Tab A – Cover Sheet

TXShare
Your Public Sector Solutions Center

REQUEST FOR PROPOSALS
For
PAVEMENT ANALYSIS AND RELATED SERVICES
RFP # 2022-063

Sealed proposals will be accepted until **2:00 PM CT, Tuesday February 21, 2023,** and then publicly opened and read aloud thereafter.

IMS Infrastructure Management Services, LP
Legal Name of Proposing Firm

Jim Tourek	Client Services Manager
Contact Person	Title

480.462.4030	jtourek@imsanalysis.com
Telephone Number	E-Mail Address

8380 South Kyrene Road, Suite 101	Tempe, Arizona	85284
Street Address of Principal Place of Business	City/State	Zip

8380 South Kyrene Road, Suite 101	Tempe, Arizona	85284
Complete Mailing Address	City/State	Zip

Acknowledgment of Addenda: #1 X #2 _____ #3 _____ #4 _____ #5 _____

By signing below, you hereby certify that the information contained in this proposal and any attachments is true and correct, and may be viewed as an accurate representation of proposed services to be provided by this organization. You agree that failure to submit all requested information may result in rejection of your company's proposal as non-responsive. You certify that no employee, board member, or agent of the North Central Texas Council of Governments has assisted in the preparation of this proposal. You acknowledge that you have read and understand the requirements and provisions of this solicitation and that the organization will comply with the regulations and other applicable local, state, and federal regulations and directives in the implementation of this contract. And furthermore that I certify that I am legally authorized to sign this offer and to submit it to the North Central Texas Council of Governments, on behalf of said offeror by authority of its governing body.

Authorized Signature

Infrastructure Management Services
an ICC Company

Request for Proposals (RFP) for

Pavement Analysis and Related Services

RFP No. 2022-063

February 24, 2023

North Central Texas Council of Governments
Centerpoint II
616 Six Flags Drive
Arlington, Texas 76011

February 24, 2023

IMS Infrastructure Management Services, LP
6001 W Parmer Lane |
Suite 370-8933
Austin, Texas 78727
Phone: (480) 839-4347
www.imsanalysis.com

North Central Texas Council of Governments
Centerpoint II
616 Six Flags Drive
Arlington, Texas 76011

Dear Selection Committee,

Members of the IMS Engineering and Technical Teams at our most recent "Pavement and Asset Management" in-service training week.

IMS Infrastructure Management Services is pleased to submit our proposal in response to the North Central Texas Council of Governments (NCTCOG) above referenced solicitation. IMS is an industry leader with nearly four decades of pavement and asset management experience. Since our founding in 1985, we have provided pavement and asset management services to more than 1,000 municipalities across the United States and Canada.

Since 2016, IMS has worked successfully with more than 20 NCTCOG member agencies under the existing TxShare Cooperative Purchasing Program for these services. Ultimately, we understand that the services we provide to member agencies through this program are critical for assisting agencies in justifying and allocating limited pavement and infrastructure asset funding. **With our sole focus on pavement and asset management services, NCTCOG member agencies will continue to acquire quality data, exemplary service, and reliability that define our commitment.** This level of quality, service, and commitment has resulted in IMS being retained by many NCTCOG member agencies for multiple engagements over the past several years. **IMS is also a licensed Texas engineering firm, and we have locally based staff available for the member agencies to negotiate with separately and outside of this contract for providing engineering services should the need arise.**

This proposal will remain in effect until a contract has been finalized and a Purchase Order has been issued by the North Central Texas Council of Governments. I will serve as the official contact person for any questions regarding our submission, and I am authorized to legally bind IMS Infrastructure Management Services, LP. We are confident that IMS will continue to be an excellent partner to NCTCOG and its member agencies. Thank you for this opportunity to submit our proposal. My colleagues and I truly look forward to working with NCTCOG and its member agencies for years to come!

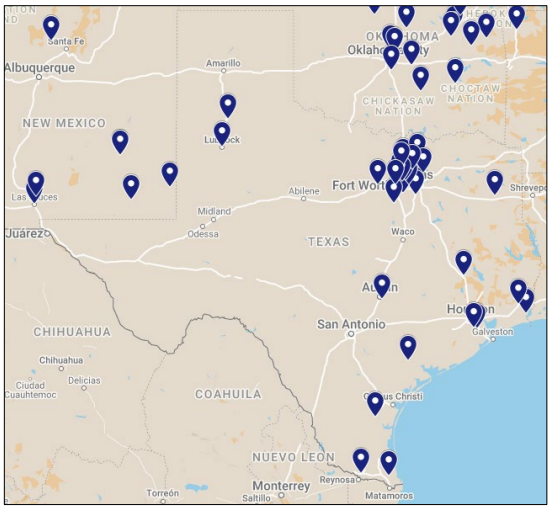
Best Regards,
IMS Infrastructure Management Services, LLC
Texas Registered Engineering Firm No. 22225

Kurt Keifer, PhD, PE (Texas License No. 127170)
President | Principal Engineer
kkeifer@imsanalysis.com | (737) 900-6676

Table of Contents

Tab B – Executive Summary

IMS Infrastructure Management Services successfully delivers between 80 and 100 pavement and asset management projects each year to local agencies in Texas and across the United States. By successfully delivering more than 20 projects to NCTCOG member agencies through the TxShare Cooperative Purchasing Program since 2016, IMS has demonstrated that we have the experience, expertise, state-of-the-art pavement assessment technologies, and Texas-based project staff and resources to continue to meet and exceed the expectations of NCTCOG and its member agencies. Approximately half of our projects in Texas are performed through the TxShare program, and we look forward to bringing in even more agencies in Texas and elsewhere under the program moving forward. In this section, we present a concise statement of our understanding of the project followed by the key differentiators that we believe continue to make IMS the right partner for NCTCOG and its member agencies.



IMS has performed more than 40 pavement and asset management projects in Texas over the past five years alone and approximately half have been through the TxShare Cooperative Purchasing Program.

Project Understanding

Based on our work with NCTCOG member agencies since 2016, we understand that **our primary objective is to provide member agencies with the tools, skills, and information to manage their roadway networks and right-of-way assets in the most cost-effective manner possible.** To accomplish this goal, IMS conducts automated pavement condition surveys using industry standard ASTM D6433 and E3303 standards that provide an objective and repeatable understanding of the status and needs of roadway networks. **IMS performs a full suite of pavement testing services to assess both the pavement surface condition and its structural adequacy by using state-of-the-art 3D pavement imaging Road Surface Testers (RST), and Fast Falling Weight Deflectometers (FastFWD).** The data are used develop comprehensive multi-year street rehabilitation plans that optimize pavement quality and minimize annual expenditures.

IMS also delivers right-of-way asset inventory assessments that are linked to an agency's existing GIS environment such inventories include sidewalks, ADA ramps, curb and gutter, signs and supports, and nearly any other roadside feature that can be seen from the high-definition imagery that we collect during our surveys. We recently integrated automated lane stripe reflectivity measuring systems to our fleet of collection systems for assessing the condition of striping, which is becoming more critical – and is now incentivized by FHWA – with the advent driver assist systems and self-driving vehicles. When deemed necessary, we deploy lidar for capturing 3D point clouds of the right-of-way from which detailed measurements may be taken for a variety of asset management or design purposes.

While there is no "one-size-fits-all" when it comes to pavement management programs, IMS assists NCTCOG member agencies in the evaluation of software solutions if implementation is desired. We

have the experience and expertise implementing, updating, and providing training for all the most common pavement management systems, including PAVER, Cartegraph, AgileAssets, StreetSaver, StreetLogix, Lucity, and others. We also recognize that not all agencies have the resources to run a dedicated pavement management program and because of that, IMS has engineered an easy-to-use interactive Excel spreadsheet – Easy Street Analysis (ESA) – that utilizes the core metrics of any good pavement management system, such as industry standard performance curves, ASTM D6433 and E3303 distress protocols, custom prioritization, and cost-benefit optimization.

January 2023, Dallas, TX: *Five of IMS' eight state-of-the-art 3D pavement imaging Road Surface Testers (RST) posing for a photo after wrapping up 6,000 miles of pavement condition data collection per ASTM D6433 and E3303 and for the City of Dallas, TX during a three month window through the existing TxShare program.*

Our proposal highlights the following IMS capabilities:

- The IMS team's innovative approach to objective data collection using industry standards protocols such as ASTM D6433, E3303 or custom protocols required by an agency. ***Note: We are the first firm to implement both D6433 and the new E3303 protocol for Dallas, TX through the existing TxShare program.***
- Pavement management software integration into any pavement management system, including delivery of an interactive Excel spreadsheet that can be easily reprioritized with new budgets.
- Delivery of quality and comprehensive pavement, sidewalk, pedestrian ramp and asset management data and results in industry standard formats such as spreadsheets, databases, geodatabases, shape files, or even Google Earth KMZ files. The idea being to simplify pavement and asset management, not make it needlessly complicated.
- Development of a comprehensive multi-year pavement management plan that prioritizes member agency needs and optimizes the rehabilitation plan based on cost-benefit techniques.
- Collection and analysis of pavement roughness, friction, and structural data using industry leading testing systems and analytical tools.
- The IMS team's successful collaboration with several NCTCOG member agencies over the past six years developing practical pavement and asset management plans and recommendations.

Project Approach

IMS assigns seasoned pavement engineers as project managers for all our projects. We believe it is imperative that the project manager have the requisite technical and domain knowledge – as well as practical project management experience – to lead the project team. Our project managers apply the following principles in developing and delivering projects:

- Strive for a collaborative, people-oriented consultative approach in scoping and performing the project data collection, and analysis and reporting tasks.
- Leverage technology to gather objective, repeatable, and ultimately useful information.

- Rely on established technology, industry standard protocols – *deploy leading edge not bleeding edge technology and processes.*
- Deploy data collection, processing, and visualization software that integrates all subsystems on data collection vehicles, processed and analyzed data, and presents the data to the agency in a practical, easy-to-understand way.
- Establish credible, cost-effective pavement and asset maintenance and rehabilitation recommendations and programs rooted in sound engineering principles and collaboration with agency staff.

Our project management process is based on thorough planning, proactive management of schedules, and constant communication. The result of effective project management is higher quality with respect to project deliverables and satisfied stakeholders. We understand that the services we provide to member agencies through this program are critical for assisting agencies in justifying and allocating limited pavement and infrastructure asset funding. **When we approach each project we deploy our technical team's experience and expertise, along with our state-of-the art pavement testing equipment, to develop practical, cost-effective pavement and asset management maintenance and rehabilitation (M&R) recommendations.**

Experience and Expertise: IMS brings significant regional experience to meet the NCTCOG member agency pavement and right-of-way asset management needs. **We have performed more than 40 projects in Texas over the past five years, and more than 20 of them have been through the TxShare program. Nationwide, we have performed more than 375 pavement and asset management projects over the past five years deploying services identical to those required by NCTCOG.** IMS is a registered Texas engineering firm and our technical team is comprised of nine pavement engineers, five of whom have doctoral degrees in pavement engineering and four of whom are licensed professional engineers in Texas. Collectively, our team of pavement engineers has more than 150 years of experience and is supported by our team of 17 trained and experienced pavement technicians. Altogether, the IMS technical team brings nearly 350 years of pavement and asset management experience to the table.

State-of-the-Art Data Collection Technology, Unparalleled Capacity, and Rigorous QA/QC: IMS has the largest fleet of Road Surface Testers (RST) equipped with state-of-the-art 3D Laser Crack Measurement System (LCMS-2) technology in the United States. **Our team has eight systems that each collect approximately 1,500 miles per month for a total of approximately 12,000 miles monthly – with a capacity of nearly 150,000 miles annually.** Our large fleet of equipment provides our team with the needed capacity to expedite data collection. It also provides our team with operational redundancy, which is important when deploying state-of-the-art technologies. We deploy industry standard pavement profiling systems and friction testing systems for measuring pavement roughness and skid resistance, respectively. **For sidewalk and ramp surveys we deploy mobile lidar systems with integrated 360-degree imaging systems along with our in-house designed and manufactured Sidewalk Surface Testers (SST) to capture detailed sidewalk and ramp condition and ADA compliance data.** In order to ensure high quality data deliveries on all of our projects, we have developed comprehensive QA/QC processes for all of our equipment. These QA/QC processes address both the "in-the-field" collection stage of each project as well as the "in-the-office" data processing and analysis phases of each project.

Practical, Cost-Effective Maintenance and Rehabilitation (M&R) Recommendations: Having performed hundreds of similar projects over the past 40 years, the IMS team has significant experience developing optimal M&R recommendations for municipal agencies that consider both technical and non-technical

priorities of the agency. We have experience with asphalt, concrete, and composite pavements M&R applications for high- and low-volume roads. **We understand the importance of applying the right treatment to the right pavement at the right time.** Underlying our approach to M&R planning is the concept of "cost of deferral," whereby M&R priorities are initially based on the increased cost incurred by delaying M&R to a pavement. We work collaboratively with agencies to identify the most effective M&R strategies, and we tailor our decision trees and unit costs to account for local realities. Our approach to establishing overall prioritization of M&R recommendations is flexible and can account for non-engineering factors. We look forward to continuing to collaborate with NCTCOG member agencies to ensure that their pavement and asset management programs address the needs and priorities of the stakeholders involved.

Optional Services

In addition to the primary services requested in the RFP, IMS proposes the following services:

1. **Sidewalk condition surveys using Sidewalk Surface Testers (SST) developed by IMS:** SST-based sidewalk surveys provide comprehensive imagery and condition data for sidewalk and pedestrian ramps. These surveys are used by agencies that require comprehensive sidewalk and ramp data for M&R planning and to assess ADA compliance issues. This approach to sidewalk surveys is described in Tab D, Service Category #7.
2. **Esri Story Maps and Dashboards:** To make our data more easily accessible to agencies that may not have significant inhouse GIS expertise, we have recently started developing interactive story maps and dashboards for our clients. These tools are available online and are extremely intuitive to navigate, both for agency staff as well as the public, if desired. Our Story Maps and Dashboards are described in Tab D, Service Category #6: GIS Related Services.
3. **Enhanced Pavement Data QA/QC, Processing, and Formatting:** This approach to QA/QC if for agencies that use their pavement condition data to track pavement performance more accurately over time. This approach considers the automated data collected with the state-of-the-art imaging systems and includes supplemental field observations and intensive manual QA/QC of all collected data by independently certified pavement raters. This approach is described in Tab D, in the subsection titled, "IMS' Signature Semi-Automated QA/QC Process."
4. **Inform™ cloud hosted software for pavement data visualization and analysis:** IMS offers a convenient, web-based tool for reviewing pavement condition data and associated imagery. The software enables agencies to review all collected pavement data, including cracking, rutting, and roughness data together, in a geocentric environment. The system was just released in early 2023 and will be available to all IMS clients moving forward. The Inform™ software is shown here: https://www.internationalcybernetics.com/inform/

Pricing for these services and others are provided in the "Additional IMS Value Added Services" section (i.e., last page) of Attachment A "Pricing Proposal Form" in Tab F.

Tab C – Experience and Key Personnel

Firm Overview

Founded in 1985, IMS has operated continuously as the premier municipal pavement and right-of-way (ROW) asset management firm in the United States and Canada. IMS was the first firm to bring automated pavement evaluation to the North American market, and we have kept that innovative mindset by continuing to implement state-of-the-art data collection and processing technologies.

We offer the following pavement and asset management services:

- Automated and semi-automated pavement condition assessments using leading data collection technologies.
- Streamlined data collection and processing workflows.
- Customizable GIS deliverables and supplemental GIS consulting services.
- Non-destructive pavement testing and analysis.
- Pavement management system implementations and training.
- Pavement management plan development.
- Stakeholder engagement through council and/or staff presentations and reports.

In addition to pavement management, IMS also offers complimentary services that include ROW asset inventory development using 360-degree imagery and mobile lidar, sidewalk and ADA compliance surveys, data visualization services using dashboards, story maps, and web applications built on geographic information systems (GIS).

FIRM QUALIFICATIONS

38 years of experience helping cities and counties assess, analyze, and manage pavements and ROW assets.

Project teams led by **Professional Pavement/Infrastructure Engineers.**

Successful project delivery for more than **1,000 municipalities** across the United States.

More than 20 NCTCOG member agency project in the past five years.

Large fleet of state-of-the-art pavement data collection vehicles.

More than **1,000,000 miles** of pavement condition surveys.

QA/QC technicians **independently certified** for condition rating according to **ASTM D6433**.

Extensive experience with more than **15 pavement and asset management systems,** including StreetLogix, VUEWorks, Cartegraph, Agile Assets, PAVER, Lucity, Cityworks, and others.

IMS was acquired by International Cybernetics Company, LP in May of 2022. ICC manufactures precision hardware for pavement testing for government agencies, civil engineering firms, and roadway contractors globally. We are incredibly excited about what our future holds – while in the same industry, IMS and ICC operated in different market sectors with very little overlap. We are now able to bring our customers a full range of products, services, and software solutions to meet their pavement, sidewalk, and asset management needs.

IMS Office Locations
Arizona: 8380 S Kyrene Rd, Suite 101; Tempe, AZ 85276
Texas: 6001 W Parmer Ln; Suite 370-8933; Austin, TX 78727
Florida: 10630 75th Street North; Largo, FL 33777

Number of years in business*:* 38 years
Firm Size*:* 49 full time employees

IMS Project Team

IMS can provide all the services requested under this RFP except for ground penetrating radar (GPR) testing and pavement coring. To meet the GPR testing requirements, we have added Infrasense, Inc. to our team. Infrasense will provide specialized GPR data collection and analysis services. We will subcontract with local firms for any pavement coring needed.

We have also added Gorrondona and Associates, Inc. (G&AI) to our team. G&AI will provide additional survey, lidar, mapping, and geotechnical support and capacity, if needed. IMS has worked with both firms in the past, and we are confident in their abilities to deliver high quality results. G&AI's ability to provide ground control for mobile mapping projects may be useful to agencies in need of high positional accuracy of their assets. G&AI is also based in Fort Worth and in a registered Texas Historically Underutilized Business Certification (HUB).

Infrasense, Inc.

Infrasense specializes in the non-destructive evaluation (NDE) of highway and airfield pavements, bridge decks, and other transportation facilities. **Infrasense and its staff have conducted projects for clients in all 50 US States, Canada, Europe, Asia, and the Middle East. This work, including over 40,000 lane-miles of ground penetrating radar (GPR) pavement surveys, has been carried out for numerous municipal, state, and federal agencies.** Infrasense has also worked on large scale projects and On-Call Contracts, including the use of GPR for VDOT, SCDOT, GDOT, ODOT, LADOTD, VTrans, IDOT, WisDOT, MnDOT, SDDOT, ITD, and NDDOT.

Gorrondona & Associates, Inc.

Gorrondona & Associates, Inc. (G&AI) has more than 30 years of experience managing complex projects across the State of Texas. Throughout this time span, G&AI has consistently been a leader in the field and continue that tradition of innovation today. **A key component to the consistent success of G&AI's survey and mapping projects is the continuity of their staff and their diverse experience working with established workflows, providing an unmatched level of efficiency across a full spectrum of services.** The combination of the continuity of G&AI's staff, the implementation of leading-edge technology, and the ability to deliver projects on time and within budget are cornerstones of the G&AI culture.

