

### 3. Scope of Services

#### Understanding of the Project: The City of Coral Springs Comprehensive Pavement Management Program

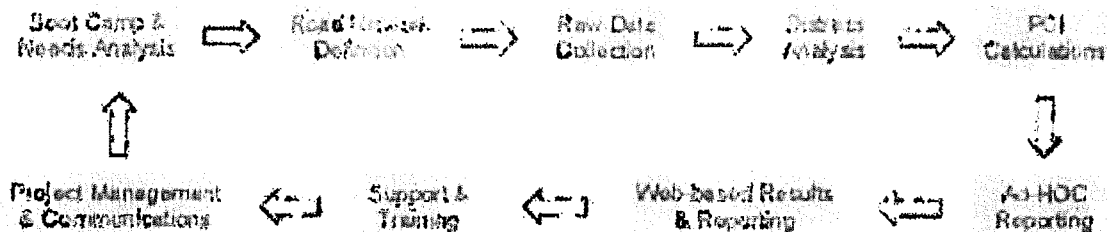
Transmap has read and understands the tasks described in the City of Coral Springs' Request For Proposal. **We believe our approach and plan to this project would be the most beneficial to the City of Coral Springs because our only focus has been pavement and roadway asset management for over 20 years. Unlike other vendors, Transmap makes actual measurements.**

#### Pavement Management System (Overview)

Transmap offers a total pavement management solution that we call **Pavement Management 2.0**. **Pavement Management 2.0** is based on a **Hybrid Approach** for data collection and assessment, employing cutting edge hardware and software. Clients benefit from robust reporting of pavement condition data fully integrated into a GIS. We offer on-site support and customized training based on your specific needs.

*Please read the next section for details on how Pavement Management 2.0 will provide the best solution for your project and exceed your expectations.* The flowchart below shows how Transmap will conduct this pavement management project for the City.

#### Pavement Management 2.0 Core Principles



#### Boot Camp & Needs Analysis

Initiating any project begins with understanding what our customer wants to accomplish with their asset and Pavement Management System (PMS). We will collaborate with your team and study existing data, work processes, and requirements for hardware and software. This process will establish a benchmark for productivity improvements that the new system will help you achieve. **We will gather all information on pavement maintenance procedures including any preventative maintenance. We will also gather any pricing information on materials to assist with budget reporting.**

#### Road Network Definition

During the Needs Analysis, our clients provide Transmap with existing road centerline maps (digital and paper), orthophotographs, and other records that describe the road network to be inventoried. These data sets are used as a reference for planning and conducting the proposed work. We will ask you to specifically identify the roads that are not to be collected by Transmap. During this phase we structure the road centerline network to define branches and segments that link to the MicroPAVER software.

#### Raw Data Collection with the ON-SIGHT™ System

Transmap will use its ON-SIGHT™ HD System to capture ground-based LIDAR and 360 degree street-level, photogrammetric images. The ON-SIGHT™ HD mobile mapping system collects data at normal driving speeds so special traffic control devices are not required during the data collection process.

A unique element of the Transmap Hybrid Approach is our **NEW Laser Crack Measurement System (LCMS)**. This 4K system has two laser line projectors with more than 2,000 points per laser. A total of 4,160 laser points are used to capture pavement condition assessments. The LCMS will detect and analyze cracks, lane markings, ruts, potholes, macro-texture, patches, ravelling, rutting, and International Roughness Index (IRI) data that meets ASTM E950 standards.

**EXHIBIT A**

### **Distress Analysis**

Transmap follows the **ASTM D6433 standard for computing a Pavement Condition Index**. Our solution uses the newest automated approach (LCMS), but we rely on our pavement technicians to categorize distress data. These technicians have been trained to identify ASTM D6433 distress categories. **Transmap believes in the power of measurements. We do not simply turn on a laser or conduct a windshield survey.** Transmap's Hybrid Approach is both reliable and repeatable.

### **Pavement Management Software System**



### **PCI Calculation in MicroPAVER**

Distress data will be automatically loaded into MicroPAVER for processing and analysis. The **Pavement Condition Index (PCI)** is computed for all segments of the street network. PCI data is immediately linked to the GIS based on the road centerline network. **Transmap has completed over 25 successful MicroPAVER projects in the last two years alone.** Although we suggest MicroPAVER, Transmap can implement your data into any Pavement Management System. MicroPAVER is currently being used by over 600 cities, counties, airports, and private consulting firms. MicroPAVER's Pavement Condition Index methodology received the American Society for Testing and Materials (**ASTM standard D6433**). Receipt of this standard means that MicroPAVER is the only Pavement Management System to have received an ASTM standard designation. Standard D6433 is the only pavement rating methodology recognized for rating road and parking lot pavements.

### **Ad-Hoc Reporting**

Once the PCI's are computed, we will help the City **create reports directly in MicroPAVER** as well as in the GIS and other programs. We can help you design custom reports showing statistics of current road conditions. You can also develop different rehabilitation scenarios and show how they would affect the overall condition of the City's roadway network. With our understanding of pavement preservation treatments, we can go beyond condition survey and data integration. Transmap can also assist you with selecting treatment options as well as developing rehabilitation strategies and budgets that can be presented to the City's leaders.

### **Web-Based Reporting in a GIS**

As street data are linked to the road centerline network, the pavement condition information can be immediately displayed on a map. Typically, the PCI layer is shown in different colors (Red = Poor Condition, Yellow = Fair Condition, Green = Good Condition) on top of the road centerlines. **Transmap will host the PCI data online** using the ArcGIS platform so that the City can access pavement condition maps online and display them in a regular map browser. Reports can be printed without the need for any extra software programs.

### **Support & Training**

This task is conducted at different times during the project. It includes readiness reviews, acceptance tests, and even software and maintenance training to show your staff how to keep the pavement databases current. We want your managers to understand the savings you can achieve with the new system. Transmap has certified PMS trainers who can conduct training courses at your office.

### **Project Management & Communications**

Transmap will provide the City with monthly milestone reports, as well as informal updates on a weekly or as-needed basis. In addition to our reports, you will get access to an **ArcGIS Online Site** that shows up-to-date project results. Detailed communications guarantee that you, our customer, will receive exactly what you expect. Transmap believes in exceptional customer support; this is why each customer gets their own unique Content Delivery website.

### **Phased Deliveries**

We have found that communications and data quality can be significantly improved with incremental deliveries. Incremental deliveries ensure a significant amount of data is presented to our customer early in the project. This delivery process helps root out hard-to-find problems as early as possible. At the same time, phased deliveries help the customer spread the workload of receiving and inspecting large amounts of data. We believe this is the best approach to meet your expectations and avoid unpleasant surprises.

## Pavement Management 2.0 (Detailed Description)

This unique approach to pavement management was exclusively developed by Transmap. Pavement Management 2.0 exceeds industry standards and provides our customers with a reliable and robust solution to pavement management. Furthermore, this unique approach generates real savings and improves efficiencies in public works and highway departments throughout the USA. Pavement Management 2.0 combines the following 4 components to a smooth system: **Hybrid Approach, Robust Reporting, On-Site Support, and Software.**

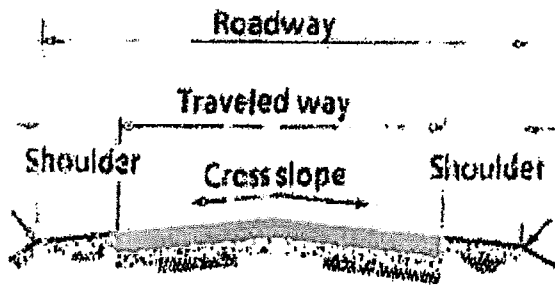
### Hybrid Approach

#### Advanced Inspections: Laser Crack Measurement System (LCMS)

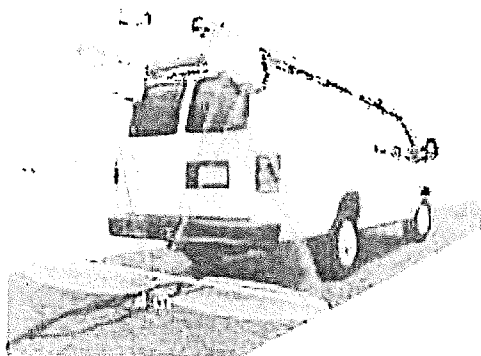
Transmap's ON-SIGHT vehicle is equipped with the newest Laser Crack Measurement System (LCMS), which uses laser line projectors, high speed cameras, and advanced optics to acquire high resolution 3D profiles of the road. The LCMS captures surface conditions up to a **4m (13.1 foot) width**. Transmap will drive in both directions for a complete view of all surface distresses. Transmap can deliver a complete **Crack Map** of surface distress data. This map can be viewed in the Esri (GIS) system.



