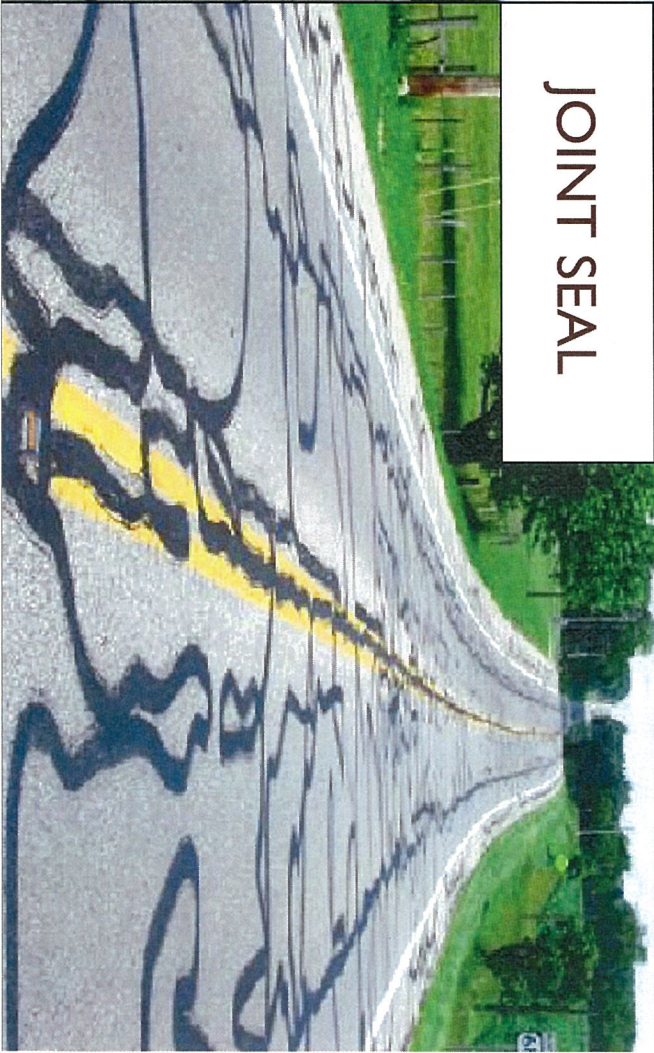
Goals Identified for an Alternative Solution

- Efficient assessment of roadways in a timely manner
- Non-subjective process for pavement rating
- Data accessible to multiple viewers & the public
- Customizable PCR score range utilizing specific street conditions
- GIS integration
  - Roughness
  - Rutting
  - Cracking
  - Other various street conditions
- PCR Score that can aid in prioritizing future capital projects and maintenance decisions

Development of a Solution

- Partnership with Idea Integration, Inc. to develop the Street Surface Assessment Vehicle (SSAV)

- Utilization and coordination of various technologies housed in a mobile unit

- Began testing July 2009

- Full production began May 2010

- Assessments are anticipated to occur every 2 years
  - Major thoroughfares to be assessed annually

- Estimated 5-year initial system life
  - 3 Assessments

How Does it Work?

Techical Components of the
Street Condition Assessment Vehicle

Distance
Measuring
Instrument

CrackScope

Accelerometer
(inside van)

360 degree camera

GPS Unit

Road Profiler

Technical Components of the Street Condition Assessment Vehicle

The following systems are onboard the vehicle:

- **_Road Profiler:_** The Road Profiler is mounted on the front bumper of the vehicle. It contains three lasers and two accelerometers that are used to capture both the roughness (IRI) and the rutting of the road.

- **_Line Scan Camera System:_** The vehicle is outfitted above the back end with a line-scan camera system called CrackScope. It takes high-resolution images that are analyzed by post processing software to automatically detect the severity & extent of cracking on the pavement.

- **_Accelerometer:_** This device tracks the speed of the vehicle and is used to account for vehicle motion when data is being gathered.