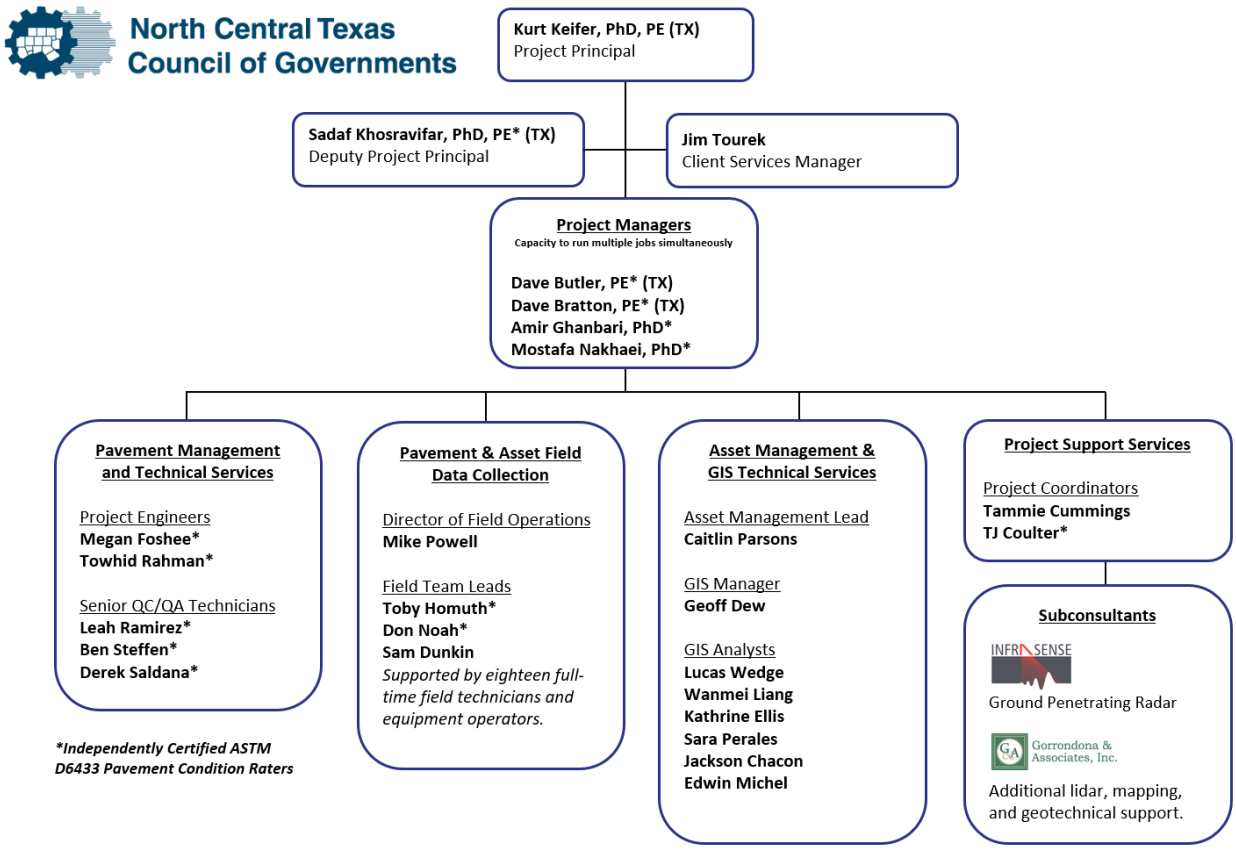
G&AI is a Texas Corporation and registered Texas Historically Underutilized Business (HUB) firm with offices in Austin, Dallas, Fort Worth, Houston, San Antonio, and Lubbock providing full service professional land surveying, GIS, Mobile lidar, aerial mapping (photogrammetry and lidar) unmanned aerial vehicle mapping (UAV), and terrestrial scanning. The original founder, Brad Gorrondona, RPLS, holds G&AI's sole ownership. Established in 1990, the company maintains a staff of nearly 90 people, including 12 registered professional land surveyors, two licensed professional engineers, two certified photogrammetrists, a certified mapping scientist, a geographic information system professional (GISP), and 20 survey field crews.

Key Personnel

IMS employs 49 full-time staff, including eight pavement engineers – five possessing PhD degrees in pavement engineering, thirteen GIS analysts and technicians, thirteen Orange County Transportation Authority (OCTA) independently certified ASTM D6433 pavement raters, and fourteen trained and experienced field technicians. Together, the IMS team completes between 80 and 100 pavement and asset management projects annually. We stand second to none in our ability to establish cost-effective pavement management programs for large and small agencies alike, and our team has earned a reputation for excellence over the course of thousands of projects for municipal clients in Texas and across the United States. Our multi-disciplinary team, led by pavement engineers, has the experience and expertise to assist our clients with full-service pavement and asset management services, software needs assessments, and custom implementations.

Project Organizational Chart

The primary project team is shown in the organizational chart below. To be able to continue to handle multiple projects successfully, we need several project managers, engineers, field staff, GIS technicians and analysts, QA/QC specialists, and administrative staff available to work together on projects as they develop. The individuals shown in the organizational chart will be assigned to specific projects based on their forecasted availability during the duration of the project. Based on our experience working on multiple projects at the same time and our familiarity with the NCTCOG program, we are confident that the proposed project team is adequate to handle the anticipateds project load.



Primary Points of Contact

IMS Infrastructure Management Services, LP
Kurt Keifer, PhD, PE | kkeifer@imsanalysis.com | 737-900-6676
Jim Tourek | jtourek@imsanalysis.com | 480-462-4030

Gorrondona & Associates, Inc. (Subcontractor)
Scott Dunham | sdunham@ga-inc.net | 512-348-3350

Infrasense, Inc. (Subcontractor)
Adam Carmichael | acarmichael@infrasense.com | 781-572-0563

Project Team Interaction with NCTCOG

Jim Tourek and Kurt Keifer will serve as primary and secondary points of contact with NCTCOG. IMS' approach to handling NCTCOG service requests is detailed in Tab D – Technical Proposal. To date, Mr. Tourek has been successfully handling communications with NCTCOG under the existing TxShare program and we plan to keep him in this role moving forward. Dr. Keifer will coordinate all subcontractor agreements required for specific projects needs with Gorrondona and Associates and Infrasense.

Roles and Responsibilities for Key Personnel

Kurt Keifer, PhD, PE (TX) is based in Austin, and he will serve as the **Project Principal** and will be responsible for the overall program success. He will be responsible for coordinate IMS and subcontract resources to support the individual projects. He will also provide guidance and recommendations to project managers and technical staff, as required.

Jim Tourek will serve as the overall **Contract Manager**, and he will also serve as a liaison between the member agencies, NCTCOG, and the IMS project team before, during and after the completion of each project. Mr. Tourek will be instrumental in developing preliminary project scope documents and in ensuring that administrative paperwork is handled efficiently.

Sadaf Khosravifar, PhD, PE (TX) will serve as the **Deputy Project Principal** and as a project manager for some projects, if needed. She will provide technical expertise to the project teams and will assist Dr. Keifer and Mr. Tourek in finalizing project scope documents and in reviewing project expectations with member agencies early in the process. She will work closely with the project teams to review and confirm project goals, objectives, deliverables, schedules, and necessary labor and equipment resources.

Project Managers

The Project Manager oversees the project in its entirety and leads technical deliverable discussions to ensure continuity of services and technically correct results. They keep the project moving forward from inception to completion. It is the Project Manager's job to know where the project is at all times.

The following IMS engineers will serve as project managers and will be assigned projects based on their forecasted availability.

- **Dave Butler, PE (TX)**
- **David Bratton, PE (TX)**
- **Mostafa Nakhaei, PhD, EIT**
- **Amir Ghanbari, PhD, EIT**

Note: Project Managers my serve as Project Engineers, when their technical skills are needed for a project.

Project Engineers

The Project Engineer is the "doer" of the team. They are responsible for reviewing the survey maps, reviewing GIS linkage, processing the condition data, developing draft reports and recommendations for review by the Project Manager.

The following IMS engineers will serve as Project Engineers and will similarly be assigned projects based on their forecasted availability.

- **Megan Foshee, EIT**
- **Towhid Rahman, EIT**

Leah Ramirez is our **Senior QA/QC Team Lead**, and she is an independently certified ASTM D6433 PCI pavement rater and has eight years of experience performing pavement condition surveys for local agencies across the United States. She leads the IMS team of certified ASTM D6433 pavement condition raters for all projects.

Mike Powell is our **Director of Field Operations**, and he manages the scheduling and deployment all IMS pavement and asset data collection systems. He works closely with the project managers to ensure that project schedules are met.

Caitlin Parsons is our **Asset Management Team Leader** and will direct a team of data technicians to ensure that project preparation, field data collection, data processing methods, and deliverables are executed to correctly and efficiently. Mr. Parsons also overseas all sidewalk and ramp ADA condition surveys.

Geoff Dew is our **GIS Manager**, and he will oversee our team of GIS analysts and technicians to ensure that they are processing all GIS mapping and reporting activities efficiently. Geoff and his team will engage directly with member agency staff to ensure that GIS maps are correct and complete prior to data collection and processing.

Tammie Cummings will serve as a **Project Coordinator**. She is responsible for project administration, coordinating meetings, assisting internal and external progress communication and reporting.

Key Personnel Resumes

Kurt Keifer, PhD, PE (Texas)

Project Principal

Dr. Kurt Keifer is the President of IMS. He has 25 years of experience with pavement testing, analysis, engineering, and management. He has implemented pavement management systems for municipal agencies across the United States and around the world. A major focus of his career has been developing and integrating automated pavement imaging and road surface profiling hardware and software technologies. Prior to joining IMS, Dr. Keifer served as the Director of Pavement Engineering at Gorrondona & Associates for five years and before that as Director of North American Consulting at Dynatest Consulting for a decade. While at Dynatest, Dr. Keifer managed the TxDOT pavement condition project, which consisted of assessing 90,000+ miles of TxDOT roadways annually – *the largest pavement condition survey project on earth!* Dr. Keifer also worked with the US Army Corps of Engineers for more than ten years developing the PAVER pavement management system and the image-based automated method for performing ASTM D6433 PCI inspections.

Recent Projects

City of Dallas, TX (In Progress) – Principal Engineer

Dr. Keifer serves as Principal Engineer of the city's TxShare pavement condition survey, sidewalk inventory, and selected GPR testing project. The project includes approximately 6,000 miles of city-managed arterial, collector, and local roadways. The pavement survey consists of an automated ASTM D6433 PCI survey and the city's first E3303 pavement condition survey, which is being run in parallel. International Roughness Index (IRI) data and rutting data are collected for each roadway during the survey. Collected data will be delivered in a geodatabase and integrated with the city's existing pavement management system.

City of Fort Worth, TX – Principal Engineer and Project Manager

Dr. Keifer served as Project Principal and Project Manager (2021-Pres.) of the city's ROW asset inventory and pavement condition survey. The project included approximately 4,200 miles of city-managed arterial, collector, and local roadways as well as bus lanes. The asset inventory included collection of signs, sign supports, streetlights, signals, curb and gutter, pavement markings, speed bumps/cushions, sidewalks, and ADA pedestrian ramps. The pavement survey consisted of an automated ASTM D6433 PCI survey. International Roughness Index (IRI) data and rutting data were also collected for each roadway during the survey. The project team worked collaboratively with the city to customize the ASTM D6433 PCI calculation to account for different functional classifications and surface types.

City of Bedford, TX – Principal Engineer

In 2022, Dr. Keifer oversaw the implementation of a pavement management system project for theCity of Bedford, TX. Using automated technology to collect pavement data that adhered to ASTM D6433 standards, a pavement condition database was created. This data was then utilized to populate IMS's in-house pavement management program, ESA. Dr. Keifer collaborated with the IMS project manager and the city to create a short-term CIP for pavements and continues to provide ongoing training and support for the use of ESA.

City of Lancaster, TX – Principal Engineer

In 2019 and again in 2022, Dr. Keifer was the Principal Engineer for the City of Lancaster, that was involved with right-of-way (ROW) asset and updated the pavement management system. The project involved collecting ASTM D6433-compliant pavement surface data using automated LCMS-2 equipment

and collecting inventory of support and sign database. The IMS team submitted individual street and alley conditions to the council and used zone-based analysis in the ESA to create separate plans for the streets and alleys. This approach addressed the challenge of distinguishing between the two and provided the city with two distinct plans.

City of Allen, TX – Principal Engineer

In 2022, Dr. Keifer oversaw the implementation of pavement management systems for 600 test miles of city-managed arterial, collector, and local roadways. This survey consisted of an automated survey using LCMS-2 that included distresses identified in ASTM D6433 in addition to capturing International Roughness Index (IRI) data.

City of Euless, TX – Principal Engineer

In 2022, Dr. Keifer oversaw the implementation of a pavement management system for the city's roadways. The project involved conducting an automated ASTM D6433 PCI survey of 184 test mile of the city's roadways and collecting International Roughness Index (IRI) ride quality data as well as rutting data for each roadway. Structural testing was also conducted on the arterials and collectors, totaling 81 miles, using a Fast FWD system to assess the network's structural integrity. The project utilized ESA for pavement management.

Texas Tech University Roads and Parking Lots, TX – Principal Engineer

In 2021, Dr. Keifer oversaw a comprehensive pavement management project for Texas Tech University. The survey consisted of an automated ASTM D6433 PCI survey of approximately of the University-managed roads and parking lots, creation of a PAVER pavement management system, pavement management analysis and PAVER training. Dr. Keifer worked closely with the IMS project manager and the client and the project team to review and confirm the project objectives, scope of work, schedule, deliverables, necessary labor, and equipment resources.

Education

BS Civil and Environmental Engineering, University of Illinois at Urbana-Champaign
MS Civil and Environmental Engineering, University of Illinois at Urbana-Champaign
PhD Civil and Environmental Engineering, University of Illinois at Urbana-Champaign

Credentials

25 Years of Experience | 3 Years with IMS | Licensed PE in Texas, Arizona, Georgia, Illinois, North Carolina, North Dakota, and South Dakota

Sadaf Khosravifar, PhD, PE (Texas)

Deputy Project Principal | Project Manager

Dr. Sadaf Khosravifar is a professional engineer and researcher with over a decade of industrial and research experience in pavement engineering. Her background includes pavement evaluation, performance, design, pavement and asset management, and GIS. She is proficient with various types of nondestructive pavement evaluation technologies including automated pavement condition survey with 3D laser crack measurement system (LCMS), falling/heavy/lightweight deflectometer and dynaflect, traffic speed deflectometer (iPAVE and RAPTOR), ground penetrating radar (GPR), and friction test devices, as well as various pavement / asset management programs including StreetSaver, Paver, Lucity, Cartegraph, and StreetLogix among others.

Recent Projects

City of Mansfield, TX – Project Manager

In 2021, Dr. Khosravifar oversaw a comprehensive pavement management project for the City of Mansfield. The survey consisted of an automated ASTM D6433 PCI survey of approximately 320 miles of city-managed roads as well as International Roughness Index (IRI) data collection. Dr. Khosravifar worked closely with the client and the project team to review and confirm the project objectives, scope of work, schedule, deliverables, necessary labor and equipment resources, and performed pavement management analysis using the ESA pavement management program and developed a five-year program for the city. Similar segments were grouped into larger supersegments to be able to provide the client with practical implementable projects. The ESA spreadsheet was linked to ArcGIS for a live update and representation of paving plans.

City of Grand Prairie, TX – Project Manager

In 2021, Dr. Khosravifar oversaw a comprehensive pavement management project for the City of Grand Prairie TX. The survey consisted of an automated ASTM D6433 PCI survey of approximately 354 miles of city-managed roads as well as an International Roughness Index (IRI) data collection. Dr. Khosravifar worked closely with the client and the project team to review and confirm the project objectives, scope of work, schedule, deliverables, necessary labor and equipment resources, and performed pavement management analysis using the ESA pavement management program and developed a five-year program for the city. She fully customized the ESA spreadsheet to accommodate for proper rehab selection for the city's large composite (asphalt over concrete) pavements.

Texas Tech University Roads and Parking Lots, TX – Project Manager

In 2021, Dr. Khosravifar oversaw a comprehensive pavement management project for Texas Tech University. The survey consisted of an automated ASTM D6433 PCI survey of approximately of the University-managed roads and parking lots, creation of a PAVER pavement management system, pavement management analysis and PAVER training. Dr. Khosravifar worked closely with the client and the project team to review and confirm the project objectives, scope of work, schedule, deliverables, necessary labor and equipment resources, and performed pavement management analysis using PAVER and developed a five-year program for the University. She also provided the client with a 2-day PAVER training tailored to client's needs.

City of Long Beach, CA – Project Manager

In 2021, Dr. Khosravifar oversaw a comprehensive pavement management project for the City of Long Beach. The survey consisted of an automated ASTM D6433 PCI survey of approximately 1,010 centerline miles of city-managed roads as well as International Roughness Index (IRI) data collection. Structural

testing was also conducted on the entire network using a falling weight deflectometer to assess the structural integrity (SI) of the structure of pavement structures. IMS developed multiple online interactive maps for the city. Dr. Khosravifar worked closely with the client and the project team to review and confirm the project objectives, scope of work, schedule, deliverables, necessary labor, and equipment resources, and performed structural analysis and pavement management analysis using the Lucity enterprise asset management program. Dr. Khosravifar developed a framework to use the pavement condition data to split the total budget between council districts based on total maintenance need of districts. Dr. Khosravifar used this framework to develop a need-based five-year program for the city. Finally, she developed online interactive mapping tools powered by Esri including a StoryMap for sharing the outcomes of the study with citizens, a dashboard to present the major findings to the council, and an asset management application for the City Engineer's regular use.

City of Beaverton, OR – Project Manager

In 2021, Dr. Khosravifar oversaw a comprehensive pavement condition survey project for the City of Beaverton, Oregon. The survey consisted of an automated ASTM D6433 PCI survey of approximately 225 centerline miles of city-managed roads as well as International Roughness Index (IRI) data collection. Structural testing was also conducted on the arterials and collectors using a dynaflect system to assess the structural integrity of the structure. The scope of work also included curb and gutter condition assessment. The condition data was delivered in a geodatabase for importing to city's Cityworks asset management program. Sadaf worked closely with the client and the project team to review and confirm the project objectives, scope of work, schedule, deliverables, necessary labor, and equipment resources, and led the technical efforts for the project.

City of Pasco, WA – Project Manager

In 2021, Dr. Khosravifar oversaw a comprehensive pavement management implementation project for the City of Pasco, Washington. The survey consisted of an automated ASTM D6433 PCI survey of approximately 336 centerline miles of city-managed roads as well as International Roughness Index (IRI) data collection. The project also involved implementation of StreetLogix online Street Asset Management program. Dr. Khosravifar worked closely with the client and the project team to review and confirm the project objectives, scope of work, schedule, deliverables, necessary labor, and equipment resources, and led the technical efforts for the project. Dr. Khosravifar also implemented and customized the StreetLogix program for the city, performed a comprehensive pavement management analysis, and developed a five-year maintenance and rehabilitation plan for the city based on city's objectives and priorities. As part of the analysis, Dr. Khosravifar developed a framework to prioritize historically underrepresented parts of the city during project selection and work planning.

Village of Kildeer, IL – Project Manager

In 2021, Dr. Khosravifar oversaw a comprehensive pavement management project for the Village of Kildeer. The survey consisted of an automated ASTM D6433 PCI survey of approximately 32 centerline miles of roads as well as International Roughness Index (IRI) data collection. Dr. Khosravifar worked closely with the client and the project team to review and confirm the project objectives, scope of work, schedule, deliverables. She implemented the PAVER pavement management system for the village and customized it with Village specific parameters and ran several network-level 'what-if' scenarios to depict the consequence of different budgets on long term pavement conditions and rehabilitation backlog in the Village.

Village of Lake Bluff, IL – Project Manager

In 2021, Dr. Khosravifar oversaw a comprehensive pavement management project for the Village of Kildeer. The survey consisted of an automated ASTM D6433 PCI survey of approximately 31 centerline miles of roads as well as International Roughness Index (IRI) data collection. Dr. Khosravifar worked closely with the client and the project team to review and confirm the project objectives, scope of work,

schedule, deliverables. She implemented the PAVER pavement management system for the village and customized it with Village specific parameters and ran several network-level 'what-if' scenarios to depict the consequence of different budgets on long term pavement conditions and rehabilitation backlog in the Village.

Education

BS Civil and Environmental Engineering, Sharif University of Technology
MS Geotechnical and Pavement Engineering, University of Maryland
PhD Geotechnical and Pavement Engineering, University of Maryland

Credentials

14 Years of Experience | 2 Years with IMS
Licensed PE in Maryland, Texas, and Virginia

Dave Bratton, PE (Texas)

Project Manager and QA/QC Manager

Mr. David Bratton is a project engineer at IMS with 12 years of experience in pavement management involving condition assessment, prediction modeling, and budget evaluation. He has worked extensively with automated pavement data collection that conform to multiple standards (ASTM, MTC, VDOT, IDOT), dynaflect and falling weight deflectometer, and right of way asset acquisition. Mr. Bratton has implemented pavement management programs for software packages including Cartegraph, Lucity, Paver, StreetSaver, and others across North America.