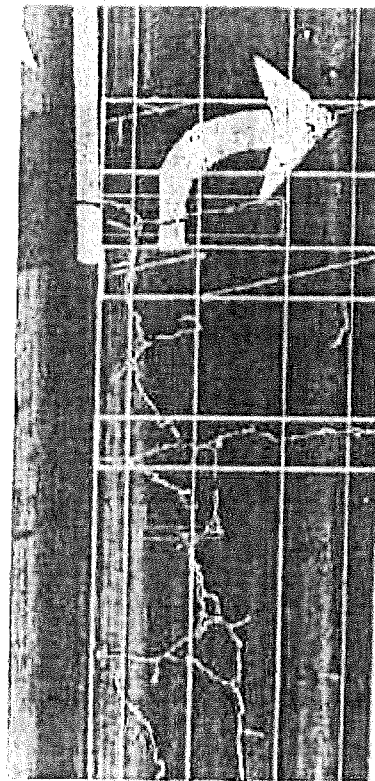
The vehicle is capable of collecting data at speeds up to 62mph and acquires both 3D and Intensity (Image) data of the road surface with 1mm resolution. This allows for the characterization and visualization of high quality images and shape (textures) of the road surface. The high precision Inertial Measurement Units (IMUs) are added to each of the LCMS sensors in order to allow us to collect and report **Longitudinal Grade, Horizontal Cross Fall (cross slope), and Super Elevation of curves.**



Cross Slope



13.1 Foot Width



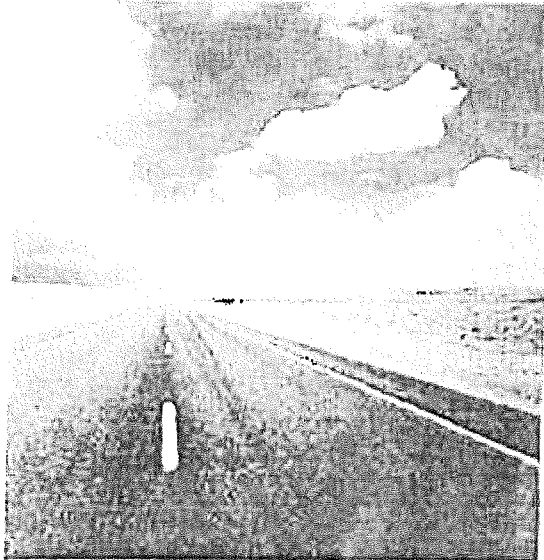
2D/3D Crack Map

### **Roughness and Rutting Data**

The **International Roughness Index (IRI)** and rutting data will be collected for the left wheel track, the right wheel track, and the average of the two wheel tracks in a manner that meets all **ASTM E950 standards**. The equipment captures continuous pavement data as the vehicle drives along a roadway. The 4,000+ points of our combined lasers are far more advanced than a typical 3 or 5 point laser. These lasers will capture IRI data across 13.1 feet of the surface and the operator does not have to worry about having the vehicle exactly in the wheel paths for rutting. The rutting depth will be delivered as minimum, maximum, and average per wheel path and the IRI data will be delivered as a value over the whole section of pavement. The IRI data represents the total anticipated vertical movement a vehicle would experience over a given stretch of road. This data is acquired from the profiler and delivered as a field in the centerline file segment by segment.

### **Key Features of the LCMS:**

- Crack detection and severity
- IRI data
- 6160 point rutting (rut depth, rut type)
- Multiple macro-texture measurements (MPD)
- 3D and 2D data to characterize Potholes, patching, raveling, sealed cracks, joints in concrete, tinning, etc.
- Day and night operation
- Low power consumption



**Single Point IRI/Rutting Collection**

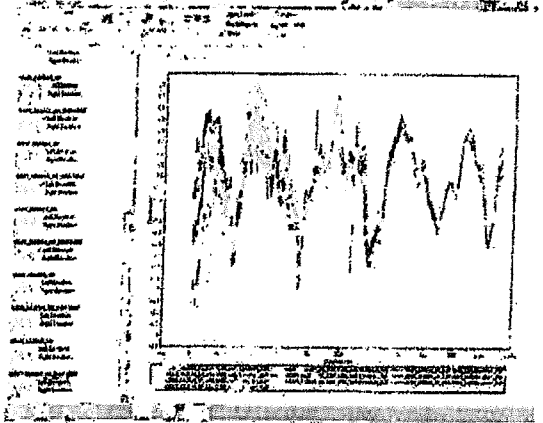


**LCMS 4000 point IRI/Rutting Collection**

The results from these measurements are based on ASTM standards and rely on the data collection vehicle traveling at a predetermined speed. Both the rutting and IRI data will be collected and delivered as an average for each line segment as attributes in the GIS file. The rutting data will be imported into MicroPAVER as part of the distress collection.

"Your IRI values are exactly where we would expect them to be. Generally we see a run that is a little different than the others, but all ten of these are dead on." - Ohio Department of Transportation (ODOT) Representative.

IRI Values



Pavement Segment IRI

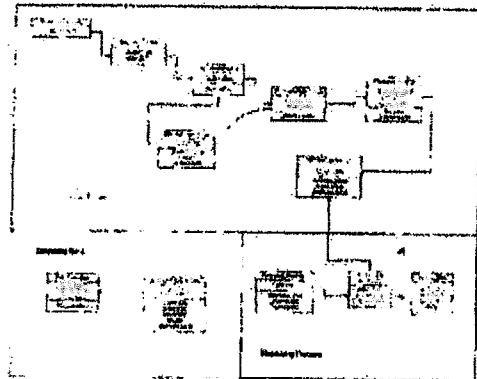


Calibration Table (Quality Control/Quality Assurance of Profiler)

<b>Distance Calibration</b>	Performed to calibrate the distance measurement instrument - Performed every 1-2 weeks
<b>Validation Object</b>	Performed to ensure the accuracy of each height sensor on the profiler - Performed every 2-3 weeks
<b>Laser Calibration</b>	Performed to mathematically compute the optimum levelness of the laser sensors mounted on the vehicle - Performed whenever a sensor is added, changed, or removed from the vehicle
<b>Accelerometer Calibration</b>	Performed to cancel out the effect of weight shifting in the van - Performed every day and/or whenever there is a shift of weight change in the vehicle
<b>Accelerometer Repeatability</b>	Performed before the start of every project by running an ODOT IRI test area 10 times to test the repeatability of the IRI system

**Establishing the Pavement Network System**

Once the ON-SIGHT™ raw data collection is finished, Transmap begins with an analysis of the pavement inventory. The first step is to prepare an updated version of the client's road centerline. The centerline serves as the route network and establishes the hierarchical structure. All pavement condition data are linked to the roadway network. Transmap has developed a unique method that ensures that all pavement and asset data are correctly related to the centerline file. The image on the right is an example of an Entity Relationship Diagram (ERD). This is represented in our ERD that is delivered to the client.