Technical Components of the Street Condition Assessment Vehicle

The following systems are onboard the vehicle:

- **_360° Video:_** A camera ball with 11 cameras taking 30 frames per second is mounted on a mechanical arm that extends above the van. The video produced allows the user to pan in all directions while viewing the right-of-way. This is similar to the Google Street View technology.

- **_GPS and DMI Devices:_** The vehicle is also equipped with a Trimble GPS receiver and a DMI (Distance Measurement Instrument) device. The data from these instruments is used in post processing to tie components together and calculate the position of the vehicle.

How the Score is Calculated

- The Pavement Condition Rating (PCR) is calculated according to the following formula:

  ○ PCR = 100 − (*Rutting Deduction + IRI Deduction + Total Cracking Deduction*)

- The Total Cracking Deduction is a combination of low, medium and high severity cracking

- The final PCR score for a road segment is the average PCR score for the most recent run of each of the lanes driven in the segment

- Each category is weighted by a maximum possible PCR point deduction

How the Score is Calculated

- There is a maximum deduction of 70 points per street segment based on the following categories:

  - Rutting – Up to 15 points deducted
  - IRI (Roughness) – Up to 30 points deducted
  - Cracking – Up to 25 points deducted based on the following cracking categories:

    - Low (up to 5 pts.) = Avg length of cracks per sq. meter with widths is < than 3mm in one area
    - Medium (up to 8 pts.) = Avg length of cracks per sq. meter with widths is 3-6mm in one area
    - High (up to 12 pts.) = Avg length of cracks per sq. meter with widths is > 6mm in one area

- A PCR score of 30 is the lowest possible score for any segment able to be traveled over by the SSAV

The Obstacles Identified

- Clear weather is needed for accurate assessments

- No standing water can cover pavement assessed

- Measured distance traveled only (centerline miles)

- Did not identify or "asset tag" any items

Future:

- Upgrades (Costs vary)
  - Asset Tagging
  - Roadway width calculations
  - Ground-penetrating radar
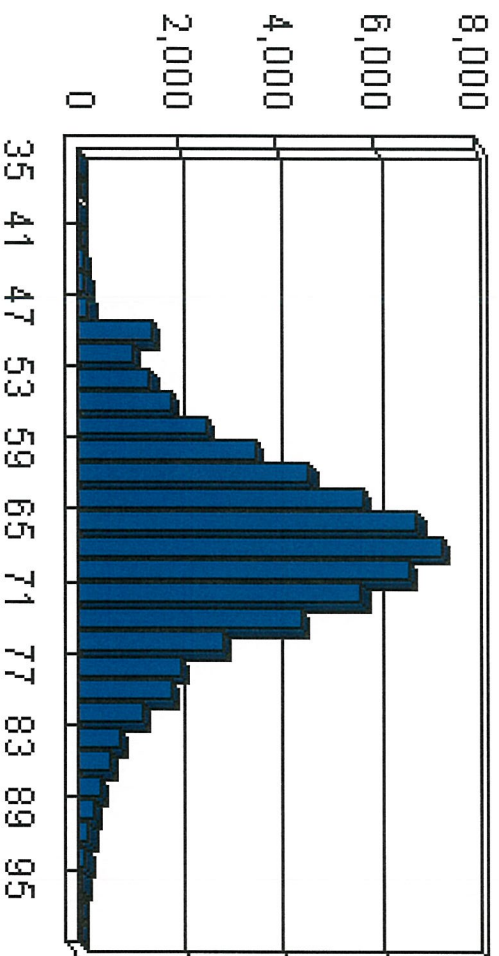 - Other system improvements
  - COHGIS Roads

Examining the Results

Frequency Distribution

PCR Score Distribution

All City Street Scores		% of total
35	58.65	10.00%
58.66	64.62	20.00%
64.63	71.69	40.00%
71.7	78.07	20.00%
78.08	100	10.00%

Supplemental Data For All Streets:

Mean PCR score: 67.50

Minimum PCR score recorded: 35

Maximum PCR score recorded: 100

Over 66,000 street segments analyzed

Accessing Information

STREET SURFACE ASSESSMENT VEHICLE DATA

Legend:
- Very High
- High
- Medium
- Low
- Very Low

CITY OF HOUSTON • TEXAS
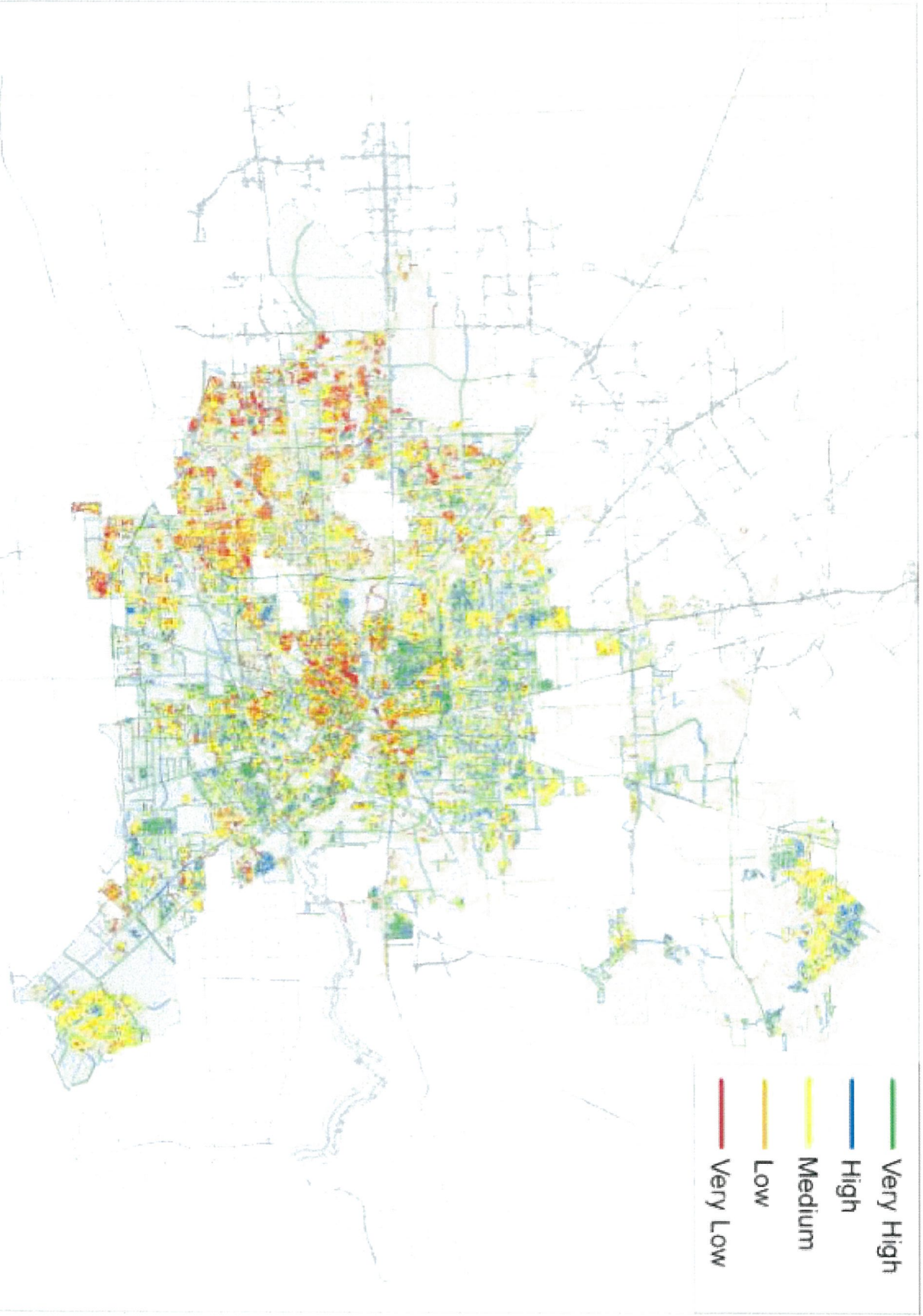
GIMS (Geographic Information Management System)