Recent Projects

City of Flower Mound, TX – Project Manager

In 2022, Mr. Bratton served as project manager for the pavement management program update of 383 miles of asphalt and concrete roadways in Flower Mound, TX. Automated pavement data collection was used to calculate a pavement condition index (PCI) for each segment in the network and an inventory of pavement striping/markings was created and linked to images of the asset from the survey. This data was then used as the basis for funding needs analysis that incorporated input from the city's engineering department and city council members. The project concluded with the creation of a comprehensive report that summarized the project approach, findings, and recommendations.

City of Lubbock, TX – Project Manager

Mr. Bratton served as project manager for the pavement management system update and deflection testing of 1,200 miles of Lubbock roadways. Mr. Bratton directed the collection of automated surface distresses and FWD data that were used to update the city's Cartegraph OMS database. Mr. Bratton developed a comprehensive overall condition for each roadway segment and completed the analysis, mapping, and reporting with the City of Lubbock's Cartegraph OMS software.

City of Beaumont, TX – Project Manager

Mr. Bratton served as project manager for the city's transition from Lucity to Cityworks. Originally contracted as a pavement condition update to the city's Lucity system using an IMS LCMS-2 automated data collection vehicle; the scope of the project was changed after data collection was complete. The revisions to the scope included modifying data segmentation to fit a new GIS centerline, ROW imagery, and the ability to link a management system to Cityworks. To accomplish the final task, ESA was used to generate condition and funding forecasts which were then field mapped to the appropriate locations within Cityworks. City staff were then trained on the functions within ESA and the process to sync with Cityworks.

Denton County, TX – Project Manager

Mr. Bratton served as project manager for the pavement management program implementation of 308 miles of roadway in Denton County, TX. Automated pavement data collection was used to identify distresses outlined in ASTM D6433 and generate condition scores for the network. As part of the project, the County required that a system to forecast future conditions and funding needs be established. ESA, an IMS developed management program, was used in conjunction with inputs from the County to generate several budget scenarios for various condition targets to be used as the foundation of a 5 year CIP. They County was trained in the use of ESA to ensure their management program remained current.

City of Denton, TX – Project Manager

Mr. Bratton served as project manager for the pavement management system update and ROW asset survey of 913 miles of city and State roads in Denton, TX. Automated surface distress and FWD data

were used to update the city's Cartegraph OMS database. This data was compared to historical paving project to determine the effectiveness of current rehabilitations strategies for use in updating the operating parameters within the Cartegraph system.

Pueblo West Metropolitan District, CO – Project Manager

In 2022, Mr. Bratton served as project manager for the final stage of a multiyear pavement and asset management program implementation. Over the course of 5 years the project involved the inventorying and assessment of the District's paved and unpaved roads, collection of georeferenced survey images, and the creation of a database for the District's street signs. During this time, the data was used to forecast funding needs for the district and assess the effectiveness of their current rehabilitation activities. This required tracking the rate at which treated and untreated pavements deteriorated and meeting with the District's engineer manager to find alternative activities that may produce better results. In the final year of the project all street signs were assessed to determine their retro-reflectivity condition.

Athens-Clarke County, GA – Project Manager

Mr. Bratton served as project manager for a pavement management system implementation and ROW asset survey for Athens-Clarke County, GA. Pavement data conforming to ASTM D6433 and sign attributes were collected through the use of automated technology to form the basis of each asset database. The pavement data was used to populate both the Paver software and IMS's in house pavement management program, while the ROW data was delivered in a series of layers to be used in ArcGIS. Mr. Bratton worked with the county to formulate a short-term CIP for pavements and remains partnered with the County to provide training and guidance on the use and refinement of their Paver database.

City of Irvine, CA – Project Manager

Mr. Bratton worked with the City of Irvine on a ROW asset survey and pavement management system update which included the submittal of their bi-annual pavement management compliance report for Orange County, CA. The project included an ASTM D6433 pavement surface data collection through the use of automated LCMS equipment, pavement structural testing for arterials and collectors, a condition assessment of all paved bike paths, and an inventory of all sidewalks, curbs, and pedestrian ramps within the city totaling over 700 survey miles. This data was loaded to both the city's Paver database for use in the generation of the compliance report and an IMS management spreadsheet that allowed for a zone-based rehabilitation plan to be created. The city has an ongoing services agreement for additional Paver training, analysis customization, and future reporting needs.

City of Sioux Falls, SD – Project Manager

Mr. Bratton served as project manager for a pavement management update for the City of Sioux Falls, SD. The project required a reevaluation of pavement conditions to follow ASTM D6433 and the collection of IRI data with a data import and operating parameters update for the city's Lucity analysis. The city has a considerable number of concrete streets that suffer from alkali-silica reaction (ASR) which required the creation of a unique index within the Lucity program to trigger an alternate rehabilitation strategy to address the defect. To finalize the project a detailed set of budget scenarios were generated to reflect a unique set of restrictions placed on how funds are sourced and used within the city. This information was then summarized and presented to the City Council.

City of Medford OR – Project Manager

Mr. Bratton served as project manager for the pavement management update and asset inventory of 351 miles for the City of Medford, OR for several cycles. In the first cycle, pavement condition data and sign inventory were collected with automated LCMS-2 equipment. In subsequent cycles, pavement data

was collected using the LCMS-2 equipment on the major roadway network consisting of approximately 165 lane miles. Mr. Bratton uploaded the pavement condition data and sign inventory into the City's Cartegraph OMS. He provided an updated pavement analysis and budget developments in a final report for City use.

City of Federal Way, WA – Project Manager

Mr. Bratton served as project manager for multiple pavement management system updates for the City of Federal Way, WA. The projects consisted of pavement condition assessments of approximately 287 miles of roadway. In the most recent cycle, pavement condition data was collected using the LCMS-2 system in accordance with the ASTM D6433 based data collection protocols. Mr. Bratton delivered the data in an Easy Street Analysis spreadsheet and a final report. The pavement analysis was completed with Lucity software to allow for analysis and flexibility.

City of Mercer Island, WA – Project Manager

Mr. Bratton served as project manager for multiple cycles of pavement condition surveys for the City of Mercer Island, WA. The projects consisted of pavement condition surveys on approximately 109 miles of roadway, deflection testing on 16.5 miles of arterial roads, and GPR data on 4.5 miles of city selected roadways. A geodatabase, corresponding KML Google Earth File, and associated maps reflecting the condition data of the city's roadways was delivered to the city. The 2019 project also included creation and delivery of an Easy Street Analysis spreadsheet. Mr. Bratton also assisted staff with a presentation to the Council that demonstrated clear and concise pavement management methodology.

Volusia County, FL – Project Manager

Mr. Bratton served as project manager for the pavement management system update of 1,065 miles of paved roads in Volusia County. Automated surface distress and ROW image collection was used to update the city's Lucity database. This data was compared to historical paving project to determine the effectiveness of current rehabilitations strategies for use in updating the operating parameters within the Lucity system. An extensive reconfiguration of the database schema was completed to better align with how the County keeps records outside of the Lucity system.

Education

BS Civil Engineering, Bradley University

Credentials

12 Years of Experience | 12 Years with IMS | Licensed PE in Illinois and Texas (145824)

David Butler, PE (Texas)

Senior Project Manager

Mr. David Butler is a Senior Project Engineer and Senior Project Manager at IMS. He has 37 years of experience with pavement design, testing, analysis, engineering, and management. He has implemented pavement management systems for municipal agencies across the United States and Canada. A large part of his career has involved the development of pavement data collection techniques using both manual and automated approaches. He has also been instrumental in developing software to analyze pavement data to provide solutions to efficiently manage pavement networks. He was involved in the development of some of the first automated pavement data collection devices and has continued to assist with the development and integration of automated data collection in the field of pavement management throughout his career. Mr. Butler is a member of ASTM and is now serving as a member of the Transportation Research Board (TRB) Pavement Condition Evaluation Committee AKP10 and the Pavement Management Committee AKT10.

Recent Projects

Cameron County, TX – Project Manager

In 2020, Mr. Butler served as the Project Manager for the Cameron County TxShare project. Under his guidance, IMS assessed the County's network of 870 miles, delivering pavement condition data and images in a personal geodatabase. The County asked IMS to collect visual data on the network of Caliche roads, performing a visual assessment on the roads that our LCMS-2 data collection equipment could not assess. The segment level data was loaded into the IMS proprietary ESA interactive spreadsheet, and cost optimized analysis performed at the project level. IMS delivered a cost optimized analysis and rehab plan, based upon the County's specific budget segmentation, rehab selection and cost, project building specifics, and County specific priorities.

City of Huntsville, TX – Project Manager

In 2020, Mr. Butler served as the Project Manager for the Huntsville, TX pavement management update project. For this project, 183 miles of RST LCMS data were collected along with 90 miles of deflection data. The city migrated from Cartegraph to the IMS ESA spreadsheet pavement management system. Since 2006, IMS has performed three pavement condition surveys and provided a comprehensive pavement management analysis and report to the city for each project. IMS had also updated the city's Cartegraph Navigator software for each cycle. The 2012-13 project included a full network, pavement condition survey, including the development of a sign inventory for loading into Cartegraph PAVEMENTview and SIGNview modules as well as delivering images at 25-foot increments and a City Council presentation.

Pasco County, Florida – Project Manager

Mr. Butler served as the Project Manager for the development and implementation of a pavement and asset management program for the arterial and collector and in a second phase local roads in Pasco County. The pavement survey consisted of an automated ASTM D6433 PCI survey of 490 miles of County-maintained arterial and collector roads and 1,588 miles of local roads. The survey also included structural deflection testing of the major roads. International Roughness Index (IRI) data and rut measurement data were also collected on all the roads. All the pavement data was processed into the PavePRO Pavement Management Program and implemented on the County computers. Mr. Butler also performed software training and data interpretation training. In addition to the pavement surveys, an asset survey including signs, curb and gutter, sidewalk/ADA ramp, catch basins, drainage swales, shoulder inventory, traffic signals and bike paths were collected and presented to the county in their GIS

format. He worked closely with the County to see that all their expectations of pavement and asset management systems were met.

City of Chesapeake, Virginia – Project Manager

In 2020 and 2021, Mr. Butler managed the automated distress data collection of pavement management data for the City of Chesapeake, Virginia. The survey included distress data, structural deflection data and roughness (IRI) and rutting data. Over 1,200 miles of pavement were surveyed including limited access highways, major arterial, collector and local roads. Mr. Butler coordinated the collection and processing of the data. All data was loaded into the County's PavePRO pavement management system. I addition the data was linked to the County's GIS. A limited study of a portion of the data was conducted by Mr. Butler to correlate the pavement data to a previous survey of the roads collected by an older, less sophisticated device.

Village of Glenview, Illinois – Principal Engineer/Project Manager

As part of a multi-year Pavement Management program in the Village of Glenview, Illinois, Mr. Butler was responsible for all aspects of data collection, data quality control and data processing for the pavement management update. Over 165 miles of pavement was surveyed within the Village including surface distress using the LCMS 2 automated data collection equipment. Structural assessment was also performed using a Dynaflect deflection device. Mr. Butler oversaw the data quality processes and the loading of the data into the Village's pavement management software program. Mr. Butler's prior experience with testing in Glenview was instrumental in processing LCMS2 data to correlate with data collected in previous years by older devices. In previous surveys Mr. Butler has presented the results of the surveys to Village Board members.

Village of Arlington Heights, Illinois – Principal Engineer/Project Manager

In 2018 the Village of Arlington Heights, Illinois began a multi-year program to test the pavement conditions of their street network. Mr. Butler was selected to manage the data collection and implementation of a new pavement management program. The Village chose to do an assessment of their entire street network in 2018 followed by an update of 1/3 of the network each subsequent year. Mr. Butler worked with the Village to establish a plan for regular testing of the street network which includes more than 225 miles of streets. The network included both asphalt and concrete surfaced streets with bases ranging from gravel materials to stabilized bases to concrete bases. Most of the Village replacement strategy involves full-depth asphalt base material. Mr. Butler developed a processing technique to collect data on all surface types with automated equipment and load it into PavePRO software to manage the network in a cost-effective manner. The successful data collection effort will continue for the foreseeable future.

Education

BS, Civil Engineering, Brigham Young University

Credentials

40 Years of Experience | 37 years with IMS | Licensed PE in Texas (68845), Colorado, Florida, Illinois, Indiana, North Carolina, and Ohio

Amir Ghanbari, PhD, EIT

Project Manager | Data Scientist

Dr. Amir Ghanbari is a dedicated project engineer and data scientist with a strong background in pavement management, pavement materials, highway and airport pavement design, and construction supported by more than 9 years of work experience. Dr. Ghanbari has extensive experience with pavement management systems, non-destructive testing and falling weight deflectometer back calculations, pavement condition index analysis, pavement life cycle cost analysis and preservation techniques, highway and airport pavement design, and asphalt material characterization. He has also contributed to several FHWA reports and 20 published articles. Dr. Ghanbari is proficient with various type of pavement/asset management software such as AgileAssets, Paver, StreetSaver, Lucity, and Cartegraph. Dr. Ghanbari has been selected for this project team should the County elect to utilize the AgileAssets software during this agreement.

Recent Projects

City of Dallas, TX (In Progress) – Project Manager

Dr. Ghanbari serves as Project Manager of the city's TxShare pavement condition survey, sidewalk inventory, and selected GPR testing project. The project includes approximately 6,000 miles of city-managed arterial, collector, and local roadways. The pavement survey consists of an automated ASTM D6433 PCI survey and the city's first E3303 pavement condition survey, which is being run in parallel. International Roughness Index (IRI) data and rutting data are collected for each roadway during the survey. Collected data will be delivered in a geodatabase and integrated with the city's existing pavement management system. Dr. Ghanbari works directly with city stakeholder to review pavement condition data, and he is developing a new process for including ASTM E3303 data in the city's pavement management system.

City of Bedford, TX – Project Manager

Dr. Amir Ghanbari oversaw the implementation of a pavement management system project for the city of Bedford, TX. Using automated technology to collect pavement data that adhered to ASTM D6433 standards, a pavement condition database was created. This data was then utilized to populate IMS's in-house pavement management program, ESA. Dr. Ghanbari collaborated with the city to create a short-term CIP for pavements and continues to provide ongoing training and support for the use of ESA.

City of Lancaster, TX – Project Manager

Dr. Amir Ghanbari was the Project Manager for the City of Lancaster, that was involved with right-of-way (ROW) asset and updated the pavement management system. The project involved collecting ASTM D6433-compliant pavement surface data using automated LCMS-2 equipment and collecting inventory of support and sign database. Dr. Ghanbari submitted individual street and alley conditions to the council and used zone-based analysis in the ESA to create separate plans for the streets and alleys. This approach addressed the challenge of distinguishing between the two and provided the city with two distinct plans.

City of Moline, IL– Project Engineer

In 2022, Dr. Ghanbari served as principal engineer for the city's comprehensive pavement management program. This survey consisted of an automated ASTM D6433 PCI survey of approximately 300 miles of city-managed arterial, collector, and local roadways. International Roughness Index (IRI) data and rutting data were also collected for each roadway during the survey. Dr. Ghanbari worked collaboratively with the city to customize the development of projects into practical sizes so the city can easily maintain it for

the next five years. This project involved implementation of Easy Street Analysis (ESA) for pavement management. However, since the city network was composed of many composite surface pavements, additional functionality was made to the program so that ESA can handle more rehab strategies for composite pavements. This custom-built improvement lay the foundation for the city's five-year plan strategy.

City of Centennial, CO – Project Engineer

In 2022, Dr. Ghanbari managed the implementation of a pavement management system and the automated ASTM D6433 PCI survey of 564 miles of the city's roadways. International Roughness Index (IRI) ride quality data as well as rutting data were collected for each roadway as well. Structural testing was also conducted on the arterials and collectors (245 miles in total) using a Fast FWD system to assess the city's network structural integrity (SI). This project uses both ESA and PAVER for pavement management. In collaboration with the city team, Dr. Ghanbari is developing five-year pavement preservation and M&R plans. He has also conducted PAVER training to city staff.

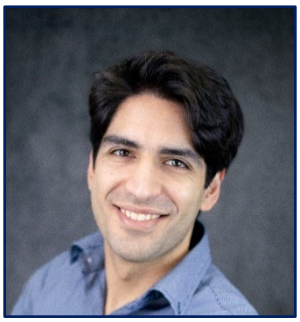
Education

BS Civil Engineering, Sharif University, Tehran, Iran
MS Transportation Material, Sharif University, Tehran, Iran
PhD Pavement Engineering, North Carolina State University, Raleigh, NC

Credentials

9 Years of Experience | 1 Year with IMS | EIT

Mostafa Nakhaei, PhD, EIT



Project Manager | Data Scientist

Dr. Mostafa Nakhaei is a project engineer and Sr. Data Scientist at IMS. His entire 9 years professional career has been dedicated to pavement engineering with experience in roadway construction, pavement management, pavement structural design, laboratory testing, FWD testing. With his dual degree in Data Science, he has developed several computer programs such as “MASTIC” and “Back-MASTIC” for layered elastic analysis and pavement modulus backcalculation. Dr. Mostafa Nakhaei was the lead developer for the ISA software package at IMS, which uses deep learning to analyze structural data. He also developed ERSA, a software for backend processing of LCMS-2 systems. He has experience in implementing pavement management systems for municipal agencies in the United States and he is proficient with several pavement and asset management software packages such as AgileAssets, Paver, StreetSaver, Lucity, and Cartegraph.

Recent Projects

City of Allen, TX – Project Manager

In 2022, Dr. Nakhaei was responsible for overseeing the implementation of pavement management systems for 600 test miles of city-managed arterial, collector, and local roadways. This survey consisted of an automated survey using LCMS-2 that included distresses identified in ASTM D6433 in addition to capturing International Roughness Index (IRI) data. The majority of Allen’s network consisted of Portland cement concrete (PCC) segments in good and excellent condition. It is well-established in the industry that capturing PCC distresses using automated equipment is challenging due to occasional detection issues on PCC segments. To ensure high-quality data on PCC segments, a rigorous quality control (QC) protocol was implemented, including the use of semi-automated software called NOMAD that allowed human raters to input their observations during the collection process. The data was then compiled into a database for manual QC of anomaly segments. Despite the high average pavement condition index (PCI) score of the city's network, the ride quality was relatively lower, which could have led to under-budgeting of the city's capital investment plan since a traditional pavement management system only considers PCI score as a criterion for decision. To address this, Dr. Nakhaei recommended combining the PCI and IRI scores into a single combined score that better represents PCC conditions by including road roughness. After working with the city staff, the project was successfully implemented in Easy Street Analysis (ESA).

City of Euless, TX – Project Manager

In 2022, Dr. Nakhaei managed the implementation of a pavement management system for the city's roadways. The project involved conducting an automated ASTM D6433 PCI survey of 184 test mile of the city's roadways and collecting International Roughness Index (IRI) ride quality data as well as rutting data for each roadway. Structural testing was also conducted on the arterials and collectors, totaling 81 miles, using a Fast FWD system to assess the network's structural integrity. The project utilized ESA for pavement management. In collaboration with the city team, Dr. Nakhaei developed five-year pavement preservation and maintenance and repair plans. He also provided ESA training to city staff to ensure the effective use of the software and data. Overall, Dr. Nakhaei’s efforts helped the city to better understand the condition of their roadways, identify critical areas for maintenance and repair, and develop plans to effectively manage their road network.

City of Grand Prairie, TX – Principal Engineer

In 2021, Dr. Nakhaei served as principal engineer for the city’s comprehensive pavement management program. This survey consisted of an automated ASTM D6433 PCI survey of approximately 211 miles of

city-managed arterial, collector, and local roadways. International Roughness Index (IRI) data and rutting data were also collected for each roadway during the survey. The project team worked collaboratively with the city to customize the development of projects into practical sizes so the city can easily maintain it for the next five years. This project involved implementation of Easy Street Analysis (ESA) for pavement management. However, since the city network was composed of many composite surface pavements, additional functionality was made to the program so that ESA can handle more rehab strategies for composite pavements. This custom-built improvement lay the foundation for city's five-year plan strategy.