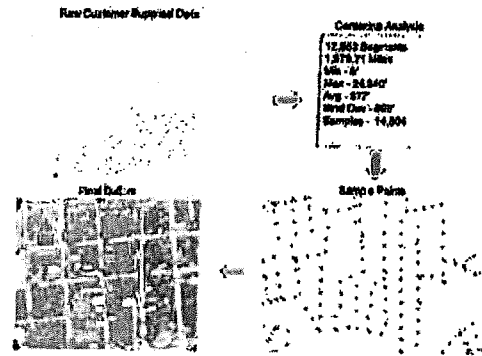
The pavement condition assessment is conducted for all routes driven by Transmap. The following terminology is used to define the hierarchy of the route system:

**Network - Branches - Sections.**

**Roadway Inventory**

As part of any pavement condition survey, Transmap collects the road width and surface type at every sample location, which is critical for establishing a pavement management plan. We will also collect any historical data on M&R and construction dates of the client's road network. This information is vital to establishing accurate pavement curves that are modeled on the client's roads.

**Network Creation / PCI Protocol**



**Sampling**

Transmap can accommodate any sampling methodology that our clients request. As a standard, we use 300-foot long management sections. All samples must belong to a network, branch, and section. All pavement sections are divided into 300-foot pieces. The general goal is to have sample areas between 1,500 sq. ft. and 3,500 sq. ft., which is the industry and ASTM standard. Transmap has suggested this initial approach for this project.

Transmap drives both sides of each roadway. This allows us to sample distress data on both lanes. In the case of divided roads, we sample both sides of the median. For large and more spread out highways, Transmap can use a wider and more cost effective sampling method. If clients wish to get 100-foot sample locations analyzed and loaded into a PMS, Transmap can accommodate that as well. As Transmap captures 100% of every roadway in each direction, any custom sampling method could be applied.

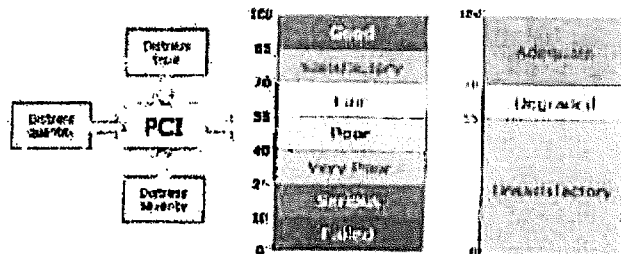
**Pavement Distress Analysis**

Transmap will assess the condition of all roadways in the City's network using the LCMS data captured during raw data collection in the field. The LCMS captures all cracking in each travel direction. Trained pavement technicians analyze the LCMS 2d and 3d solutions to determine the type of distress. Typical distresses such as alligator cracking, bleeding, block cracking, bumps and sags, corrugation, depression, edge cracking, joint reflection cracking, lane/shoulder drop off, longitudinal and transverse cracking, patching and utility cuts, potholes rutting, weathering and raveling, as well as the severity of each distress, following the guidelines established by the ASTM D6433 standards, will be captured. Our distress analysis also includes surface type, ride quality, and average segment road width. Our robust quality control procedures ensure that the measurements comply with ASTM D6433 standards.

Severity levels are typically classified as None, Low, Moderate, or High. Once related to the centerline, the severity data are processed to compute a **Pavement Condition Index (PCI)** - a number between 0 (worst) to 100 (best) that indicates the overall condition of the pavement for a specific segment.

Transmap is a total **Pavement Solution Provider**. If any other testing is required by our customer, Transmap will make sure it is collected on time and within budget.

Transmap does not rely on a totally automated approach to pavement inspection. We use field walkout inspections to supplement our LCMS and perform quality control in the field.

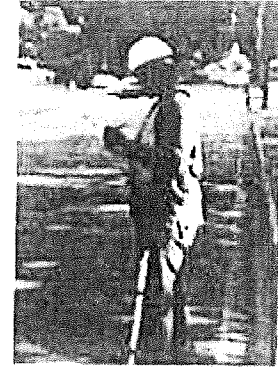


## Quality Management Plan (QMP)

### *Pavement Distress Data QA/QC*

Transmap has a 20% QA/QC methodology set up in the office and a 5-10% method-set up for boots-on-the-ground. The in-office QA/QC consists of randomly selecting 20% of all valid samples and verifying sample areas and distresses measured in sample areas.

The field QA/QC "boots-on-the-ground" occurs after all of the pavement network and samples are loaded into MicroPAVER to produce a PCI value for each segment. The purpose of field QA/QC is to verify that the distresses measured in the office align with what actually exists in the pavement. Transmap will select random samples to verify, while also focusing on roads that exhibit notable deviations from segment to segment. After the field QA/QC, Transmap updates the samples with any changes found in the field and re-loads MicroPAVER to produce the final PCI values for each roadway segment. Both the office and field QA/QC are designed to check for any inconsistencies with the analyzed samples. With more than 20 years of experience and a highly trained GIS staff, Transmap has mastered the quality assurance process. Our highly regarded quality control methodology ensures that our customers receive a quality product that exceeds their expectations.

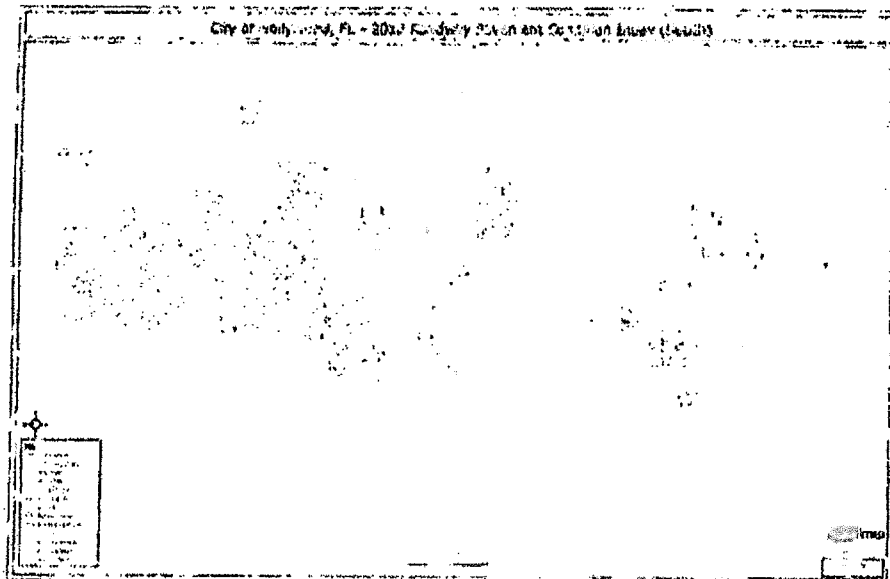


## Robust Reporting

### Tabular and Map-Based Reporting

At Transmap, we cater to our client's needs. We do not believe in just one style of reporting. Since we are also a GIS company, our reports always include *easy-to-interpret maps*. Maps are great for board presentations, for planning and justifying your budget, and to easily visualize the overall condition of your roadway network.

Transmap can customize reporting to fit the client's needs. Our reporting is both tabular and map based. We are a GIS company and believe that the best way to express the data is in full-size, easy-to-interpret GIS maps with colors that represent Good, Fair, and Poor conditions. We split up maintenance procedures based on preventative and traditional approaches. The colors of the text match which colors would be on the GIS roads file and the ranges are Pavement Condition Index values.



City of Hollywood, Florida Pavement Condition Index (PCI) Map

### Maintenance & Repair Activities

The Maintenance and Repair (M&R) work planning feature is a MicroPAVER tool for planning, scheduling, budgeting, and analyzing alternative pavement M&R activities. The M&R plan utilizes basic Inventory data combined with Inspection Information, maintenance policies, maintenance costs, and predictions about future pavement conditions. Work plan results are specific to your site.

All factors used in determining the M&R or construction activity (to apply or the costs to use) can be configured to reflect your pavement management practices and costs. Work plan options include determining budget consequences, eliminating M&R backlog in a specific number of years, maintaining Current Area Weighted PCI, and reaching Preferred Area Weighted PCI. M&R work planning is used to see the effects of different budgets and work plans on future conditions.

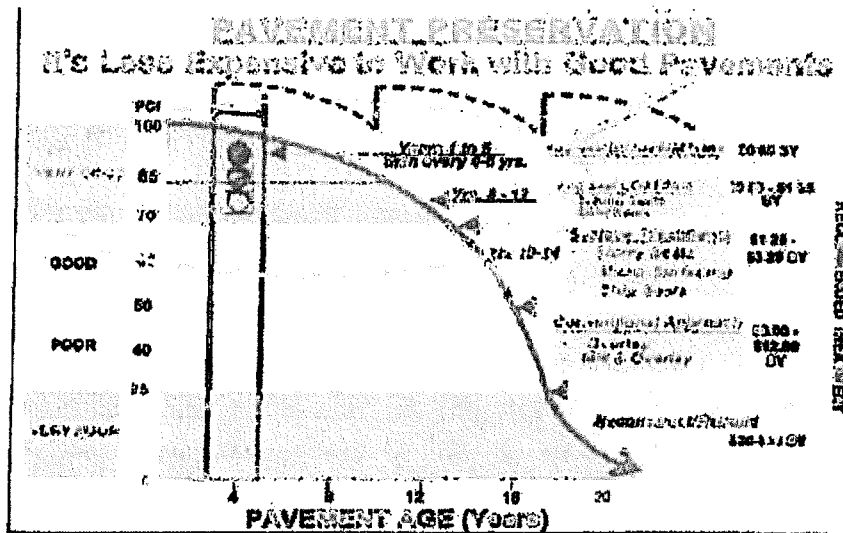
M&R Category	Treatment	Result
Regeneration PCI 90-100	Hot mix, repavement, top coat	1 year stabilization
Minor Maintenance PCI 70-80	Slurry seal, chip seal, micro emulsion	3-5 year stabilization
Major Maintenance PCI 50-60	Full depth repair, mill and overlay	5-10 year stabilization
Reconstruction PCI 0-40	Reconstruction	PCI 100% to 100

### Customized Reporting & Planning

Transmap has provided support for creating custom reports to many of our clients. These reports have assisted our clients in identifying roads that may need M&R based on budget, target PCI, and other customer-defined criteria. Transmap can develop twenty-year recommendations indicating the rehabilitation strategy, year of implementation, cost, and improved serviceability.

### Pavement Preservation Curve

The graph below displays how to apply the right treatment to the right road at the right time. Transmap can help the City develop pavement rehabilitation strategies and suggest different treatment options.





## On-Site Support

### Pavement Boot Camp

The boot camp is customized for every client and is designed as two half-day, fact-finding meetings on-site with the client. The boot camp gives the client and Transmap an understanding about which pavement reports the client needs and which legacy data Transmap needs to collect to achieve these reports.

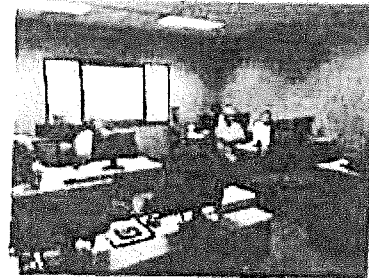
Transmap has successfully managed a boot camp for many customers. This process is considered necessary in establishing a proper PMS project from the beginning. During the boot camp, we will review any current maintenance and rehabilitation (M&R) practices that the City is using. The main focus will be to gather information on M&R practices and pricing. Transmap will suggest some preventative treatments that might best fit the project area. Transmap will use this information to gather regional cost data for the alternative methods of pavement practices. The boot camp will be the foundation for the reporting task.

The following list represents examples of which information Transmap will discuss in the boot camp:

- o **Functional class** - The class or group of roads that the road belongs to. MicroPAVER uses the following classes: Principal, Arterial, Collector, Industrial, Residential, Primary, Secondary, and Tertiary.
- o **Traffic count data**
- o **Budgets** - Current pavement rehabilitation budgets
- o **Material costs** - Typical cost of materials for rehabilitation
- o **M&R practices** - Types of rehabilitation or reconstruction practices the City is performing. Some examples are Microsurfacing, Cape seal, Slurry Seals, Hot-in-Place Recycling, etc.
- o **ArcGIS Online site** - Transmap media site. Transmap will host the geodatabase data in the cloud. The site is created to assist in the tracking of the project deliverables.
- o **Overall digital centerline file** - We will review the final centerline file that was provided to Transmap by the City.
- o **Construction dates** - Approximate or actual major M&R dates per roadway segment
- o **Family Grouping** - Information on how the City wants roads to be grouped in order to have the correct deterioration model for each family

### Personal Pavement Management System Training

Transmap uses the only APWA certified trainer, Scott McDonald, to train all of our clients. A representative from Transmap who has completed advanced MicroPAVER training will be on-site speaking about the data Transmap collected. The City can obtain a Professional Development Credit (PDH) from completing the training. The training will happen after collection activities, so all training will be based on the City's data. Transmap will facilitate a training session (up to 2 days) with City staff to review the MicroPAVER software, including topics such as applying updates, performing edits, prediction modeling, condition analysis, GIS capabilities, and availability for further support or consultation. We have conducted 2-day training classes for many of our clients.

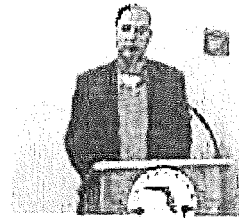


### Your Data, Your Way

We adapt the training to each client's specific needs. We always train your staff on your pavement data and street networks, and we will provide ongoing support by email or phone once the project has been completed.

### Council and Mayor Presentations

Transmap can help you prepare your budgets and even present our findings at a council meeting. Most recently, Transmap performed City Council Workshops for the **City of Hollywood, FL**, the City of Killeen, TX, and the City of Durham, NC. We have a great set of references who will agree that our specifications are the most valuable. These specifications have a tremendous impact on the customer getting what is expected. (Note: The City of Wilmington received a \$22 million dollar bond over four years because of Transmap's reporting and analysis. The City of Wilmington was receiving \$750,000 per year before Transmap's analysis.)



### Software



#### Pavement Management Software Option: MicroPAVER

Our system-wide solution for pavement management is MicroPAVER. MicroPAVER provides pavement management capabilities to develop and organize the pavement inventory, assess the current condition of pavements, develop models to predict future conditions, report on past and future pavement performance, develop scenarios for M&R based on budget or condition requirements, and plan projects. The following is a brief overview of MicroPAVER's components and capabilities.

#### Inventory

MicroPAVER inventory management is based on a hierarchical structure composed of networks, branches, and sections, with the section being the smallest managed unit. This structure allows users to easily organize their inventory while providing numerous fields and levels for storing pavement data.

These are some of the other features included in Inventory:

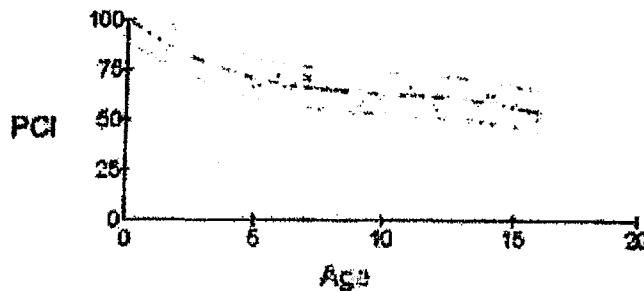
- User-Defined Fields: In addition to the standard inventory information, users can define their own fields to meet their management requirements
- Virtual Inventory: Allows the user to create virtual copies of the existing inventory and group sections for easy presentation
- Surface Change: Automatically calculates and updates pavement surface based on work history information
- Edit Historical Inventory: Easily edit historical inventory values associated with previous inspections

#### Field Inspection

To assess pavement condition, MicroPAVER uses the Pavement Condition Index (PCI) as its primary standard. The PCI measures pavement condition on a scale from 0 (worst) to 100 (best). ASTM has adopted the PCI as standard practice for roads (D-6433). MicroPAVER provides users with the ability to customize the PCI condition rating categories. It also allows the user an interface for recording the results of an inspection, as well as for easily importing data from automated vehicle collection sources.