City of Deerfield Beach, FL – Principal Engineer

In 2021 and 2022, Dr. Nakhaei oversaw a comprehensive pavement management project for the City of Deerfield Beach, FL. The survey consisted of an automated pavement condition survey of approximately 136 miles of city's roadways (based on ASTM D6433) as well as International Roughness Index (IRI) data collection. He worked closely with city staff and engineers throughout the project to review and confirm the project goals, objectives, scope of work, and schedule. Easy Street Analysis (ESA) was used to optimize the rehabilitation strategies for the city for the next five years.

City of Manhattan, KS – Principal Engineer

In 2021 and 2022, Dr. Nakhaei managed the implementation of a pavement management system and the automated ASTM D6433 PCI survey of 71 miles of the city's roadways. International Roughness Index (IRI) ride quality data as well as rutting data were collected for each roadway as well. Structural testing was also conducted on the arterials and collectors using a dynaflect system to assess the structural integrity (SI) of the structure. This project uses Paver for pavement management. In collaboration with the city team, Dr. Nakhaei is developing five-year pavement preservation and M&R plans.

Education

PhD Civil & Environmental Engineering, National Center for Asphalt Technology (NCAT) at Auburn University
MS in Data Science, Auburn University
MS in Civil & Environmental Engineering, University of Tehran
BS in Civil & Environmental Engineering, University of Sistan and Baluchistan

Credentials

9 Years of Experience | 2 Years with IMS | EIT in Texas

Megan Foshee, EIT

Project Engineer

Ms. Megan Foshee, EIT is a recent graduate of the Civil and Environmental Engineering master's program at Auburn University. Her research at Auburn University's National Center for Asphalt Technology (NCAT) focused on the structural analysis of several asphalt pavement test sections at the world-renowned Test Track. She is proficient in using many pavement analysis and design software, such as WESLEA, MEPDG, PerRoad, KENPAVE, FlexPAVE, and Evercalc. Megan is an Engineer in Training (EIT) in California and has already passed the Principles and Practice of Engineering (PE) exam. In her time at IMS, she has reviewed and analyzed pavement condition survey data using Easy Street Analysis (ESA) and PAVER, created pavement management plans utilizing various budgets, interacted with clients to help better understand their needs, and aided in the development of several reports and proposals.

Recent Projects

City of Allen, TX – Project Engineer

Ms. Foshee contributed to the project by helping review the report and attending the Council Presentation in-person. While at the Council Presentation, Megan met with Chris Flanigan, the main representative for the city. She had conducted a small-scale field inspection (took some pictures and gave feedback) on some rehabilitation work in the area that he was interested in implementing. The client was very happy to hear the opinions on the rehabilitation work. This demonstrated to the client that IMS can provide both network and project level analysis.

City of Dallas, TX (In Progress) – Project Engineer

Ms. Foshee contributed to the project by attending a few in-person meetings with the client since she lives in the area. In one of the meetings, she showed the client the Road Surface Tester (RST) vehicle and explained how its technology works. She explained the functions and purposes of the Laser Crack Measurement System (LCMS-2) and high-definition cameras and walked them through all of IMS' processes. The client asked several technical questions, and Ms. Foshee adequately answered them all. Overall, the client was impressed with IMS' technical competency as well as technological superiority.

City of Flower Mound, TX – Project Engineer

Ms. Foshee contributed to the project by working directly with the client, reviewing the pavement condition data, and performing the network analysis. She met with the client on several occasions to discuss details to be incorporated in the analysis and corresponded with them regularly to ensure the project proceeded according to schedule. She also combed through the pavement condition data meticulously to ensure its accuracy. Finally, she customized Flower Mound's analysis parameters in the Easy Street Analysis (ESA) spreadsheet so that the results were meaningful and practical for the client.

City of Mustang, OK – Project Engineer

The purpose of this project was to collect and process pavement condition data, provide georeferenced pavement imagery, load the condition data into Easy Street Analysis (ESA), and run several ESA budget scenarios for the city. Ms. Foshee contributed to the project by working directly with the client, reviewing the pavement condition data, and performing the network analysis. She met with the client many times to discuss project details and even helped them understand the need to plan for smaller projects due to the scale of their budget. She also applied several Quality Control (QC) checks to the data to ensure its accuracy. Finally, she customized Mustang's analysis parameters in the ESA spreadsheet so that the results were meaningful and practical for the client. The client was then able to present the results, which were provided in an easily digestible format, to the city's council members.

Education

Bachelor of Civil Engineering, Auburn University, Auburn, Alabama
MS in Civil and Environmental Engineering – Pavements & Materials, Auburn University, Auburn, Alabama

Credentials

3 Years of Experience | 1 Year with IMS | Engineer In Training (EIT) in California
Orange County Transportation Authority (OCTA) Certified Pavement Rater

Towhid Rahman, EIT

Project Manager and Project Engineer

Mr. Towhid Rahman is a PhD candidate from the National Center for Asphalt Technology (NCAT) at Auburn University including nearly 8 years of experience with Pavement Materials and Performance Modeling of Pavement Preservation Techniques. He is proficient in the Nondestructive Deflection Testing method with Falling Weight Deflectometers. His research focuses on prediction of Structural Health of the Pavement from the Surface Condition information using machine learning and AI. His area of expertise includes but is not limited to GIS, CAD, and Computer Programming Languages.

Recent Projects

City of Waxahachie, TX – Project Manager

Mr. Rahman led a project with the City of Waxahachie, TX to develop its first comprehensive pavement management plan for the city's 264 lane miles of pavements in 2022. Using pavement condition data collected by LCMS-2 semi automate survey methods in accordance with ASTM D6433, Mr. Rahman and his team developed a 5-year maintenance and rehabilitation program for the city that focused on maintaining the PCI and backlog in a stable or improving condition. As project manager, Mr. Rahman contributed his expertise related to M&R techniques to the project to develop budget scenarios, maintained open client communication and performed quality control on all data and analysis results.

City of Northglenn, CO – Project Manager

Mr. Rahman took over the Project of Northglenn, CO project when the data was already collected and completed the analysis for the updated comprehensive pavement management plan for the city in coming years. IMS has been serving the city with engineering consulting service since 2016. The network consists of 120 lane miles and a major challenge was assuring repeatability and reproducibility of the performance information. The city has been experiencing the benefits of following IMS made recommended paving plan for the past 7 years.

Bryan County, GA – Project Manager

Bryan County, GA is a 200 lane miles sized network located at a strategically important location where Fort Stewart lies within the center of the county. The County awarded IMS the pavement management contract for the first time, and IMS has completed the data collection, and Mr. Rahman has led this project in data collection, engineering QC, data analysis and client communication. The 5-year budget analysis and pavement rehabilitation plan are already submitted to the client and under review. One of the major difficulties in this project was project formulation, assigning the right maintenance and rehabilitation plan for exceptionally long stretches of roads.

City of Peachtree, GA – Project Manager

Mr. Rahman has been actively leading this project for the last few months. Peachtree City, GA is a repeat client, and they also chose IMS as their pavement network structural analysis of the whole network. This is a unique challenge for Mr. Rahman to accomplish a structural analysis of the city which he successfully delivered to the client. The city consists of 232 lane miles of paved asphalt roads where FastFWD test was performed on more than 350 locations along the network in accordance with the ASTM D4694 standard. Mr. Rahman exhibited his expertise and skills in pavement engineering by providing the best quality structural condition-based scoring to the client by involving traffic and construction information from the city. The city has grown over last few years after IMS started as a PMS consultant for the city, Mr. Rahman is efficiently helping the city update their database and developing the paving plan for the city for next 5 years.

Education

BS Bangladesh University of Engineering and Technology
MS Auburn University (NCAT)

Credentials

8 Years of Experience | 1 Year with IMS | EIT in Texas

Mike Powell

Director of Field Operations

Mr. Michael Powell is the Director of Field Operations, and has 30 years of survey collection, data analysis experience in pavement management, and hundreds of installations of pavement management systems. His background includes pavement collection and evaluation, and asset management, technical support of software, hardware, and GIS. He manages the LCMS-2 fleet and is highly experienced in pavement evaluation technologies such as automated pavement condition survey with Ramboll (RST), Cybernetics RT, and 3D laser crack measurement system (LCMS-2), lidar, falling/heavy/lightweight deflectometer and dynaflect, and ground penetrating radar (GPR). He also has experience with various pavement / asset management programs including PavePro, SurfPro, StreetSaver, Paver, Lucity, and Cartegraph, among others.

Recent Projects

City of Fort Worth, TX (In Progess) – Director of Field Operations

Mr. Powell is the Director of Field operations for the 2021-2023 Fort Worth data collection effort. The project included approximately 4,200 miles of city-managed arterial, collector, and local roadways as well as bus lanes. The asset inventory included collection of signs, sign supports, streetlights, signals, curb and gutter, pavement markings, speed bumps/cushions, sidewalks, and ADA pedestrian ramps. Prior to the commencement of data collection Mike worked with the engineers to review client needs to determine the most effective and efficient methods of data collection. He loaded map and location information into NOMAD™ prior to deployment of the RST and lidar vehicles and created and managed both deployment schedules and troubleshooting efforts. Upon completion of the project, Mike will work closely with the QA/QC team to ensure the value and accuracy of the data collected.

City of Baytown, TX – Director of Field Operations

Mr. Powell is Director of Field Operations for the ongoing right-of-way asset data collection effort in Baytown, Texas. He is partnering with Ms. Parsons to review client needs, schedule deployment of the lidar vehicle and Sidewalk Surface Tester (SST), and load information into the NOMAD™ prior to deployment. Upon completion of data collection Mike will partner with the QA/QC team to ensure accuracy and value of all data collected.

City of Euless, TX – Director of Field Operations

Mr. Powell was the Director of Field operations for the pavement data collection project in Euless, TX. This project consisted of pavement data collection and deflection testing for approximately 169 miles of roadway. Mr. Powell created and managed the van deployment schedule and created and loaded the city's data into NOMAD™. He worked with the project engineers to set up procedures for Fast FWD deflection testing and created queries to enhance the QA/QC process upon completion of deflection testing.

Tehama County, CA – Director of Operations

Mr. Powell was the Director of Field Operations for the 2021 and the ongoing 2022-25 pavement data collection efforts in Tehama County, CA. The project consisted of pavement data collection for approximately 830 centerline miles of roadway and deflection testing on 240 survey miles. Mr. Powell was responsible for equipment deployment and maintenance. He loaded County inventory into the NOMAD™ for both the RST and Fast FWD. He broke the project into 4 parts allowing for collaboration during data processing.

City of Glenrock, WY – Director of Operations

Mr. Powell is the Director of Field Operations for an ongoing survey in Glenrock, Wyoming. The project consists of pavement data collection and deflection testing for 14 miles of parking lots before and after industrial trucks travel the lots. The city will use the data to measure the effect the trucks have on the integrity of the pavement. Mr. Powell is responsible for the deployment schedules of the LCMS-2 system and Fast FWD deflection testing and loading the city's data into NOMAD™. He is partnering with the QA/QC team to ensure data accuracy.

Natrona County, WY – Director of Operations

Mr. Powell was the Director of Field Operations for a gravel survey in Natrona, Wyoming. The project consisted of a condition survey of 363 miles of gravel to determine the slope of the gravel and different grades. Mr. Powell executed the equipment deployment schedule, managed equipment upkeep and maintenance, and loaded city map and location data into the NOMAD™.

City of Chesapeake, VA – Director of Field Operations

Mr. Powell was the Director of Field Operations for the 2021 pavement data collection effort in Vienna Virginia. The project consisted of a pavement condition assessment of approximately 70 miles of roadway and creation of budget scenarios. Mr. Powell helped the project manager organize and double check collected data, as well as formatting the data for PavePro.

Education

Network Administrator, Elgin Community College
MCSE, Harper College

Credentials

30 years of experience with IMS | Certificates include: ArcGIS, Microsoft Office, Visual Studio, C++, C#, FoxPro, Data Scientist Python, Network Installation, SQL

Leah Ramirez

Senior QA/QC Technician

Ms. Leah Ramirez is a certified ASTM D6433 PCI pavement rater and has 19 years of experience performing pavement condition surveys for local agencies across the United States. In her role as Senior QA/QC Technician she leads the QA/QC team and communicates directly with the engineering staff as it pertains to each individual project to further improve the quality of the data collected by the field crews and automated systems. She also conducts virtual and in-person training with our field collection employees on distress rating and software systems to ensure consistent data collection throughout the field teams. She also served as a PCI rater on several US Army Corps of Engineers pavement condition inspection projects.

Recent Projects

City of Fort Worth, TX – Senior QA/QC Technician

In 2021, Ms. Ramirez lead initial QA/QC team efforts for LCMS-2 data collected across all 11 zones of Fort Worth. This included a manual comparison of digital images with distress quantities collected. She also conducted in-person and virtual training with the data collection crew in Fort Worth to ensure correct data collection procedures were being followed. She also identified sections with mislabeled pavement surface type and inaccurate slab counts, which lead to correct reclassification of pavement surface in the GIS layer. In addition, she also assisted in the quality review of right-of-way assets.

City of Lubbock, TX – Senior QA/QC Technician

In 2022, Ms. Ramirez performed QA/QC to ensure quality data was collected by the field rating crew and the LCMS-2 system. She analyzed digital images and directly compared them with distress quantities to confirm accurate values. In addition, Ms. Ramirez performed a thorough review and documentation of the planned and committed work projects. She provided this review to the engineering team to assist in a more accurate analysis and recommendation for future pavement management projects.

City of Flower Mound, TX – Senior QA/QC Technician

In 2022, Ms. Ramirez performed the QA/QC process of field data from both the field rating crew and the LCMS-2 system. She compared this with digital imaged to confirm correct distress quantities and PCI values. In addition, she did a thorough comparison of the current survey to the previous survey, to determine problems within the network and its existing management plan and passed this information along to the engineering team.

City of Santa Monica, CA – Senior QA/QC Technician

Ms. Ramirez performed QA/QC to ensure quality data was collected by the field rating crew and the LCMS-2 system. She analyzed digital images and distress quantities to confirm accurate values. She also manages the team of QA/QC technicians and delegates tasks to them while ensuring a consistent data product moves through the interpretation and analysis process.

City of Auburn, WA – Senior QA/QC Technician

Ms. Ramirez performed QA/QC to ensure quality data was collected by the field rating crew and the LCMS-2 system. She analyzed digital images and distress quantities to confirm accurate values. She also manages the team of QA/QC technicians and delegates tasks to them while ensuring a consistent data product moves through the interpretation and analysis process.

Credentials

19 Years of Experience | 2 Years with IMS | OCTA Pavement Inspector Qualification - 2022

Caitlin Parsons

Asset Management Lead

Ms. Caitlin Parsons has 6 years of experience working with geospatial technologies to develop functional workflows that serve the needs of a variety of clients. As the asset management team supervisor overseeing the program at IMS, Ms. Parsons is responsible for the success of the full lifecycle of projects. She oversees a team of data technicians that ensure project preparation, field data collection, data processing methods, and deliverables are executed to fulfill the nuanced needs of public sector asset managers. Prior to her role at IMS, Ms. Parsons processed and extracted data from satellite imagery and UAV systems. She has brought her knowledge of remote sensing methodologies to IMS, wherein she has integrated a mobile lidar system into daily operations.

Recent Projects

City of Fort Worth, TX – Asset Manager

Ms. Parsons is the acting asset manager for the 2021-2023 Fort Worth, TX data collection effort. She oversees team coordination and vendor management to ensure the timely delivery of a wide variety of right-of-way assets, including curbs, poles, ramps, sidewalks, signs, speedbumps, streetlights, and pavement striping. The reported attributes will include a condition assessment as well as dozens of other properties, including material type, MUTCD codes, and other information depending on the asset type. These observations will be recorded from right-of-way imagery, as well as lidar point cloud data for supplementary measurement data. Ultimately this data is intended to update the city's existing VUEWorks asset management system which contains historical data about the assets in question, so the results of this survey will be linked to existing feature IDs. Ms. Parsons' team will assist in updating the existing database when the survey is complete.

City of Denton, TX – Asset Manager

Ms. Parsons oversaw the right-of-way inventory portion of the Denton, TX pavement and asset survey. She ensured camera configurations and database structures were aligned with the city's deliverable expectations. In conjunction with her team, she delivered a pavement marking and striping geodatabase with over two-thousand marking locations and striping data for the 913 miles that were surveyed. A variety of attributes were recorded for each feature type, including condition, color, and type.

City of DeSoto, TX – Pedestrian Network Survey Project Manager

Ms. Parsons served as the project manager for the DeSoto, TX pedestrian network survey, which was a data collection effort to support the creation of an ADA transition plan developed by Kimley-Horn and Associates. Similarly to the Baytown project, IMS developed an inventory of 38 miles worth of sidewalks, 1,151 pedestrian curb ramps, and the associated crosswalks, complete with geometric and distress information captured from imagery, lidar point cloud, and by operators in the field. The ADA transition plan was approved by the DeSoto, TX city council in March of 2022, at which time the city created an online interface to encourage citizens to report compliance concerns directly to the ADA coordinator.

City of Atlanta, GA – Sidewalk Survey Project Manager

Ms. Parsons was responsible for overseeing field operations, data processing, QA/QC efforts, and deliverable development for the City of Atlanta's 2019-2020 sidewalk and pedestrian ramp survey. This survey was conducted using semi-automated boots-on-the-ground style surveying in addition to mobile-lidar system mapping. Her team successfully reported dozens of attributes for the pedestrian network, including sidewalk distress extents, sidewalk condition, and ramp dimension information to assist the

city in determining ADA compliance. The extensive survey encompassed approximately 1,200 sidewalk miles wherein locations of 15,000 pedestrian ramps and 8,900 obstructions were also recorded.

City of Fontana, CA – Sidewalk Survey Project Manager

Ms. Parsons coordinated efforts across all internal teams to survey 800 sidewalk miles for the city of Fontana in 2021. The city requested precise locations of all sidewalk distresses be recorded throughout the survey. Over 60,000 coordinates were collected in the field to represent these defects. This information was analyzed to determine a rehabilitation prioritization schedule for the city in conjunction with data recorded about over 7,000 pedestrian ramps and 700 obstruction locations, all of which were linked to individual parcel IDs in the network to assist in providing more localized rehab strategies. This data will ultimately be integrated into the city's Lucity asset management system to provide them with further decision-making capabilities.

City of Joplin, MO – Sidewalk Survey Project Manager

Ms. Parsons was responsible for overseeing field operations, data processing, QA/QC efforts, and deliverable development for the City of Joplin's 2020 sidewalk and pedestrian ramp survey. This survey was conducted using semi-automated boots-on-the-ground style surveying in addition to mobile-lidar system mapping. Her team reported dozens of attributes for the pedestrian network, including sidewalk distress extents, sidewalk condition, and ramp dimension information to assist the city in determining ADA compliance. The extensive survey encompassed approximately 133 sidewalk miles wherein locations of 1,736 ramps and 170 obstructions were also recorded. An additional 75 miles of sidewalk were surveyed within the boundary of an area impacted by a tornado. Ms. Parsons' team completed a good-fair-poor style survey for this phase of the project to assist the city with disaster mitigation.

City of Port Orange, FL – Lead Sidewalk Analyst

Ms. Parsons provided data processing, QA/QC, and deliverable creation support to the Port Orange project team. This extensive manual survey of 325 sidewalk miles and 3,750 pedestrian ramps required many hours of review and data manipulation to ensure all attributes as defined in the project scope were accounted for and accurate. In addition to an analysis spreadsheet, Ms. Parsons delivered a set of map books to the client, which visualized sidewalk and ramp conditions throughout the network.

City of Baytown, TX – Pedestrian Network Survey Project Manager

Ms. Parsons is the acting project manager for the Baytown, TX pedestrian network survey, which is a data collection effort to support the creation of an ADA transition plan that will be developed by Kimley-Horn and Associates. Through a combination of georeferenced imagery capture, lidar point-cloud acquisition, and a semi-automated boots-on-the-ground survey approach, the IMS team has built a comprehensive GIS inventory of all sidewalks, pedestrian curb ramps, and crosswalks within the city limits of Baytown. The sidewalk, ramps, and crosswalk features are assessed for various attributes, including material type and design style, as well as geometric information, to include cross slopes, running slopes, flare slopes, area, and beyond, as well as surface defects, including vertical displacements and horizontal separations. Spatial relationships are maintained between all features by a common intersection ID, which supports remediation planning at the project level. This data is formatted for integration into the city's Cityworks asset management system, which will allow the city to easily manage the information collected during this survey internally.

Education

BA, Geography & Environmental Studies, University of Colorado, Colorado Springs
Undergraduate Certificate: Geographic Information Science

Credentials

6 Years of Experience | 4 Years with IMS

Geoff Dew

GIS Manager

Mr. Geoff Dew is an accomplished Data Analysis Manager with over 17 years of experience in pavement and asset data collection and processing. He manages the data processing team and associated tasks, from verifying incoming data streams to overseeing each step of the data processing efforts. His experience includes 500,000 miles of data processing for 12 DOTs, including delivering more than 3.5 million unique assets across 70 different asset types. Geoff actively develops project-specific manuals, trains staff, manages project quality control measures, and thoroughly prepares data for post-processing. In addition, he has meticulously designed and implemented Standard Operating Procedures (SOP) and Data Quality Management Programs (DQMP) on the departmental level as well as to the project level.

Recent Projects

Delaware Department of Transportation (DelDOT) – Data Processing Manager

In this ongoing project Mr. Dew serves as Data Processing Manager for pavement condition data collection of approximately 5,987 miles of roadway for the state of Delaware. As a sub to Kimley Horn, IMS is responsible for collecting pavement data and processing distress data in accordance with Delaware's Pavement Management Distress Dictionary and Data Quality Management Plan along with HPMS data and video log images. Geoff manages all aspects of the data processing including validating incoming data streams and ensuring workflows meet projected schedules.

City of Mount Juliet, TN – Data Processing Manager

In 2021, Mr. Dew oversaw data processing for a pavement condition survey of approximately 168 centerline miles for Mt. Juliet, TN. In addition to pavement distresses, imagery collected during the survey was used to extract assets including street signs and pavement markings and stripings. Geoff managed all aspects of data processing including data stream verification, ensuring workflows met projected schedules, and compilation of processed data into required deliverable format.

City of Jacksonville, FL – Data Processing Manager

In this ongoing data collection project, Mr. Dew serves as Data Processing Manager for pavement condition data collection of approximately 3,700 centerline miles of roadway to support the city's Road Maintenance Program. Data is collected based on ASTM E3303 standards via ICC's IrisPRO Pave survey vehicle and IMS' Connect software. Geoff is responsible for verification of the data stream, projected schedules, and quality of the data.

Education

Business Administration, Human Resources Management Diploma, Durham College

Credentials

16 Years-Experience | 3 Years with IMS

Jim Tourek

Client Services Manager

Mr. Jim Tourek has been at the helm of pavement and right-of-way asset projects for clients ranging from small cities to large government municipalities having led over 250 successful pavement management assignments. As a regional manager of client services, Jim is responsible for maintaining client relationships for specific projects in the United States and Canada. On each assignment, he serves as the primary point of contact and is well versed in the project scope, schedule, budget, and most of all, client expectations. His responsibilities include responding to municipal solicitations and facilitating initial scope negotiations. Jim is active in all phases of project management, and he follows each project through to completion. He ensures that all deliverables are met, and the projects end with a satisfied client.

Education

BS Construction Management, University Nebraska-Lincoln
Master Graduate, Rapport Leadership International

Credentials

30 Years of Experience | 9 Years with IMS

Tammie Cummings

Project Coordinator

Ms. Tammie Cummings has 25 years of experience supporting engineering teams in Florida and Oklahoma. As a Project Administrator, Ms. Cummings proactively approaches the needs of leaders, teammates, and clients to meet critical timelines. She is responsible for coordinating with multiple departments to ensure all aspects of the projects are aligned with the strategy, assignments, and goals of the team. Her vast experience includes building project directories, database management, tracking and documenting project performance from the proposal phase to the closeout phase, preparing client presentations, managing schedules, assisting with action plans, arranging meetings, and communicating progress to team members and clients. Prior to joining IMS, Ms. Cummings served as the Project Administrator to the National Society of Professional Engineers (NSPE) 2020-21 President and local team.

Education

BS Business Administration, Universidad Interamericana de Puerto Rico

Credentials

25 Years of Experience | 1 Year with IMS

Registrations, Testing Accreditations, and Equipment Certifications

Firm and Employee Registrations

IMS Infrastructure Management Services, LP is **Texas Registered Engineering Firm No. 22225.**

We also have four licensed Texas Professional Engineers who serve as Project Managers, Senior Engineers, and QA/QC Managers depending on project specific requirements.

1. Kurt Keifer, PhD, PE – Texas PE No. 127170
2. Sadaf Khosravifar, PhD, PE – Texas PE No. 130116
3. David Bratton, PE – Texas PE No. 145824
4. David Butler, PE – Texas PE No. 68845

Testing Accreditations – *Compliance with ASTM Standards*

The primary pavement data collection equipment that IMS intends to deploy for these projects include:

1. Road Surface Testers (RST) equipped with Laser Crack Measurement Systems (LCMS-2) and inertial profilers, 360-degree imaging systems, GPS units, and other minor subsystems.
2. Fast Falling Weight Deflectometers (FastFWD) for pavement structural testing.
3. Surface Friction Testers (SFT) for assessing the skid resistance of pavements.
4. Ground Penetrating Radar (GPR) systems for subsurface investigations.

The ASTM standards that these automated systems meet are shown in the table below.

Standard	Status	Notes
ASTM 1656-06 Standard Guide for Classification of Automated Pavement Condition Survey Equipment	IMS RST LCMS-2 equipped data collection systems **meet** the standard requirements.	The L223 and C3232 conditions are satisfied.
ASTM D6433 Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys	IMS RST LCMS-2 equipped data collection systems **meet and exceed** the standard requirements for distress identification and classification.	IMS utilizes continuous sampling rather than the partial sampling that is outlined in the standard.
ASTM E3303 Standard Practice for Generating Pavement Surface Cracking Indices from Digital Images	IMS RST LCMS-2 equipped data collection systems **meet and exceed** the standard requirements.	
ASTM E950 Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference	IMS RST LCMS-2 equipped data collection systems **meet** the standard requirements.	The vans can collect longitudinal profile data and compute IRI with the precision and bias of a Class 1 Profiler.
ASTM D4694-96(2020) Standard Test Method for Deflections with a Falling-Weight-Type Impulse Load Device	FastFWD **meets** the standard requirements.	
ASTM D4748 Standard Test Method for Determining the Thickness of Bound Pavement Layers Using Short-Pulse Radar	GSSI GPR systems deployed by Infrasense **meet** the standard requirements.	
ASTM E274 Standard Test Method for Skid Resistance of Paved Surfaces using a Full-Scale Tire	IMS SFT 5041 Pavement Friction Tester **meets** the standard requirements.	

Equipment Certifications

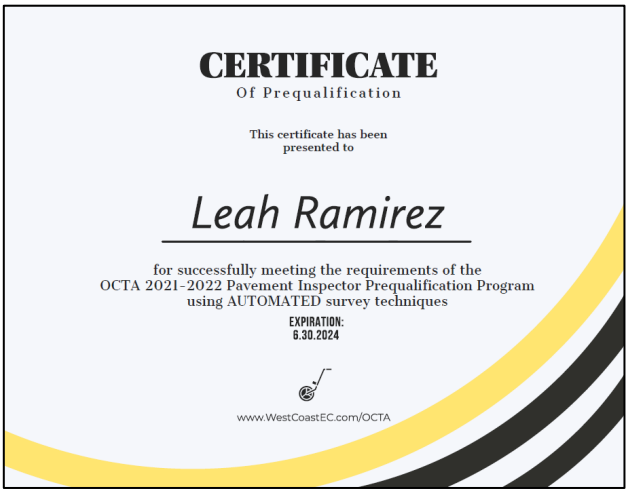
Several IMS systems go through formal certification processes for specific project needs, typically for state DOT-related testing to meet federal reporting requirements. Appendix A shows examples of equipment and operator certifications held by the IMS team.

Pavement Rater Certifications

IMS has the following individuals certified through the Orange County Transportation Authority (OCTA) ASTM D6433 PCI Rater Certification Program. This is an annual certification process that ensures our QA/QC raters and pavement engineers can correctly interpret and apply ASTM D6433.

The rater certifications through 2022 are shown here: https://www.westcoastec.com/octa
We have had an additional five raters certified in 2023, and the following IMS employees are currently OCTA certified:

1. Sadaf Khosravifar, PhD, PE
2. Dave Bratton, PE
3. David Butler, PE
4. Mostafa Nakhaei, PhD, EIT
5. Amir Ghanbari, PhD, EIT
6. Megan Foshee, EIT
7. Towhid Rahman, EIT
8. Leah Ramirez
9. Nick Messick
10. Ben Steffen
11. Derek Saldana
12. TJ Coulter
13. Adeline Jordan


CERTIFICATE
Of Prequalification

This certificate has been presented to

Leah Ramirez

for successfully meeting the requirements of the OCTA 2021-2022 Pavement Inspector Prequalification Program using AUTOMATED survey techniques

EXPIRATION: 6.30.2024

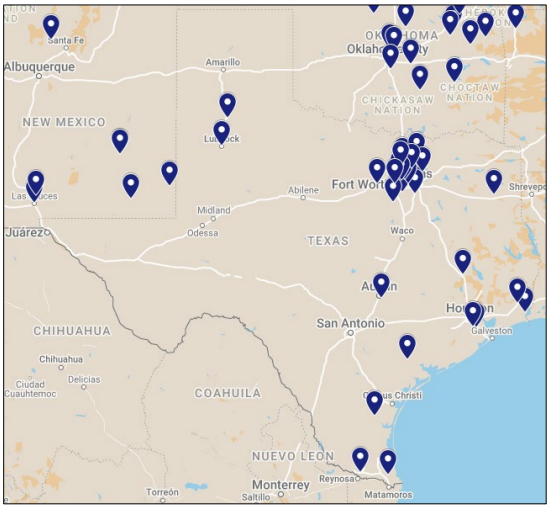
www.WestCoastEC.com/OCTA

Example IMS OCTA PCI Pavement Rater Certificate.

Services Provided in Past Five Years

Recent Texas Experience

The IMS team has recently completed projects in Allen, Bedford, Euless, Baytown, Plainview, Victoria, Kingsville, Port Arthur, Carrollton and many more cities and counties as shown in the table below. We are currently in the final phase of a multi-phase project for the City of Fort Worth. We delivered more than 4,250 miles of pavement condition and right-of-way asset inventory data to the City of Fort Worth, and we are currently finishing a comprehensive lidar-based sidewalk and ADA ramp assessment for the city under the same contract. Even though the project is still underway, the city's Project Manager, Ms. Elizabeth Young, has kindly permitted us to include her as a reference for our pavement and right-of-way asset work to date. Her email address is elizabeth.young@fortworthtexas.gov, and her mobile phone number is (817) 233-9866. We have also just completed data collection for the City of Dallas, TX and we are in the initial stages of pavement QA/QA. For the Dallas project, we are implementing ASTM D6433 and E330 in parallel. We are also performing a sidewalk inventory and a GPR survey on select roadways.



IMS has performed more than 40 pavement and asset management projects in Texas over the past five years alone and approximately half have been through the TxShare Cooperative Purchasing Program.

Texas Agency	Miles	Software	Year(s)
Aledo*	31	ESA	2022
Allen*	660	ESA	2023
Angelina County	251	CRS	2023
Baytown	192	ESA/Sidewalk & lidar	2023
Beaumont	837	Lucity	2012, 2023
Bedford*	232	ESA	2023
Brenham	118	ESA	2021
Cameron County	869	ESA	2021
Carrollton*	732	ESA/SST	2013, 2015, 2018, 2023
Celina*	77	ESA	2019
Cleburne*	222	ESA	2015, 2021
Dallas*	6000	AgileAssets	2023
Denton*	913	Cartegraph	2010, 2015, 2019-SST, 2022
Denton County*	558	ESA	2019, 2022
DeSoto*	37	ESA SST/lidar	2021

Texas Agency	Miles	Software	Year(s)
Hurst	210	ESA	2018
Keller*	260	Lucity	2006, 2011, 2016, 2020
Kingsville	132	ESA	2020
Lancaster*	320	ESA	2022
Longview	200	Roadmatrix	2011, 2012, 2013, 2014
Lubbock	1500	Cartegraph	2022
Mansfield*	320	ESA	2023
McAllen	744	ESA	2021
Murphy*	92	ESA	2021
Pearland	455	ESA	2014, 2018, 2022
Plainview	133	ESA	2022
Port Arthur	540	ESA	2020
Prosper*	270	ESA, Cityworks	2023
Red Oak*	62	ESA	2021
Richardson	694	Cartegraph	2010

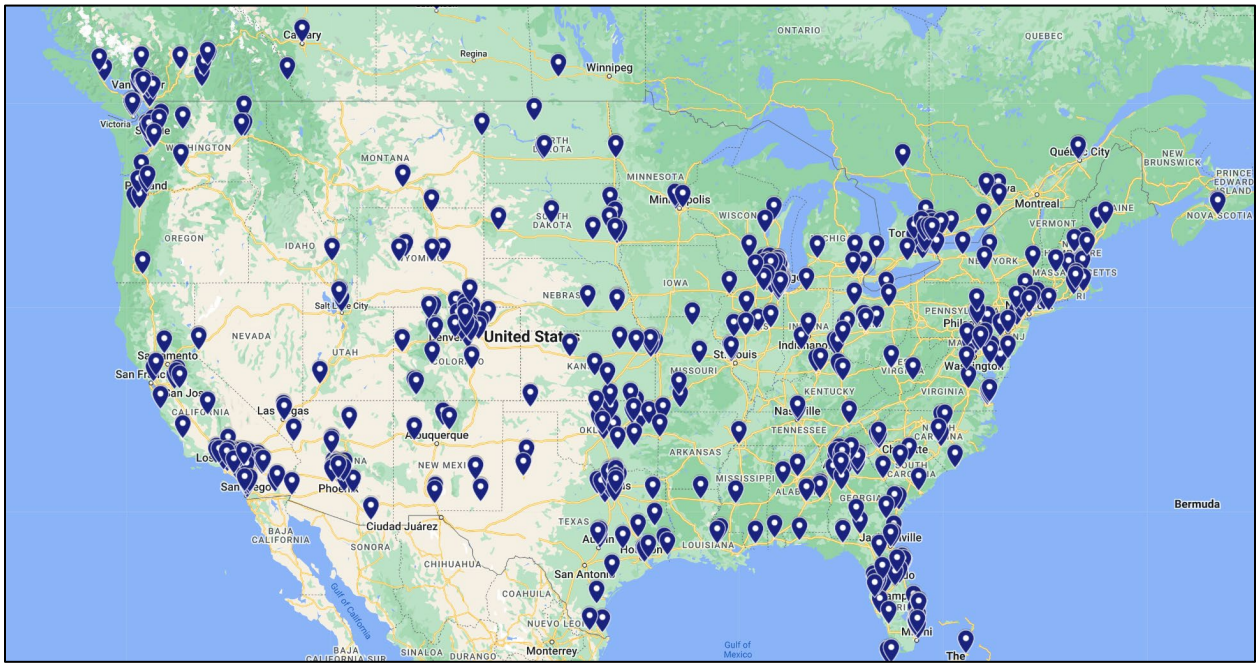
Euless*	184	ESA	2014, 2018, 2022
Farmers Branch	196	PavePRO	2013
Flower Mound*	525	ESA	2017, 2023
Fort Worth	4250	VUEworks SST/lidar	2022
Friendswood	219	ESA	2017, 2022
Grand Prairie*	354	ESA	2016, 2021
Grapevine	226	ESA	2018
Huntsville	183	Cartegraph, ESA	2015, 2021

Southlake	180	Roadmatrix	2011, 2012, 2013, 2014
Texas Tech University	72	PAVER	2022
The Colony	207	ESA	2018
Travis County	1600	Cartegraph	2010
Victoria	278	ESA	2020, 2021
Waxahachie	264	ESA	2023
Weatherford*	244	ESA	2009, 2013, 2020

Indicates that projects since 2017 were done under the NCTCOG TxShare contract.

Past IMS Pavement and Asset Management Projects

The map below shows several of the more than 1,000 projects that IMS has performed over its nearly four decades as the industry leader providing pavement and asset management services to municipal agencies.



Current Pavement and Asset Management Projects – *Nationwide*

IMS is currently providing pavement and asset management services to the agencies shown in the table below. Most of these projects include pavement condition surveys, right-of-way (ROW) asset inventories. Several include structural testing with a FastFWD, and a few include ground penetrating radar (GPR) testing. Sidewalk and ramp ADA condition surveys using lidar are underway for a handful of agencies as well.

Agency	Scope of Services
Addison, IL	Pavement Condition Survey, ROW Assets
Allen, TX	Pavement Condition Survey, ROW Assets
Angelina County, TX	Pavement Condition Survey
Arlington, WA	Pavement Condition Survey, ROW Assets
Auburn, AL	Pavement Condition Survey, ROW Assets, Sign Retroreflectivity
Augusta Richmond Co., WA	Pavement Condition Survey, ROW Assets
Avondale, AZ	Pavement Condition Survey, FastFWD
Bartlesville, OK	Pavement Condition Survey, ROW Assets
Baytown, TX	ADA Ramp Survey (lidar), Sidewalk Condition Survey
Beaverton, OR	Pavement Condition Survey, FastFWD
Bedford, TX	Pavement Condition Survey
Bloomington, IN	Pavement Condition Survey, ROW Assets, ADA Ramp Survey (lidar)
Broken Arrow, OK	Pavement Condition Survey, ROW Assets, FastFWD
Brookhaven, GA	Pavement Condition Survey, FastFWD
Brookings, SD	Pavement Condition Survey, ROW Assets, FastFWD
Bryan County, GA	Pavement Condition Survey
Camden, SC	Pavement Condition Survey, FastFWD, ROW Assets
Carlsbad, CA	Pavement Condition Survey, FastFWD
Carrollton, TX	Pavement Condition Survey
Chatham County, GA	Pavement Condition Survey, ROW Assets
Chino, CA	Pavement Condition Survey
Dallas, OR	Pavement Condition Survey, ROW Assets
Dallas, TX	Pavement Condition Survey, ROW Assets, GPR
Doraville, GA	Pavement Condition Survey
Eagle County, CO	Pavement Condition Survey
Eaton, CO	Pavement Condition Survey, FastFWD
Edmonds, WA	Pavement Condition Survey Pre-Post Haul
El Monte, CA	Pavement Condition Survey
Fayetteville, NC	Pavement Condition Survey, ROW Assets
Flower Mound, TX	Pavement Condition Survey
Fontana, CA	Pavement Condition Survey, ROW Assets, FastFWD
Fontana, CA	Sidewalk Condition Survey
Fort Worth, TX	Pavement Condition Survey, ADA Ramp Survey (lidar), ROW Assets
Glendale Heights, IL	Pavement Condition Survey, FastFWD
Glendale, AZ	Pavement Roughness Testing