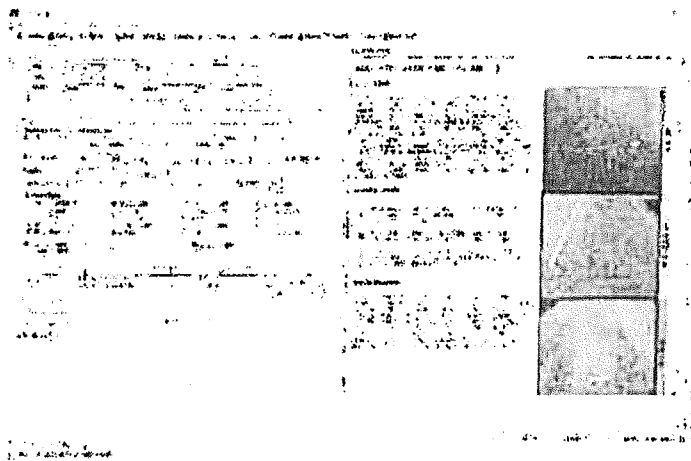
#### Prediction Modeling

The Prediction Modeling function in MicroPAVER helps identify and group pavements of similar construction that are subjected to similar traffic, weather, and other factors affecting pavement performance. The pavement condition historical data are used to build a model that can accurately predict the future performance of a group of pavements with similar attributes.



### Condition Analysis

The Condition Analysis feature allows users to view the condition of the entire pavement network or any specified subset of the network. This feature reports past conditions based on prior interpolated values between previous inspections as well as projected conditions based on prediction models. ***In MicroPAVER, conditions can be viewed on GIS maps in addition to tables and graphs.***



### Open Source Policy

With an increasingly changing software environment, Transmap's open source policy allows for data to be seamlessly implemented into *many software systems.*

### Esri Developer

Transmap is an Esri Public Works Partner and Developer. Transmap is the only vehicle-based pavement and asset management company hired by Esri to collect roadway infrastructure data.



Through many joint asset management projects, Transmap has helped Esri better understand the needs of a transportation layer for pavement management. We were part of the UNETRANS data model setup and worked exclusively with the Geodatabase, ArcSDE, and ArcGIS Server technologies. It is through this knowledge that Transmap can create a Linear Reference System which will allow the City to link assets to a milepost value. This also helps in describing federal functional direction of the road (West to East and South to North). **Transmap incorporates all collected pavement and asset data in the client's existing GIS.**



## Roadway Imaging

### The ON-SIGHT™ Mobile Mapping System

Transmap's ON-SIGHT™ state-of-the-art mobile mapping system combines the latest imaging and mapping sensors in a vehicle. The ON-SIGHT™ system can capture vehicle-based LIDAR, 360 degree street-level HD images, and a dedicated LCMS scanning for pavement distresses. All data is tied to an accurate GPS location and heading of the vehicle. Technical details of its sensors can be found in the box on to the right.



#### Vehicle-Based LIDAR

Transmap employs an Infrared LIDAR sensor that assists us in asset extraction and identification by scanning the Right-of-Way (ROW) in each travel direction. LIDAR has been successfully used to inventory traffic signs, street lights, and to accurately measure their dimensions. The image to the right is an example of utility poles and traffic signs recorded with our LIDAR sensor for a street light inventory.



The following is a list of the mobile government asset inspection equipment:

Freightliner Sprinter 2300 Full Size Van  
(Clean diesel)

Trimble POSLV 420 DGPS fully integrated system  
(best solution on the market)

- GPS-Ag 332 (L1,L2, Omnistar real-time correction)
- Litton LN 200 at 400hz (highest accuracy)
- X, Y position 1.5 feet

HD and Ultra HD Cameras

- 1628 x 1236 Color Images
- 2448 x 2048 Pavement Camera
- 6916 x 3744 Pavement Camera (Optional)

Off Laser Crack Measurement System (LCMS)

Distance Measurement Instrument (DMI)

Sick LMS211 Ground-based LIDAR

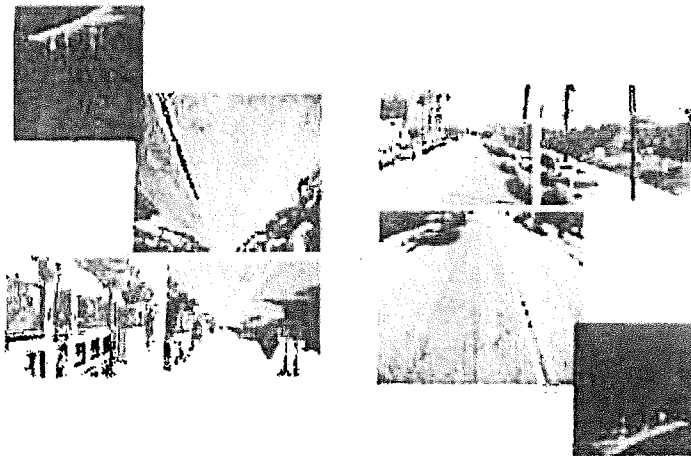
Two Servers to run up to six devices at one time

- Real time Field array

Trimble 5700 Geodetic Base Stations for post processing data

#### ON-SIGHT™ HD Imaging & Raw Data Collection

To record pavement condition data and roadway assets in the field, Transmap drives its ON-SIGHT™ HD mapping vehicles along all roads specified during the network definition phase of the project. The system captures pavement and ROW images on both sides of each roadway for a 360-degree view of the road. This process allows us to capture 100 percent of the pavement surface and ROW of each road. As a standard, Transmap records images at 13.1-foot intervals in order to capture a clear view of every ROW feature and pavement distress. This spacing can be customized in order to meet specific customer needs.



Transmap's standard roadway imaging system consists of a 3-camera configuration: One camera facing forward, another camera at a 45-degree angle to capture ROW features, and a third rear mounted camera facing down on the pavement. This system can be upgraded for a total of 12 sensors (LIDAR, cameras). The ON-SIGHT™ system is increasingly flexible and can be adjusted to meet our client's needs.

**Transmap's Images are open source.** Images can be set up and used with any image viewer. The image database is comprised of industry-standard JPEGs that are geo-referenced via the **Esrri geodatabase** (shapefile). This process allows Transmap to host images on our server and provide clients with immediate access over the Internet, allowing multiple users to view and use the data from a central location. **ArcGIS Online** technology allows users to view images and see all asset features in a web-based GIS environment. A copy of the images will be delivered to the customer on a USB2 hard drive with the raw AVI files or flash media.

#### **QC for ON-SIGHT™ HD Imaging**

Transmap performs daily quality control checks for all ON-SIGHT™ HD data. Each day, the **GPS data** is processed, reviewed, and backed up. If the results do not meet our standards, the GPS data will be re-collected the following day. On any given day, the ON-SIGHT™ HD data is processed and basically ready for delivery. In terms of **Completeness Checks**, Transmap has created a drive coding system that allows for simple completeness tracking at any stage of the imaging process. **Imaging Quality Control** starts with the ability to view all images being collected in the field as they are recorded. If there are quality problems with the cameras, the area can be reimagined as soon as the problem is detected. The images from the vehicle are also spot-checked in the office for consistency of exposure. To ensure the highest image quality, we will not survey during low light or adverse weather conditions. Unacceptable images will be re-collected. If poor exposure is detected in the office, the image area is sent back to the field for re-imaging.

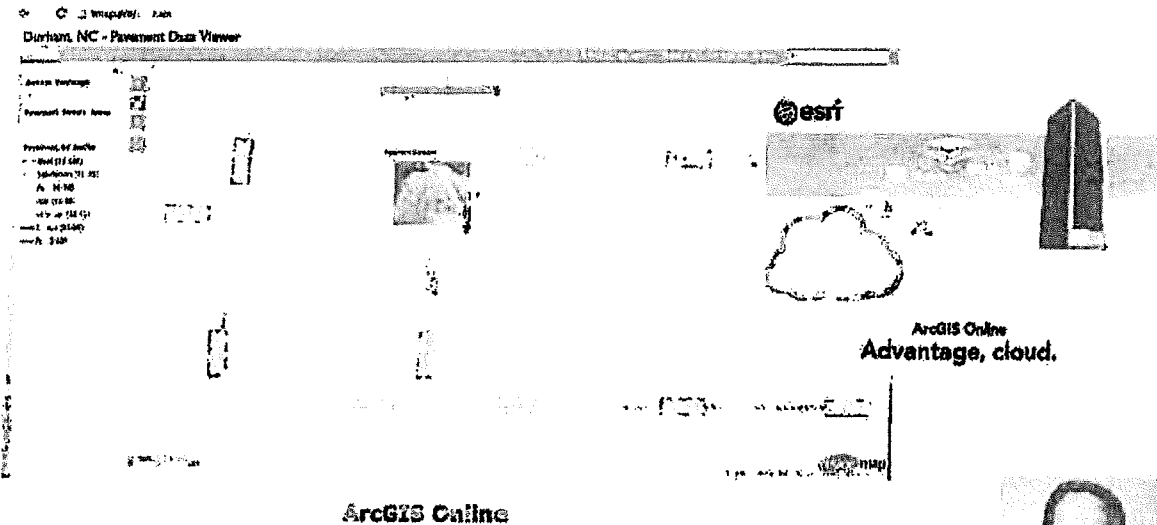
## Optional Tasks

Transmap understands that the City of Coral Springs would like the option to be provided with a road asset management system that includes items such as sidewalks, bike paths, curbs, gutters, and other details. Transmap has included the following two Road Asset Management System options:

### Road Asset Management System: Option 1

#### ArcGIS Online

Transmap can host our client's data on our servers for easy access over the Internet. This allows for multiple users to view and use the data in their web browser. Some clients choose to make their GIS and asset information available to their constituents.



*"This is fantastic... Transmap is doing some amazing stuff." - David Totman, Esri's Public Works Industry Manager*



### Road Asset Management System: Option 2

#### Cityworks Asset Management Software

*Transmap is a total solution provider and has been a Cityworks Strategic Partner for over 10 years. We are a Silver Sponsor every year at the Cityworks User Conference.*



#### MicroPAVER/Cityworks Interface

If the City wishes to purchase Cityworks, our data can be implemented directly into Esri and the **Cityworks/MicroPAVER interface**. The pavement management interface allows users to link MicroPAVER and Cityworks. As both systems use a street centerline network as their reference frame, a line of communication is established that allows the user to pass information between the two programs. The type of information passed back and forth includes inspection data and work history.

***Transmap has completed five MicroPAVER/Cityworks implementations since 2013.***

Transmap can meet the City's requirements to provide the professional and technical services necessary to install MicroPAVER software on 1-3 work stations, connect MicroPAVER and Cityworks platforms using the MicroPAVER/Cityworks interface, and test the two systems to confirm full functionality consistent with manufacturers specifications.

## Optional ROW Asset Collection

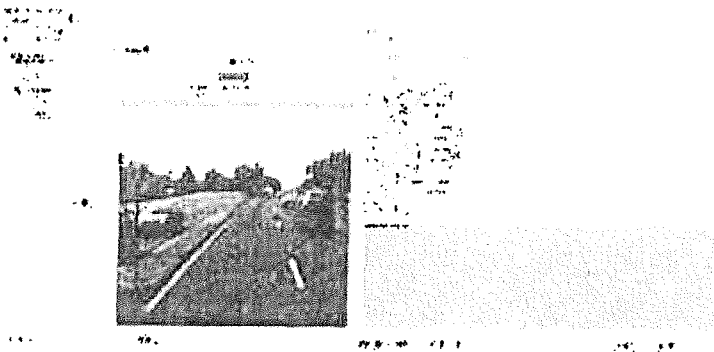
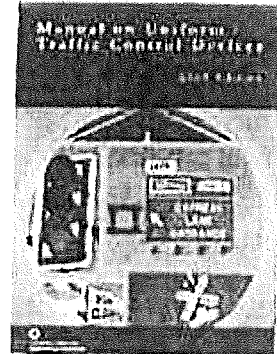
In addition to providing the City with a complete pavement management solution, Transmap can inventory roadway assets that will provide cost savings for the City of Coral Springs.

### Additional Value

Transmap has the capability to extract and populate all assets listed in the City's RFP including *parking lots, sidewalks, asphalt paths, curbs, valley gutters, traffic and street name signs, swale trees, medians, guardrails, manholes, valves, hydrants, and storm drains.*

### Citywide Sign Inventory (MUTCD Compliance)

Through our technology and our expert employees, Transmap can meet and exceed the data requirements for the condition assessment of all signs as listed as an optional task in the RFP. These services include but are not limited to: Sign location (within 1 meter), sign orientation, sign position, MUTCD code, standard width and height, sign structure, post structure, condition, sign condition, etc. Transmap understands that all signs must be in compliance with the current edition of the Uniform Traffic Control Devices Manual. Below is a screen capture of what our sign extraction software looks like along with our attribute fields.



### Optional MUTCD Nighttime Sign Assessment (Reference Federal Highway Administration)

Transmap uses the MUTCD-approved nighttime assessment method for determining if a regulatory or warning sign meets minimum reflectivity requirements. The usual method of inspecting signs at night is to use a two-person crew. While the driver focuses on the driving task, the passenger evaluates the signs and records the appropriate information. Transmap will perform a nighttime visual inspection of signs that are in need of further inspection after we perform our daytime assessment. Most recently, Transmap performed nighttime sign assessments in the City of Killeen, Texas, the City of Rockford, Illinois, the City of Bozeman, Montana, the City of Ann Arbor, Michigan, and the City of Santa Barbara, California.



### **Optional Falling Weight Deflectometer (FWD)**

Transmap can supply the City with project-level FWD testing using our trailer mounted KUAB 2m-FWD dynamic impulse loading device. The KUAB meets or exceeds all requirements of ASTM standard test method D4694-96 and the SHRP calibration protocol for FWD equipment. Some of the unique features of the KUAB 2m-FWD include:

- **Two MASS Configuration:** The most significant factor in the production of a load pulse that simulates the actual effects of a moving vehicle.
- **Segmented Load Plate:** Ensures a uniform pressure distribution over the full area of the plate.
- **Seismometers:** The deflection measuring sensors with a range of 0 to 200 mils (0 to 5080 microns).

### **Optional Ground Penetrating Radar**

Ground Penetrating Radar (GPR) testing is used to determine pavement layer thickness and to help identify the uniformness of pavement layers along a section. This process should be used in conjunction with FWD testing. Transmap offers this service as an option in connection with project level FWD testing.

### **Communications**

Transmap will provide the City of Coral Springs' Project Manager with monthly and milestone reports, as well as informal communications on a day-to-day or every-other-day basis. We encourage the City to contact our references regarding our reliable services.