Table Cont.	
Agency	**Scope of Services**
Glendale, AZ	Pavement Condition Survey, ROW Assets
Glenrock, WY	Pavement Condition Survey, FastFWD
Gunnison, CO	Pavement Condition Survey
Gunnison, CO	Pavement Management Services
Gurnee, IL	Pavement Condition Survey, ROW Assets
Henry County, GA	Pavement Condition Survey, ROW Assets
Hot Springs Village HOA, AR	Pavement Condition Survey
Hutchinson, KS	Pavement Condition Survey, FastFWD
Irvine, CA	Pavement Condition Survey, FastFWD
Johns Creek, GA	Pavement Condition Survey, ROW Assets
La Plata County, CO	Pavement Condition Survey
Lake County, IL	Pavement Condition Survey, FastFWD
Lake County, SD	Pavement Condition Survey
Lake Forest, CA	Pavement Condition Survey, ROW Assets
Lake Forest, IL	Pavement Condition Survey, FastFWD, Parking Lot Survey
Lancaster, TX	Pavement Condition Survey, ROW Assets
Laramie, WY	Pavement Condition Survey, FastFWD, ROW Assets
Lawton, OK	Pavement Condition Survey, ROW Assets, FastFWD
Lindenhurst, IL	Pavement Condition Survey, ROW Assets
Long Beach, CA	Pavement Condition Survey, FastFWD
Longmont, CO	Pavement Condition Survey
Louisville, CO	Pavement Condition Survey
Manhattan, KS	Pavement Condition Survey, FastFWD, ROW Assets
Mansfield, TX	Pavement Condition Survey
Medford, OR	Pavement Condition Survey
Mercer Island, WA	Pavement Condition Survey, FastFWD, Sign Retroreflectivity
Milton, GA	Pavement Condition Survey
Minnetonka, MN	Pavement Condition Survey, FastFWD
Minot, ND	Pavement Condition Survey, FastFWD, ROW Assets
Moline, IL	Pavement Condition Survey
Moore, OK	Pavement Condition Survey, FastFWD
Moorpark, CA	Pavement Condition Survey
Natrona County, WY	Gravel Road Survey
Norman, OK	Pavement Condition Survey, FastFWD
North Port, FL	Pavement Condition Survey, ROW Assets, FastFWD
Paterson, NJ	Pavement Condition Survey, ROW Assets
Peachtree City, GA	Pavement Condition Survey, FastFWD, ROW Assets
Peachtree Corners, GA	Pavement Condition Survey, FastFWD
Powder Springs, GA	Pavement Condition Survey
Prescott, AZ	Pavement Management Services
Prince George's County, MD	Pavement Condition Survey, ROW Assets

Table Cont.	
Agency	**Scope of Services**
Prosper, TX	Pavement Condition Survey, FastFWD, ROW Assets
Rapid City, SD	Pavement Condition Survey, ROW Assets
Ridgecrest, CA	Pavement Condition Survey, Crack Map
Riverside, CA	Pavement Condition Survey, FastFWD
Riverside, CA	Pavement Condition Survey, FastFWD
Rochester, NH	Pavement Condition Survey
Routt County, CO	Pavement Condition Survey, FastFWD
San Bernardino County, CA	Pavement Condition Survey
Sandwich, IL	Pavement Condition Survey
Sanford, FL	Pavement Condition Survey, FastFWD
Santa Fe County, NM	Pavement Condition Survey
Santa Monica, CA	Pavement Condition Survey
Scottsdale, AZ	Lucity Training Only
Seattle DOT, WA	Pavement Condition Survey
Smithtown, NY	Pavement Condition Survey
Springfield, MO	Pavement Condition Survey
Stamford, CT	Pavement Condition Survey
Stillwater, OK	Pavement Condition Survey, FastFWD, StoryMap
Tehama County, CA	Pavement Condition Survey, FastFWD, GPR
University Place, WA	Pavement Condition Survey
Upland, CA	Sidewalk Condition Survey, ADA Ramp Survey (lidar)
Volusia Co., FL	Pavement Condition Survey
Waxahachie, TX	Pavement Condition Survey
Westfield, NJ	Pavement Condition Survey, ROW Assets
Winnetka, IL	Pavement Condition Survey, FastFWD
Worcester, MA	ROW Assets
Wyandotte County, KS	Pavement Condition Survey

Summary Listing of Judgements

IMS Infrastructure Management Services, LP has had no judgements, pending lawsuits, adverse contract actions, or other actions relating to failure to perform or deficiencies in fulfilling contractual obligations.

Claims

IMS Infrastructure Management Services, LP has had no claims within the past two years related to services or key personnel.

Financial Stability

IMS Infrastructure Management Services, LP affirms that it has the financial resources sufficient to secure all necessary labor and equipment to complete the work, and to cover the cost of other anticipated reimbursable allowances. The company has been operating in the industry since 1985. Additionally, the company is owned by International Cybernetics Company, LP which additionally has been operating as a leader in the equipment manufacturing segment of the same industry, since 1975. The company has all necessary resources on staff and in any cases where a subcontractor may be engaged, has ensured that redundancy and contingency plans are in place to mitigate any risk of subcontractors unable to execute assigned work. The company is not in default nor has any history of defaults with any projects or financial institutions. If any additional information is preferred, references from the company's financial institution can be promptly furnished. The company receives reviewed financial statements by an external accounting firm annually.

Tab D – Technical Proposal

In this section, we begin with a description of how we respond to an order for services from NCTCOG member agencies. We include an overview of our seven-step approach for pavement condition and asset inventory projects that we have used successfully for NCTCOG member agency projects. We describe our kickoff meeting process; our GIS verification and validation process; and we also describe our process for developing a Quality Management Plan (QMP) for each project. These steps are common to all projects. We then describe our approach to each of the six service categories specifically called out in the RFP. These include the following:

- **Service Category #1. Pavement Data Collection**
- **Service Category #2. Asset Inventory**
- **Service Category #3. Pavement Management Analysis**
- **Service Category #4. Electronic Products**
- **Service Category #5. Pavement Structural Analysis**
- **Service Category #6. GIS Related Services**
- **Service Category #7. Value Added Services**

The IMS Team can provide all services in all seven categories as well as additional data visualization and cloud hosting services and we are willing to provide these services anywhere in the United States. We take no exceptions to any part of the RFP. We have added two subcontractors to our team, Infrasense, Inc. and Gorrondona and Associates, Inc (G&AI). Infrasense will provide specialized ground penetrating radar (GPR) data collection and analysis services. G&AI will provide additional lidar, mapping, and geotechnical support and capacity, if needed.

Description of IMS Process for Responding to an Order for Services

As a professional engineering firm dedicated entirely to pavement and asset management, our ability to respond to the shared service arrangement of participating member agencies goes together with our philosophy on project ownership. Every project is assigned a team of dedicated professionals, with the core group comprised of a Project Principal, Project Manager, Project Engineer, and Client Services Manager. We can ensure project ownership because each member of the IMS team understands who is accountable for each phase of the project.

Illustrating project ownership begins with understanding the team dynamic. The Project Principal is responsible for ensuring the technical resources are available to meet the needs of each client. The Project Manager oversees the project in its entirety and leads technical deliverable discussions to ensure continuity of services and technically correct results. They keep the project moving forward from inception to completion. It is the Project Manager's job to know where the project is at all times. The Project Engineer is the "doer" of the group. They are responsible for preparing the survey maps, reviewing GIS linkage, and processing the condition data. The IMS team has several Project Managers and Project Engineers available to serve multiple member agencies simultaneously.

Every team also needs someone who can proactively reach out to member agencies and develop preliminary project scopes, schedules, fee estimates, also and perform project administration-related tasks. These are the primary responsibilities of the Client Services Manager. The Client Services Manager works hand-in-hand with both the Project Principal and Project Manager in setting up a project, and also

check in with clients periodically during a project to further ensure that the client's needs are being met. The primary benefit of the IMS ownership philosophy is that all members of the team are points of contact throughout the entire project. Nobody is replaced with a "B" team.

When a shared service agreement arrives and/or is requested, IMS will take the following action:

- **Service Request Review** – The Client Services Manager will immediately contact NCTCOG, participating member agency staff, and the Project Principal to review the request and ensure a full understanding of the scope of services.
- **Scope Document Development** – Upon completion of the service request review, the Client Services Manager will work with the Project Principal and assigned Project Manager to draft a scope document detailing the scope of services requested and the details associated with each phase of the project. The Scope Document will serve as the "Blueprint" for this project so everyone is on the same page.
- **Notice To Proceed & Project Preparation** – As soon as the NTP is received, the Project Manager will immediately schedule the fieldwork and initiate all project preparation activities. This includes working with the assigned Project Engineer to review the member agency's existing pavement and asset inventories (if available) and/or their existing GIS environment. A survey coverage map will be produced and IMS staff will begin development of the field inventory.

The IMS approach to responding to service requests is immediate and efficient. Our team prides ourselves on service to the client and we will work with each participating member agencies to ensure we are meeting their deliverable expectations and schedule requirements.

Designated Contact Persons

- **Bid Process** Jim Tourek (Primary POC) and Kurt Keifer (Secondary POC)
- **Contracting Process** Jim Tourek (Primary POC) and Kurt Keifer (Secondary POC)
- **Contract Administration** Jim Tourek (Primary POC) and Kurt Keifer (Secondary POC)

Contact information:
Jim Tourek – jtourek@imsanalysis.com | 480-462-4030
Kurt Keifer – kkeifer@imsanalysis.com | 737-900-6676

Project Approach – The IMS Seven-Step Process

The IMS project approach for pavement condition and asset inventory projects that we have used successfully for NCTCOG member agency projects typically follows the seven steps shown in the graphic below. In this section, we detail the specific services that will be required for the successful completion of resulting projects.

IMS assigns seasoned pavement engineers as the project managers for all our projects. We believe it is imperative that the project manager have the requisite technical and domain knowledge – as well as practical project management experience – to lead the team. Our project managers apply the following principles in developing and delivering projects:

- Strive for a collaborative, people-oriented consultative approach in scoping and performing the project data collection and analysis and reporting tasks.
- Leverage technology to gather objective, repeatable, and ultimately useful information.
- Rely on established technology, industry standard protocols – *deploy leading edge <u>not</u> bleeding edge technology and processes.*
- Deploy data collection, processing, and visualization software that integrates all subsystems on data collection vehicles, processed and analyzed data, and presents the data to the agency in a practical, easy-to-understand way.
- Establish credible, cost-effective pavement and asset maintenance and rehabilitation recommendations and programs rooted in sound engineering principles and collaboration with agency staff.

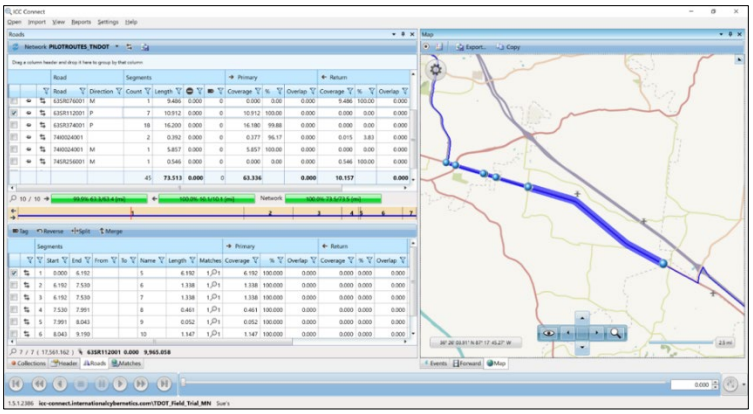
Our project management process is based on thorough planning, proactive management of schedules, and constant communication. The result of effective project management is higher quality with respect to project deliverables and satisfied stakeholders.

Kickoff Meeting

IMS has standardized a project approach based upon our 37 years of pavement management experience and the subsequent lessons learned after performing hundreds of projects. Detailed conversations with our clients allow us to tailor a solution to the specific needs of an agency.

A prerequisite for a successful project is an initial project meeting with the agency's team members and the IMS team. This early communication is critical to ensuring that we are fully aligned with the agency's overall vision for this project as well as the specific data needs for the agency. Through this project initiation process, we will prepare the project plan for overall implementation. The plan includes:

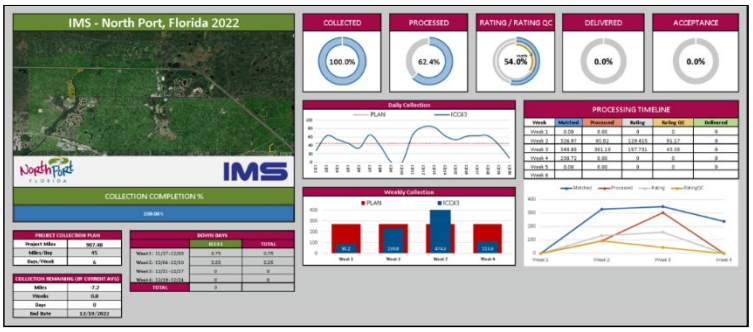
- Contacts and stakeholders
- Measurable tasks and milestones
- Project approach and specific data collection methods
- Allocation of resources, including personnel and equipment
- Quality Management Plan (QMP) review and customization
- Deliverables and schedule
- Performance and schedule risks



Sample road network loaded into Connect™ software.

We will ensure that the plan remains current with any further data needs. Our Project Initiation Form and GIS Setup Form are part of our process, where the outcome will include a final project plan and an approved schedule in collaboration with the agency's staff and stakeholders. This plan is established before any data collection begins. Project requirements are incorporated in the two project success documents. The project success documents ensure transparency and act as a reference point to ensure all stakeholders are accounted for and involved.

GIS Survey and Network Mapping



Sample GIS reporting dashboard showing data collection and processing progress daily.

Regardless of what data collection services we are performing for an agency, our data collection plan relies on a complete and up to date GIS street centerline. Shortly after the kick-off, our Esri GIS experts review and update the agency's street centerline data to ensure there is an accurate inventory of streets to be surveyed. Agency review of the centerline data is a critical path activity to ensure timely and accurate data collection. Once the inventory is confirmed by the agency, the IMS team will prepare the GIS maps that guide field data collection.

Data collection is unique in every jurisdiction, varying by network complexity, the mix of urban and rural roadways, type of terrain, schedule constraints, and most notably, the analysis and data delivery requirements. To facilitate a standard approach that yields deliverables tailored to our clients' needs, we have developed our Unify™ Suite of collection, processing, and viewing software. The comprehensive software relies on street centerline GIS data provided by the agency to build all successive processes which include calibration, collection, analysis, and reporting. The Unify Suite™ eliminates the need to use numerous scripts and transformations to produce the geodatabase and tabular deliverables.

Our technical team will review the agency's road network files (expected in an Esri GIS file format) that define the routes to be collected. The GIS will be reviewed against any existing pavement database

street segments and roadways. If discrepancies arise, they will be noted and discussed for resolution with the agency before the start of data collection. The finalized road network will be loaded into the Connect™ software, which defines the pavement network segmentation and attribution to be collected and delivered, minimizing routing problems and location errors. The GIS files will include attributes such as Road Section ID, Street Name, Street Type, beginning description, ending description, start reference, and end reference for each segment.

Our Unify™ software automatically extracts data from the various sensors on the data collection vehicle and combines it with location information and imagery. The Unify™ workflow provides easy field data collection using the RST and Drive™ software onboard each vehicle, and the data is seamlessly transferred to Connect™ for spatial analysis and processing. Unify™ provides our clients with a perfect match between the agency's existing GIS and the resulting condition data and allows us to configure our data deliverable in many formats that are ready to use by pavement management software, GIS, and other management systems.

Connect™ allows for daily progress tracking, as the field crew uploads the files from the day's collection for the office staff to match against the network for location and completeness. For larger projects, it is common practice to divide a large network into smaller, more manageable sections, such as council districts or maintenance areas.

Quality Management Plan (QMP)

Based on discussions with the member agency during the project initiation and kickoff meetings, IMS will either use our standard QMP or develop a project-specific version of our standard QMP. The plan will address the following:

- How the data collection equipment will be calibrated and certified,
- What data quality control measures will be conducted before data collection begins and periodically during data collection,
- How data will be sampled, reviewed, and checked for quality,
- What error resolution procedures will be followed,
- How data will be accepted.

Our final QMP plan will consist of these elements, all of which will be formalized prior to data collection. **We describe in more detail our specific Quality Assurance/Quality Control (QA/QC) steps in the QA/QC Procedures subsection of Tab D.**

IMS' standard Quality Management Plan (QMP) document that is customized for projects, as needed.

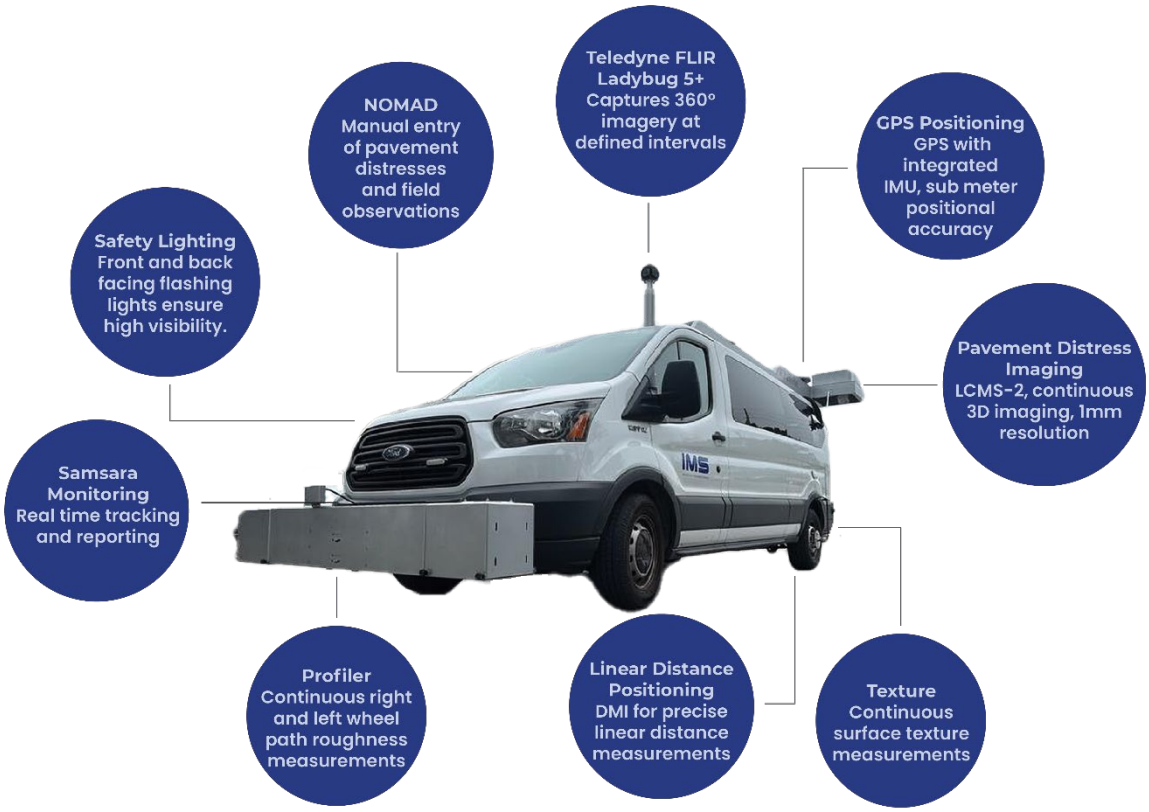
Description of Services

Service Category #1: Pavement Data Collection

Pavement Surface Distress Data Collection

Our two-person field crews will collect both outward facing and downward facing pavement imagery, using one or more of our eight Road Surface Testers (RST) equipped with Laser Crack Measurement System (LCMS-2) 2D and 3D pavement imaging technology. The LCMS-2 system is the highest resolution 3D pavement scanning technology available. Each LCMS-2 system relies on two downward-facing, high-resolution 3D cameras. Combined, the two 3D cameras capture continuous downward imagery for more than a standard lane width. The cameras are coupled with downward-facing lasers that provide constant and consistent illumination of the pavement surface regardless of ambient lighting conditions. The impacts of shadows from trees, buildings, or simply overcast sky conditions are eliminated by the laser illumination.

The 3D cameras can detect one-millimeter-wide cracks and full-lane-width rutting, as required by ASTM D6433 and E3303, on the pavement surface at speeds up to 65 mph. **In fact, the LCMS-2 systems far exceeds the requirements set forth in RFP and collects the equivalent of more than 4,000 individual sensors-worth of data for assessing rutting, fatigue cracking, transverse cracking, and longitudinal cracking.** Due to the versatility of the LCMS-2 technology, automated pavement condition surveys will be performed at posted speeds, and traffic control will not be necessary for the data collection effort. Pavement data collection and imagery surveys are expected to progress at a rate of between 30 and 70 miles per day for typical NCTCOG agencies.



Standard IMS Road Surface Tester (RST) equipped with a Laser Crack Measurement System (LCMS-2), 360-degree right-of-way (ROW) imaging system, pavement profilers, texture lasers, GPS, and an Inertial Measurement Unit (IMU).