**Request For Proposals**

**City of Coral Springs, Florida**

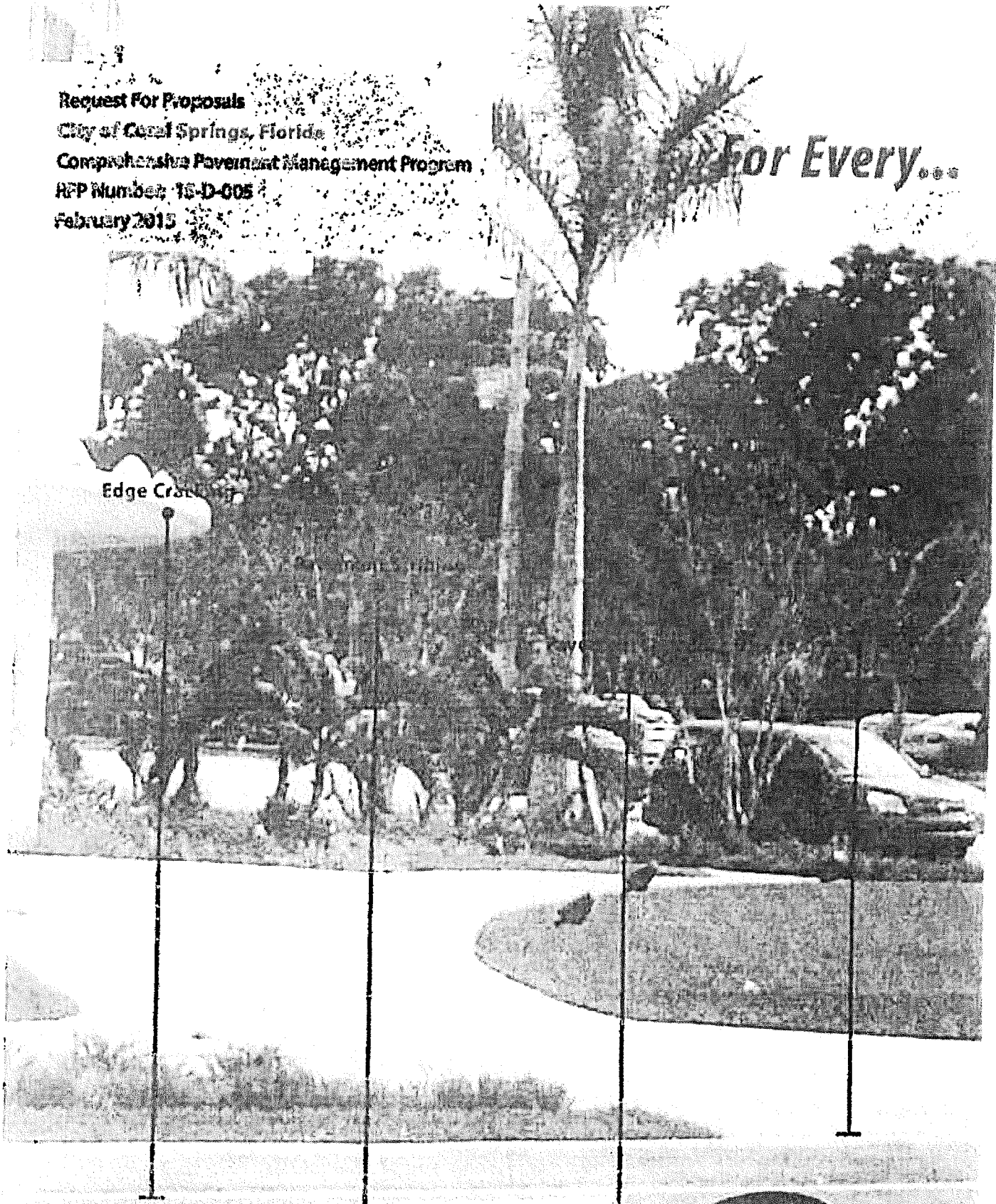
**Comprehensive Pavement Management Program**

**RFP Number: 15-D-005**

**February 2015**

*For Every...*

Edge Crack



**EXHIBIT B**





February 18th, 2015

The City of Coral Springs Purchasing Administrator  
City Hall  
9551 West Sample Road  
Coral Springs, Florida 33065

**RE: RFP NO. 15-D-005, Comprehensive Pavement Management Program**

Ms. Gall Dixon:

Thank you for allowing Transmap Corporation to propose our solutions. We are pleased to present the City of Coral Springs with our response to your request for a best and final offer. Since our establishment in 1994, all of our projects have been completed under budget. Transmap Corporation can meet and exceed the technical requirements for this project.

*Unlike other vendors, Transmap uses a Hybrid Approach for measuring pavement.*

I have outlined a few key features that you will find beneficial in qualifying Transmap as the best provider for your pavement and asset management needs:

- **Technology (Crack Map 3D)** - 2015 2D/3D Laser Crack Measurement System (Hybrid Approach) - Field Verification (QA/QC) - ASTM Pavement Condition Index - Customer Delivery Interface
- **360° Coverage** - Pavement and assets driven in both directions - Repeatable solution
- **ASTM Standards** - Pavement is collected following the guidelines established by ASTM D6433 standards - PCI adopted as the standard practice for roads - Robust QA/QC procedures

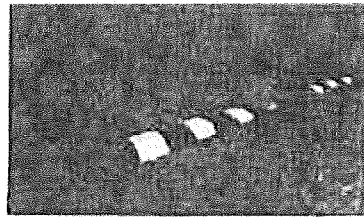
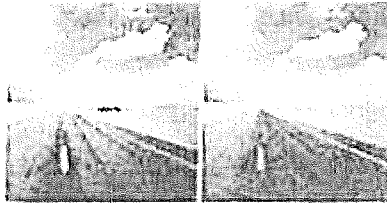
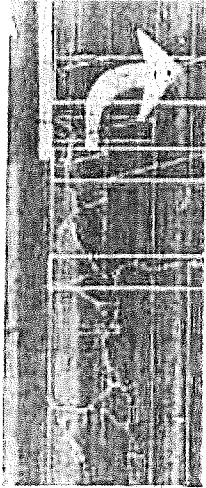
Please feel free to call with any questions. I can be contacted at [hluxhoj@transmap.com](mailto:hluxhoj@transmap.com) or on my mobile at 614-886-4100.

Best regards,

A handwritten signature in black ink, appearing to read "Howard Luxhoj".

Howard Luxhoj, PE  
President and CEO  
Transmap Corporation

# Best Technology

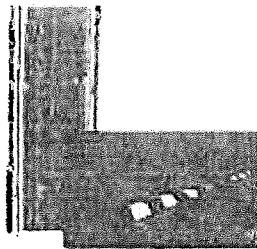


**Laser Crack Measurement System  
(3D Modeling Cross Slope)**

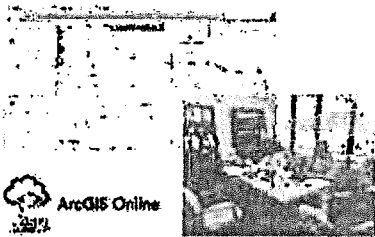


**LIDAR**

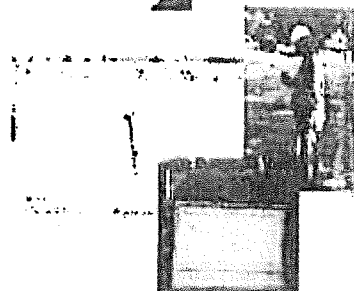
## Map



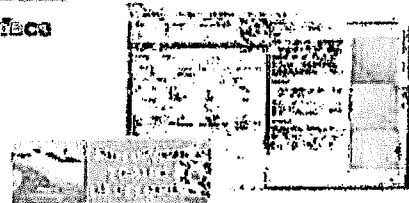
**LIMS 3D/2D System  
(Hybrid Approach)**



**Customer Delivery Interface**



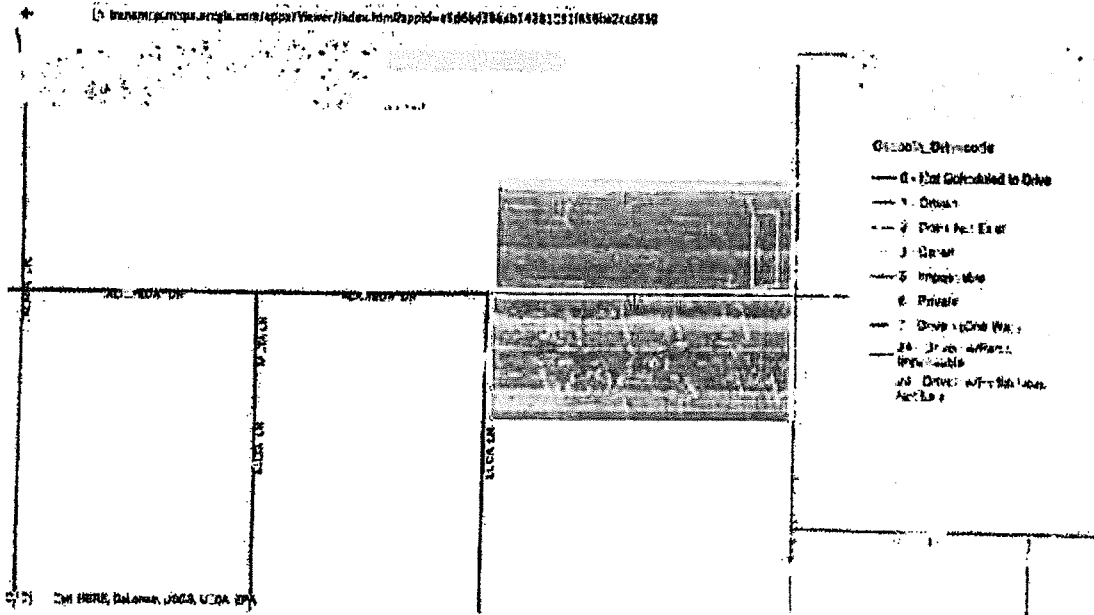
**Field Verification - QA/QC**



**MicroPAVER (PCI/Planning Interface)**

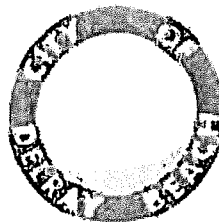
# Map

100% coverage (both sides of the roadway)



## Local Florida Data Models

Transmap has experience with local performance models.