Laser Crack Measurement System (LCMS-2) for capturing 2D and 3D Pavement Distresses and Rutting Measurement	The state-of-the-art LCMS-2 system is the equivalent of 4,000+ individual sensors/measurements for objectively quantify pavement cracking (longitudinal, transverse, and fatigue), texture, rutting (wheel path and full lane width), and several other distresses. The LCMS-2 system collects data in severity and extent formats that conform to ASTM D6433 and E3303.
Pavement Profiler for Measuring Roughness	Inertial profiler for capturing right and left wheel-path International Roughness Index (IRI) values per industry standards.
GPS Acquisition	GPS technology is coupled with inertial navigation to enhance the acquisition of accurate longitude and latitude coordinates. Agencies are becoming GIS centric and thus all data must be georeferenced for plotting in GIS and linking with the Texas state plane XY coordinates.
Inertial Measurement Unit (IMU)	The IMU enhances GPS positional accuracy and provides pavement geometrics, such as cross fall, crown, grade, and radius of curvature.
Distance Measuring Instruments (DMI)	Dual DMI pulse transducers that accurately collect and report vehicle distance and speed. The distance data is integrated with the inventory, GPS data flow, and time code.
360 Degree Digital Camera *Teledyne FLIR Ladybug 5+*	The 360-degree, high resolution digital camera collects continuous ROW imagery. Digital images are used for many purposes: data validation, virtual drive deliverables to clients, and right-of-way (ROW) asset inventory development.
Digital Condition Rating System (DCRS)	The touch-screen event board allows IMS to collect a wide range of data from pavement distresses to the validation of pavement attributes. The touch-screen event board can be configured in any manner and can be used to enhance ASTM severity and extent data collection protocols.

The IMS RSTs are also outfitted with right- and left-wheel profilers for capturing International Roughness Index (IRI) in both wheel paths data per industry standards. The RSTs are all equipped with Inertial Measurement Units (IMU) for capturing roadway geometrics, such as grade, cross slope, and radius of curvature. The RST imagery and measurements collected provide all data required for identification of pavement distress types specified in ASTM D6433 and ASTM E3303. **IMS RSTs automatically and continuously collect all pavement surface condition data – distress, rutting, roughness, and geometrics – required in the RFP.**

The IMS team then processes the collected data using a combination of advanced analytical tools and QA/QC checks to determine accurate and repeatable PCI values for each roadway segment. A rigorous, manual QA/QC is performed by IMS' certified Pavement Condition Index (PCI) raters to further ensure the data accuracy. Pavement surface distresses such as alligator (load-related) cracking, block cracking, rutting, raveling, reflective cracking, loss of section, bleeding, edge distress, and patched areas as well as right-of-way imagery will be collected on a segment-by-segment basis, with each distress being captured by type, extent, and severity. The data and imagery that is collected is then linked to the agency's existing GIS data. Furthermore, we deliver our PCI ratings and supporting data (distress information, rutting, and IRI values) in both spreadsheet and GIS formats for easy review. The data that we provide may be used immediately for decision making or be imported into any pavement management system.

Pavement Friction Testing

IMS' parent company, International Cybernetics Company (ICC) is a leading manufacturer of pavement friction testers and provider of pavement friction testing services, and IMS deploys these systems routinely for pavement friction testing. Friction testing is a valuable method for testing the functional performance of pavement by simulating wet conditions. **It can be particularly valuable for evaluating the safety at intersections, crosswalks, and bike lanes.** The friction of the pavement surface will be measured using an ICC SFT 5041 Pavement Friction Tester, in accordance with ASTM E274. This evaluation will incorporate a ribbed tire, in accordance with ASTM E501, for studies of the left wheel path at each site. The ICC SFT 5041 pavement friction tester measures average locked wheel (skid) and peak incipient (slip) friction characteristics of paved surfaces. The friction tester consists of a fully instrumented tow vehicle and test trailer that uses a two-axis force transducer to provide dynamic vertical load and horizontal tractive force measurements. Water is delivered ahead of the test tire and braking is applied to completely lock the wheel from rotating. The frictional force acting between the pavement surface and the test tire, along with the vehicle speed, is recorded during the test.

IMS' Locked Wheel Friction Testing for measuring skid resistance. (Note: Manufactured by IMS' parent company, ICC.)

Lane Striping Reflectivity Quality

IMS deploys the RetroTek-D mobile retroreflectometer for measuring road markings across the full width of a lane in a single pass. The system records all road markings to the left and right sides of the lane, plus all central markings along with the absence and presence of reflective pavement markings and road studs. The RetroTek-D system is a standalone, portable system and secures to the front hitch mount of the survey vehicle; no dangerous protrusions from the side of the vehicle.

Data capture is run at fixed frequency, not fixed distance, so it's ideal to keep the system moving at a constant speed and turn it off while the vehicle is stopped. The strobes run at 60 Hz to avoid causing visual distraction, and the onboard cameras capture images at 20 Hz. Results are written to text file during a run. After the run, the data is passed to a results processing program which chops it into 60 to 300 feet intervals.

RetroTek-D system for day or night lane striping reflectivity measurements.

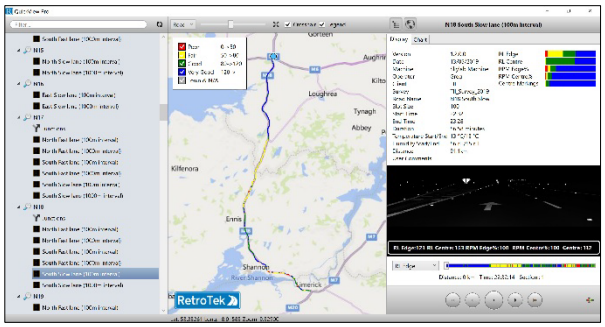
Collected data include:

1. Night-time visibility (RL) of all road markings (measured in mcd/m^2/lux)
2. RL of right and left edge, centre lane markings & symbols (measured in mcd/m^2/lux)
3. The absence and presence of RPMs/road studs/markers

4. Each line width
5. Day contrast ratio when surveyed in daylight (RetroTek-D)
6. Indicates if single or double lines (Auto Detection)
7. Indicates if skip or continuous lines (Auto Detection)
8. Indicates colour - white or yellow (Auto Detection)
9. Individual RL for each line in double lines
10. Measurements all GPS tagged with map and video images.
11. Road name and number
12. Temperature and humidity

The data are saved to a text file, and the images are saved as JPGs or as video file. KML and PDF reports are generated also, and IMS produces a geospatial deliverable optionally tied to client's GIS and road sections.

Retroreflectivity measurements taken by RetroTek-D system during collection.

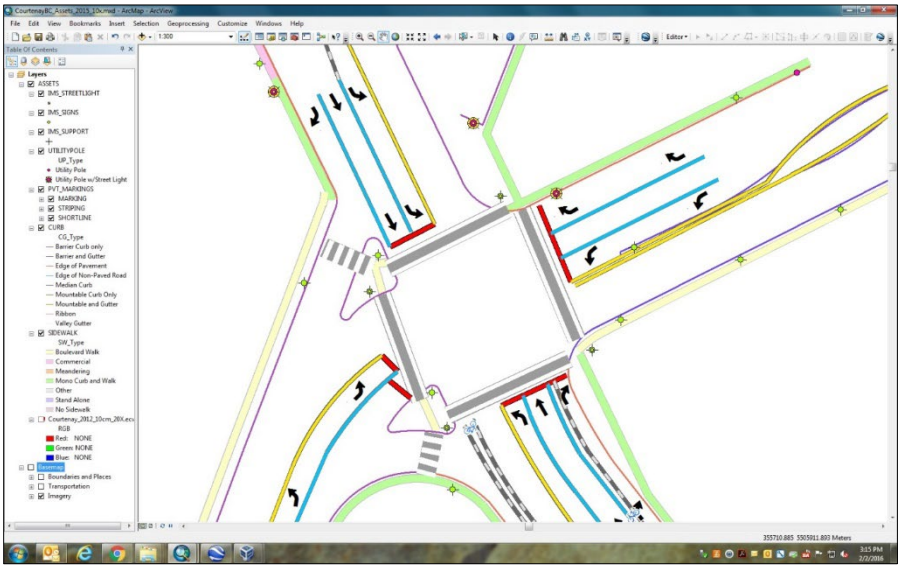


All collected data is GPS tagged and may be loaded into viewing software or the agency's exiting GIS.

Service Category #2: Asset Inventory

The IMS RSTs, previously described in Service Category #1, are equipped with accurate GPS systems and 360-degree, high resolution digital cameras. All right-of-way assets and relevant attributes in the line of sight of the camera are visible in the collected imagery. IMS has the capability to identify right-of-way assets such as sidewalks, ADA ramps, traffic signs, curbs and gutters, pavement markings and many other assets for location verification and condition assessment. **The asset inventories are supplemented with aerial photos and GPS to ensure positional accuracy.**

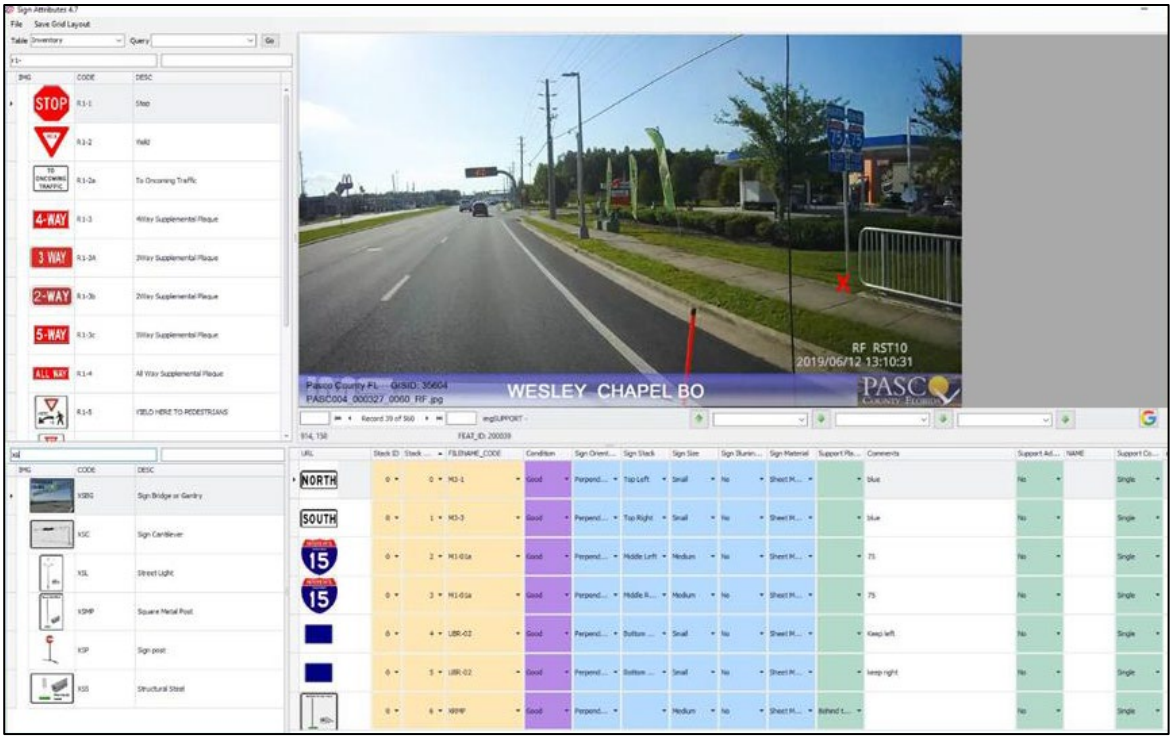
The IMS technology is an open architecture system that allows virtually any type of asset to be defined for collection of location, attribute, and condition data. Once an asset is observed, the operator toggles to the individual record input screen and proceeds to input the appropriate attribute and associated information. Wherever possible, "pick lists" are employed to streamline the data entry function and provide uniform, high quality data. IMS confirms the feature attributes to be collected with the client prior to data collection. The images and GPS data are merged on a frame-by-frame basis. The images are then post-processed using specialized GIS and image viewing software. Using RST imagery, the existing centerline GIS, and aerial photography, IMS spatially plots each right-of-way asset in its real-world location.



IMS asset inventory of sidewalks, ADA ramps, utility poles, pavement striping, traffic markings, and crosswalks presented in a geodatabase.

Prior to commencing the asset inventory, a document called the **Master Asset List (MAL)** will be developed, using each applicable exhibit as a starting point. The MAL defines what assets or inventory items are to be logged and what attributes will be extracted. The MAL also defines the methodology for condition rating each asset. Essentially the Master Asset List is the direct equivalent of a "data dictionary" as it sets the rules for right-of-way asset data collection. The image shown above depicts an IMS asset inventory of sidewalks, ADA ramps, utility poles, pavement striping, traffic markings, and crosswalks.

The image below is a recent example of a completed sign inventory that was completed for a large municipality with over 1,800 miles. It depicts the tools for the inventory and affixing a "red X" to the asset in the hyperlinked imagery.



IMS interactive tool for the inventory and affixing a "red X" to the asset in the hyperlinked imagery delivered in the client's geodatabase.

Geodatabases attribution and corresponding photos may be developed for all the assets listed in the RFP using IMS' approach, as summarized in the table below.

Right-of-Way Asset(s)	Right-of-Way Asset(s)
Signs and supports	Cabinets
Markings and Stripings	Bridge approaches and surface conditions
Traffic Signals, Flashers, and Controllers	Bridge deck conditions
Streetlights	Utility Poles
Drop Inlets	Fire Hydrant
Drive pads	Medians Database
Bridges	Valves
Speed Humps	Manhole Covers
Street Furniture	Trees
Cattle Guards	Catch Basins and Drainage Inlets
Guardrails and Roadside Pedestrian Fences	Sidewalk Inventory
Culverts and Ditches	Curb and Gutter

The approach described above is also used for developing geodatabases of:

- Bike lane locations, including width and length and associate signage and striping.
- Sidewalk data including, location, length, width, location in relation to curb, and if greenspaces exist between curb and sidewalk condition.
- Barrier free ramp data including location, configuration, presence of truncated domes or other detectable warning features, and condition.
- Parking lot pavement condition assessments (thru-travel lanes) with inventory development and attribution is performed using the collected pavement and right-of-way imagery.

In addition to the right-of-way asset inventories, the utilization of ground penetrating radar (GPR) for relocating utilities for maintenance plans is also requested in the RFP. For these types of GPR surveys, IMS will deploy ground-coupled GPR to get high resolution GPR data from which utilities may best be located. Our teammate Infrasense will perform these GPR services.

Service Category #3: Pavement Management Analysis

Immediately following the completion of the field surveys IMS will begin processing the pavement distress severity and extent scores to develop a Pavement Condition Index (PCI) for each roadway segment per ASTM D6433 or E3303. International Roughness Index (IRI) will be calculated automatically per ASTM E1926 for each pavement segment using IMS' automated processing software. All PCI and IRI data are georeferenced and are compatible with the agency's existing GIS. The pavement condition data can then be analyzed by a team of IMS engineers, who work collaboratively to develop the agency's multi-year pavement management plan. This section provides a summary of the functionality of the IMS pavement analysis to emphasize our implementation expertise as well as the abilities and constraints within a pavement analysis.

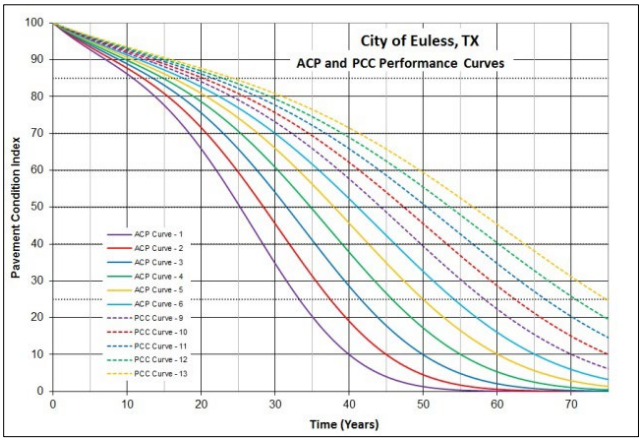
The purpose of pavement management is to produce cost effective maintenance programs that maximize available resources and roadway life. By incorporating key components of a cost benefit analysis into the analysis operating parameters, we can develop a game plan that is optimized to meet the needs of the NCTCOG member agencies. In addition, the analysis operating parameters described within this section will be delivered in an easy-to-use Interactive Excel Spreadsheet including the segment PCI data, pavement deterioration curves, triggers (priority weight factors), and the prioritized multi-year plan. Everything is linked to GIS in the form of a geodatabase.

Field Inspection Data and Pavement Condition Index (PCI) Development

The IMS analysis allows you to store information regarding your pavements, including surface types, number of lanes, patching estimates, cross slopes, and sidewalk and curb types with replacement estimates. Pavement condition data including surface distress, roughness, and deflection results can be stored and analyzed. Using our easy-to-use spreadsheet tool, we can develop customized condition elements, distress types (load and non-load related), indexes (Structural Distress Index, SDI; Ride Index, RI; and Structural Index, SI), customized weightings, and overall PCI calculations that are specific to each agency's needs.

Modeling and Performance Curves

With IMS' analysis tools, agencies can forecast various budget scenarios to help determine the ideal maintenance and rehabilitation schedule. The IMS approach will help you decide what rehab activities should be performed, when and where to perform them, and an ideal budget for your system to maintain it at a specific level of service.



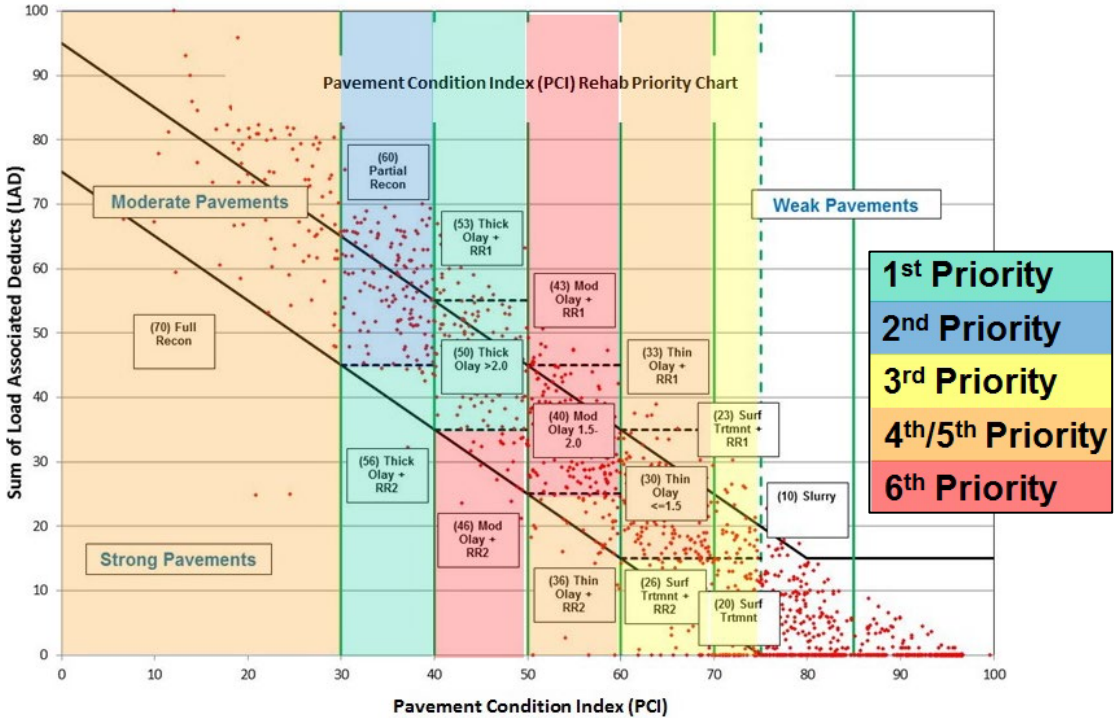
Example performance curves for the City of Euless, TX.

IMS engineers use pavement deterioration models that can be customized to reflect the

climatic conditions and structural characteristics of the agency's road network. As a result, performance curves can be developed on factors such as functional class, pavement type and sub-grade strength.