## Table of Contents

- **Best and Final Pavement**
- **Best and Final Assets**
- **Best and Final County Sidewalks**
- **Best and Final Assets Including County Sidewalks**

1) Pavement Management Program Roads

Task	Description	Comments	Transmap Units	Transmap Price	Total
1a	ON-SIGHT™ Raw Data Collection Includes LIDAR (units = centerline miles)	Raw roadway data and image capture. 360-degree image view of all roadways (ROW) with dedicated ROW cameras and ground-based LIDAR (100% roadway coverage). Transmap will utilize our Crack Map 3D technology (LCMS) for pavement collection - also driven in both directions.	224	\$92.99	\$20,829.76
1b	Advanced Inspection Processing - Profilometer (units = lump sum)	Transmap uses an ASTM compliant 8950 profilometer and will process all rutting and ride collected data.	1	\$2,995.00	\$2,995.00
1c	Network Setup and Review (units = hours)	Transmap will review the City's centerline file and set up the required network for loading into MicroPAVER. This includes any existing data from the County that needs to be incorporated into the pavement management system.	10	\$99.00	\$990.00
1d	Pavement Inspection (units = centerline miles)	Detailed surface distress analysis using Transmap's Pavement 2.0 approach. Transmap uses ASTM D6433 compliant methods - Vehicle automated collection using a combination of lasers, 2D/3D images and field walkout, average pavement width of segment included (price includes field verification)	224	\$47.50	\$10,640.00
1e	MicroPAVER Load (units = lump sum)	Formatting pavement sample data and centerline file for mass load into MicroPAVER using scripts	1	\$1,000.00	\$1,000.00
1f	GIS Integration (units = hours)	Transmap will link all PCI data to the City's centerline file. If any other GIS work is needed to be done, the hours can be purchased.	12	\$99.00	\$1,188.00
1g	Pavement Management Practices Definition "Boot Camp" (price is per day)	Transmap will meet with the City to review maintenance/rehabilitation activities, analysis procedures, and collect any existing information on roadways (ADT data, construct dates, maintenance dates, etc.)	2	\$1,750.00	\$3,500.00
1h	Pavement Reporting (units = hours)	Transmap will put together tabular and GIS map data to support traditional/preventative maintenance pavement reporting. Budget scenarios with actual dollar amounts per MA&R activity.	44	\$125.00	\$5,500.00
1i	MicroPAVER Software (units = software)	Transmap will purchase MicroPAVER software for the City. This pricing is based on the City having at least one registered APWA member. This is a download but comes with 2 installations	1	\$1,005.00	\$1,005.00
1j	On-Site MicroPAVER Training (units = days) Expenses included	Transmap will provide on-site training for up to five City personnel on MicroPAVER 1 training.	2	\$2,800.00	\$5,600.00
1k	Transmap Project Management Pavement (units = hours)	Estimated minimum hours - If the City needs more hours based on the amount of assistance from Transmap, standard rates apply.	31	\$99.00	\$3,069.00
1l	ArcGIS Server Web-Based Image Viewer (free access for 6 months after project completion) <i>Online</i>	Transmap will set up the City to view all collected images in a web hosted environment. PCI results, Sample locations, Distress data, Orthophotography and GIS basemap layer will be posted in ArcGIS Online.	0	\$875.00	
<b>Subtotal</b>					<b>\$56,316.76</b>

*Do we already have access?*

2) Pavement Management Program Alleys

Task	Description	Comments	Transmap Units	Transmap Price	Total
2a	ON-SIGHT™ Raw Data Collection Includes LIDAR (units = centerline miles)	Alleys will be driven in one direction with dedicated pavement system and ground-based LIDAR (100% roadway coverage). Transmap will utilize our 4K Laser Crack Measurement System (LCMS).	6	\$92.99	\$557.94
2b	Pavement Inspection (units = centerline miles)	Detailed surface distress analysis using Transmap's Pavement 2.0 approach. Transmap uses ASTM D6433 compliant methods - Vehicle automated collection using a combination of lasers, 2D/3D images and field walkout, average pavement width of segment included (price includes field verification)	6	\$47.50	\$285.00

**Subtotal** \$842.94  
**Pavement Subtotal** \$57,159.70  
**Rest and Final Discount 5%** -\$2,857.99  
**Total Pavement Project** \$54,301.71

\*Discount of \$2,857.99 applied

2) Assets

Task	Description	Comments	Transmap Units	Transmap Price	Total
2a	Requested Assets (units = centerline miles) Refs based on standard attributes	Transmap will extract all storm drains, sidewalks/ADA ramps, traffic signs and guard rails - At a minimum the standard attributes will include: street name, unique ID, unique ID (street centerline), type, X,Y coordinates, etc.	224	\$92.00	\$20,608.00
	Best and Final Discount (units = centerline miles)		224	\$13.00	-\$2,912.00
2b	GIS Integration (units = hours)	Transmap will link all asset data to the City's centerline file. If any other GIS work is needed to be done, the hours can be purchased.	16	\$99.00	\$1,584.00
2c	Transmap Project Management Assets (units = hours)	Estimated minimum hours - If the City needs more hours based on the amount of assistance from Transmap, standard rates apply.	12	\$99.00	\$1,188.00
			<i>Subtotal</i>		\$20,468.00

Discount of \$2,912.00 applied

3) Pathways

Item	Description	Quantity	Transmap Unit Price	Transmap Price	Total
3a	ON-SIGHT™ Raw Data Collection Includes LIDAR (units = centerline miles)	Raw roadway data and image capture. 360-degree image view of all County roadways (ROW) with dedicated ROW cameras and ground-based LIDAR (100% roadway coverage). Transmap will also run our Crack Map 3D technology (LCMS) for pavement collection for future pavement extraction - also driven in both directions.	13	\$92.99	\$1,208.87
3b	Sidewalk Extraction (units = centerline miles) Rates based on standard attributes	Transmap will extract all County sidewalks and ADA ramps - At a minimum the standard attributes will include: street name, unique ID, unique JD (street centerline), type, X,Y coordinates, etc.	13	\$32.00	\$416.00
3c	Transmap Project Management County sidewalks (units = hours)	Estimated minimum hours - If the City needs more hours based on the amount of assistance from Transmap, standard rates apply.	1	\$99.00	\$4.00
<i>Subtotal</i>					<b>\$1,628.87</b>



Transmap Corporation

Orlando Springs, FL

February 20, 2015

4) Assets Including County Sidewalks

Best and Final Assets Including County Sidewalks

Item	Description	Comments	Transmap Units	Transmap Price	Total
4a	Requested Assets (units = centerline miles) Rates based on standard attributes	Transmap will extract all storm drains, sidewalks/ADA ramps, traffic signs and guard rails - At a minimum the standard attributes will include, street name, unique ID, unique ID (street centerline), type, x,y coordinates, etc.	237	\$92.00	\$21,804.00
	Best and Final Discount (units = centerline miles)		237	-\$14.00	-\$3,318.00
4b	GIS Integration (units = hours)	Transmap will link all asset data to the City's centerline file. If any other GIS work is needed to be done, the hours can be purchased.	16	\$99.00	\$1,584.00
4c	Transmap Project Management Assets (units = hours)	Estimated minimum hours - If the City needs more hours based on the amount of assistance from Transmap, standard rates apply.	12	\$99.00	\$1,188.00

\*Discount of \$3,318.00 applied

Subtotal

\$21,258.00