Set Points and Operating Parameters

One of the most important aspects of the IMS approach is determining the "set points" or thresholds of the performance curves and other factors. In general, these set points determine what type of treatment will be selected given the current or predicted condition of a road segment over time. For example, the scatter plot displayed below illustrates a potential rehab selection process that may be incorporated for the agency. Each dot represents the outcome of a pavement condition assessment on each segment in the road network. The X-axis is the pavement condition score while the Y-axis is the sum of load associated distresses (can also be developed with deflection data). The boundaries created by the intersection of the vertical green lines and horizontal dashed black lines represent the potential rehabilitation strategy for those given conditions. Each maintenance and rehabilitation strategy is programmed to take place in the most optimal year for each roadway segment.

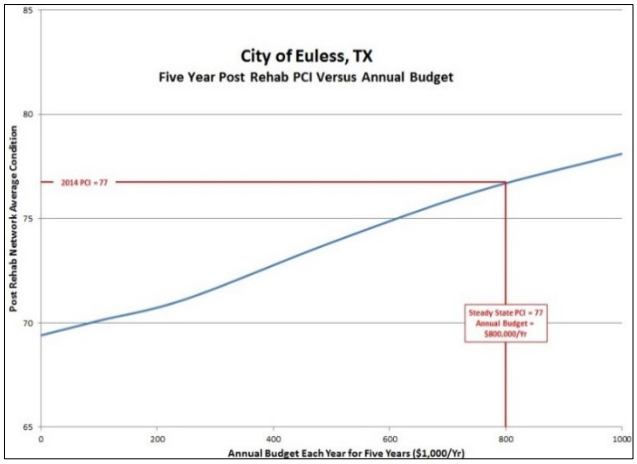


Pavement structural condition versus pavement surface condition. This comparison is used to determine most cost-effective type of rehabilitation.

The color bands are also an effective way of illustrating the activity priorities through an analysis that considers critical PCI drops, also known as "cost of deferral." The IMS analysis specifically targets "critical segments", which is defined as segments that will drop into a more expensive treatment category if they are not selected now. By presenting the rehab strategies in a visual format such as this, the user, agency staff, management, and decision makers can easily understand, follow, and potentially modify the results with confidence.

Pavement Rehabilitation Analysis

An unlimited number of pavement maintenance and rehabilitation strategies can be defined within our system. An analysis is then run, incorporating the performance curves, set points, filter criteria, and rehabilitation alternatives to identify the overall need in terms of rehab strategies and costs for the agency's road network, for today as well as year on year for the next 5 to 10 years.



The IMS approach allows you to input any number of "what if" budget scenarios and produce prioritized yearly rehab programs based on those funding levels over a 10-year analysis period. Typical budget scenarios include agency selected annual budgets, unlimited budget, "do nothing" budget, and a target PCI budget. In addition to the yearly programs, the net impact each budget scenario has on the expected condition of the road network over time can be determined. This budget impact can be illustrated in terms of both the yearly increase or decrease in the average network PCI score, PCI distribution, or percentage backlog of roads that were not selected by the budgets.

Pavement Management Software Selection and Implementation

As a leading pavement data collection and management firm, we can confidently say that we have encountered every 3rd party pavement and asset management software that is currently implemented in North America. **We are often asked which system is best, and the answer is very simple: the best system is one that integrates with a client's business processes and that is regularly used. We are "software agnostic" and we have extensive experience with systems such as PAVER, CentralSquare's Lucity, StreetSaver, Deighton, Cartegraph, StreetLogix, Cityworks, AgileAssets, and many others.**

Based on our experience with several pavement management systems, we have developed the following summary of the most common "categories" of systems: Public Domain, Enterprise, and Engineered Applications, and we provide commentary inline below.

Public Domain Systems: Roadsoft (PASER), PAVER, StreetSaver, Mobility, etc.
The benefits of Public Domain application are a low cost to implement and maintain. They also offer a wide array of users across the United States. The downside is the lack of customization and configuration options. In this case, PAVER is popular because of cost and industry acceptance, but lacks in ability when it comes to GIS integration, optimization, and flexibility of use. Roadsoft is common in the Great Lakes region and is free software that was developed by the Michigan Technological University that also incorporates ROW asset inventory modules. *While IMS would review these applications with* agency *staff, we anticipate that the Public Domain applications may not meet the needs of every member agency. They offer very little in terms of configured prioritization and do not perform configurable optimization techniques.*

Enterprise Systems: Lucity, Infor, Cityworks, Cartegraph, Pavement Express, StreetLogix, etc.
Enterprise applications are software solutions that cater to multiple divisions within an agency (streets, sewers, parks etc.). These applications are generally well coded, integrate with GIS easily, and can be very flexible. The downside is they require some configuration to work well as the operating parameters

of the system must be defined and setup. In addition, user friendliness ranges from easy to difficult to understand. *The enterprise solutions offer the most flexibility for the configuration of tools and operating parameters. While each solution is very different, most offer the ability to customize the application to meet the needs of* agency *staff, including utilization of the ASTM D6433 rating methodology. The enterprise solutions typically offer well-attended user groups and customer support forums.*

Engineered Application Systems: PavePRO, Deighton, RoadMatrix, Pavement Analyst, etc.
These are engineered programs dedicated specifically to pavement management. They have the highest level of prioritization and optimization and present the best programs based on funding and constraints. These systems work well with complex and simple roadway networks alike. The downside is they tend to be stand-alone, meaning they do not offer software modules for all divisions within an agency. Except for PavePRO, they also tend to be the costliest to implement. *The engineered systems are developed by pavement engineers for pavement engineers. While they may not cater to the complex needs of IT departments, they do retain the highest level of optimization and cost benefit analysis routines. Each available solution in this category is very different as Deighton is highly configurable, Road Matrix is moderately configurable, and PavePRO requires the least user input.*

The following table shows a comparison of pavement management systems that we performed for one of our clients based on their stated feature requirements:

Pavement Management Software Comparison						
Features	streetlogix	StreetSaver®	lucity™	Cartegraph	PAVER™	Easy Street Analysis (ESA)
GIS Centric Application	Yes	Yes	Yes	Yes	No	No
Web-Based, Hosted, and Secure	Yes	Yes	Yes	Yes	No	No
Visualization	Yes	Some	Yes	Yes	Yes	No
Ease of Use	Moderate	Moderate	Difficult	Moderate	Moderate	Moderate
Zero Installation	Yes	Yes	Yes	Yes	No	Yes
360 Image Viewer	Yes	No	Yes	Yes	No	No
Customization	Yes	Yes	Yes	Yes	Yes	Yes
Data Importing/Exporting	Yes	Yes	Yes	Yes	Yes	Yes
Network Segmentation and Pavements Condition Reporting	Yes	Yes	Yes	Yes	Yes	Yes
Repair Planning and Prioritization	Yes	Yes	Yes	Yes	Yes	Yes

Budget Analysis	Yes	Yes	Yes	Yes	Yes	Yes
Reporting	Yes	Yes	Yes	Yes	Yes	Yes
Capital Plan Reports	Limited	Limited	Limited	Limited	Limited	Limited
Integrated ASTM D6433 PCI Calculation	No	Yes	No	Yes	Yes	Yes

IMS is prepared to perform a software needs assessment for participating agencies. This entails a review of the agency's existing IT structure, program goals, and user skill set to best understand which software package will meet the agency's current and future needs. Our team is well versed in the benefits and disadvantages of each software package, and our recommendation will be based on three factors:

- the ease of use of the software,
- the agency's satisfaction with the analysis tools and subsequent outputs (link to GIS, reports, work plans, budgets, functional classifications, etc.), and
- the quality of the software support and maintenance.

IMS will go beyond software installation and training to ensure the operating parameters of the system are setup and configured to produce reliable analysis routines and reports (select applications). While there is no "one-size-fits-all" when it comes to pavement management, IMS can ensure the selection of software that will meet current and future needs of the agency's staff and elected officials. After selection and implementation, IMS will then train the agency staff on the system functionality, allowing for the development of comprehensive multi-year road rehabilitation plans that optimize pavement quality and minimize annual expenditures.

Pavement Management Software Training

Each year, IMS engineers perform dozens of training sessions for local agencies and at industry conferences, as well. Our engineers are fluent with the most common pavement management systems, and they use many of them daily. IMS will provide customized training to agency staff on general pavement management concepts, how to use PCI and IRI data, how to interpret analysis results, and how to develop effective and charts and graphs from the available data. IMS will also schedule training with agency staff based on how to use their selected pavement management software effectively, and the IMS team will provide additional remote support as needed.

Service Category #4: Electronic Products

Roadway Inventory and Condition Data Collection

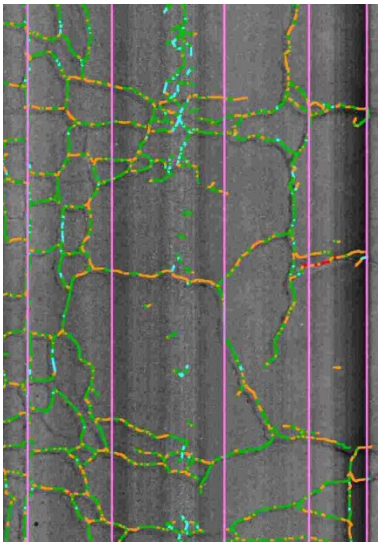
At the beginning of every project, we work with the agency to develop a pavement inventory and we then populate it with available data. If inventory data (e.g., construction records) are not readily available, we either estimate values based on data collected condition survey or we work with the agency staff to make reasonable assumptions. Typical inventory and condition datasets provided in geodatabases and tabular formats to our clients include the following:

- Street Name
- Endpoint One, Endpoint Two, and Segment ID
- Segment Length and Pavement Width

- Inventory Date
- Pavement Type
- Segment Functional Classification
- Pavement condition scores reported at intervals based on the requirements of local agency
- Pavement performance information that includes rutting, fatigue cracking, transverse cracking, and longitudinal cracking
- Pavement age (if necessary to develop pavement life curves)

Field Inventory and Condition Data Loads into 3rd Party Systems

The IMS team loads collected, fixed interval (e.g., 25 feet) imagery and pavement inventory and condition data into the agency's pavement and/or asset management system. We have developed inhouse scripts and software tools that expedite the transfer of imagery, tabular data, and georeferenced data into 3rd party pavement management systems. We will provide to the agency with the pavement condition data in a pavement management system database approved by agency, and we will coordinate with the agency's IT department to provide pavement condition data in a format compatible with the agency's existing Esri GIS database, if applicable.



Example georeferenced crack maps for display in an agency's GIS.

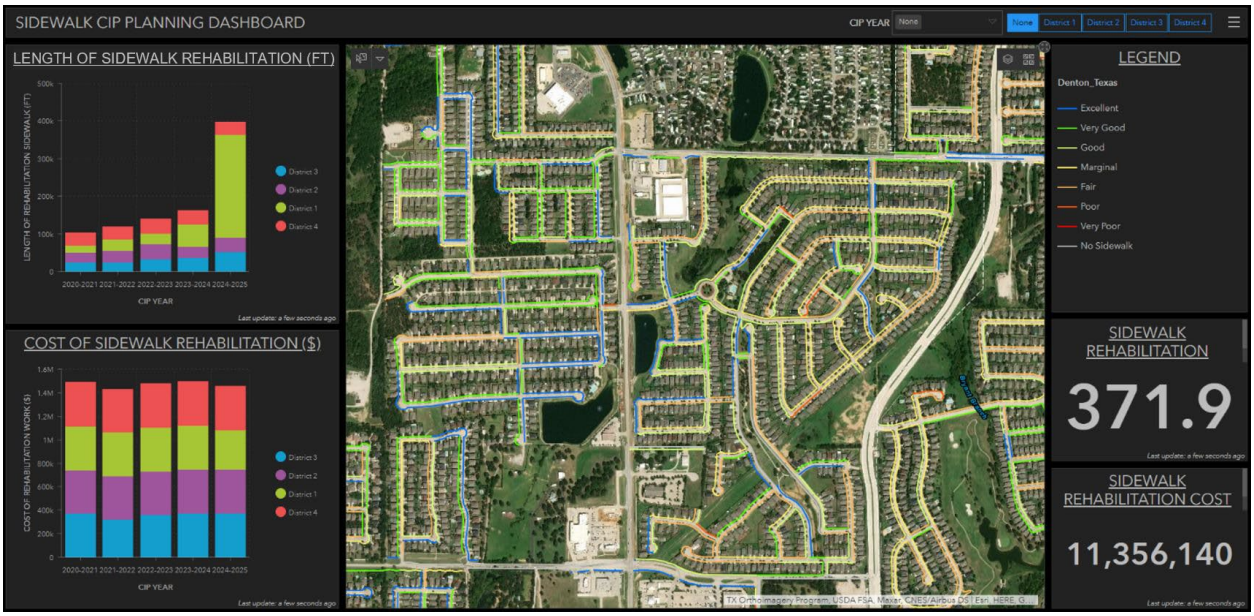
Some 3rd party systems (e.g., StreetSaver, Cartegraph, StreetLogix, etc.) require agencies to pay them to load their data into their systems. In these situations, IMS engineers will work with the 3rd party system on behalf of the agency to ensure that data are loaded correctly and in a timely manner.

Asset Management Systems and Tools

As discussed in detail in the previous section, IMS is familiar with several pavement and asset management systems. The most common asset management systems used by NCTCOG agencies are Cartegraph, Cityworks, and VueWorks. IMS has provided asset data for import into these systems, and we have worked with agency staff in develop maintenance and rehabilitation plans for asset data based off asset attributes and/or observed conditions. For the most part, asset management is less sophisticated than pavement management, and most asset maintenance and rehabilitation planning is done simply through a work order system or through a "fixed interval" maintenance or replacement schedule.

GIS and Web-Based Data Visualization Tools

All collected imagery, inventory data (including attributes), condition data, and rehabilitation recommendations developed during the condition surveys and analysis phases of a typical project are georeferenced and ultimately linked to the GIS inventories. Not only do our clients receive a spreadsheet that acts as a powerful management tool in a tabular format, but that same data is made available spatially. This allows for visualization of the data in countless permutations to respond to the changing needs of the agency. Having this information available for use in industry-standard geospatial formats allows for further analysis, historical documentation, and can act as a tool to maintain work history and maintenance records.



Example of an ArcGIS Online dashboard built to convey sidewalk capital planning information.

IMS understands the GIS capabilities across agencies is highly variable. Many users are still desktop-centric, with interest in continuing to use Esri's ArcMap or ArcGIS Pro, internally. However, these platforms require training, background knowledge, and licensing that can be cumbersome and expensive for agencies to maintain. We are continuously improving our ability to push our GIS data to the cloud and make it accessible through ArcGIS Online, and therefore more accessible to not only internal stakeholders at the agency, but to their citizens themselves. We believe in working closely with the agency to understand their specific needs to share data with their constituents in the most effective manner, and can create customized, web-based dashboards that can visualize the data we collect during our surveys in a multitude of ways.

Service Category #5: Pavement Structural Analysis

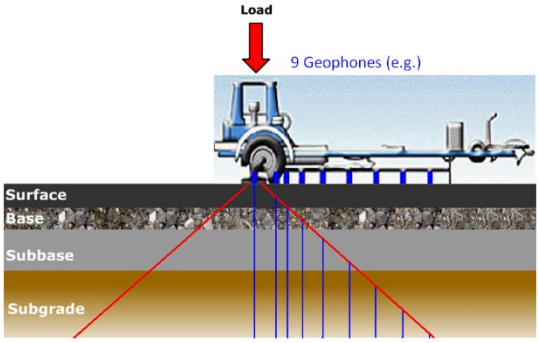
Falling Weight Deflectometer (FWD) Testing

Subsurface distress investigations are a valuable tool to assess the structural condition of a roadway. IMS offers additional pavement testing techniques to enhance decision making and prioritization. IMS performs nondestructive structural testing for agencies where the history of mill and overlays, soil conditions, and other environmental factors require additional information to determine the most cost-effective rehabilitation strategy. Earlier this year, IMS added a Fast Falling Weight Deflectometer (FastFWD) to its fleet of pavement testing equipment for objectively, repeatably, and rapidly assessing the structural integrity of pavements. The FastFWD applies a dynamic load to the pavement surface that simulates traffic loading and measures the response (deflection) of the pavement. This information is used to assess the load carrying capacity and remaining service life of the pavement. IMS can integrate the Structural Index (SI) as a component of each roadways final PCI score.

IMS Fast Falling Weight Deflectometer (FastFWD)

Structural Strength Assessment and Analysis

Deflection testing will be performed in accordance with ASTM standards and is generally recommended on the heavily traveled roadways such as arterials and collectors. Local roadways are only necessary if the Member Agency has known base failures that require additional investigation. Deflection testing is typically completed at least once in each direction in every street segment (every 300 - 500 feet) along the outside lanes of the roadway. Testing shall be altered to an inside lane when it appears to be in a worse condition than the outside lane of the segment based on site observations. IMS will record the readings of a series of geophones for inclusion in the overall pavement condition rating. These readings will be used to determine the pavement strength, load transfer capabilities, and identify properties of the base and sub-grade.

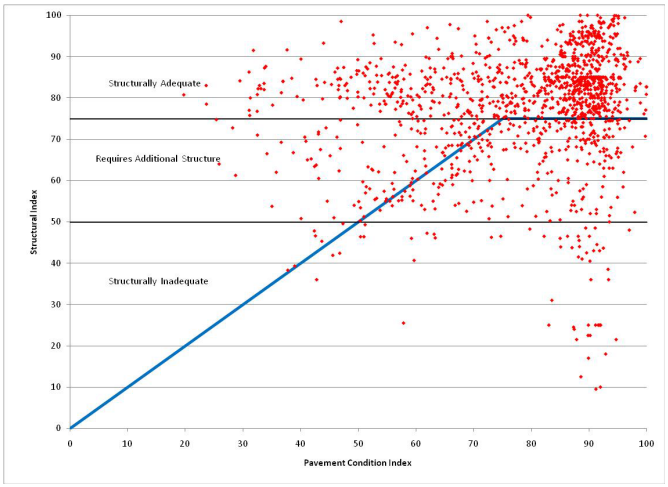


Distribution of FastFWD load through typical pavement structure. Geophone measurements used to determine pavement deflections.

Nighttime FastFWD testing of highly trafficked roads may require rolling closures for enhanced safety.

Upon completion of the deflection survey a structural analysis is performed. FastFWD's apply a known load to the pavement and measure the pavement response to the load. The structural adequacy of a road is expressed as a 0 to 100 score with several key ranges: roadways with a Structural Index (SI) greater than 75 are deemed to be structurally adequate for the loading and may be treated with lightweight surface treatments or thin overlays; those between 50 and 75 typically reflect roads that require additional pavement thickness; and scores below 50 typically require reconstruction and increased base and pavement thickness.

The graph presents a sample structural adequacy plot of a recent client's roadway network against its average pavement condition. The diagonal blue line separates roadways that are performing above expectations (above the line), from those that are not, (below the line). The number of roadways falling below the diagonal line indicates this particular agency has a high percentage of roadways that are structurally inadequate for their design load. This is typically the result of insufficient base and structural materials during the original construction, or the application of overlays that were too thin during the lifetime of the roadway.



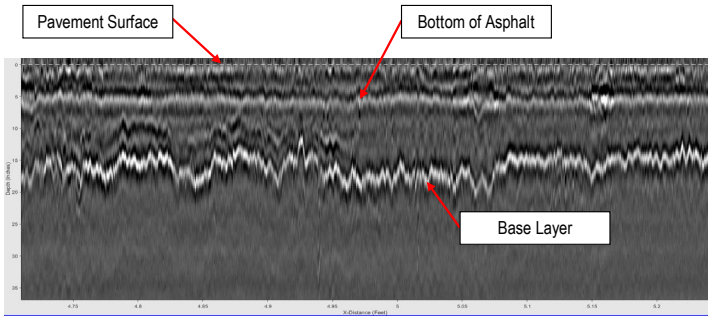
Sample structural adequacy plot of a recent client's roadway network against its average pavement condition.

Ground Penetrating Radar (GPR)

Our partner, Infrasense, will perform any services requiring ground penetrating radar. Data collection is carried out at normal driving speed using a 1-GHz horn antenna system manufactured by GSSI, Inc. The vehicle is equipped with an electronic distance-measuring instrument (DMI) mounted to the rear wheel, providing synchronous distance data as the GPR data is collected; and a Trimble GPS unit, providing high-resolution, differentially corrected geo-spatial information. The data collection and recording are controlled by the SIR-30 GPR system operated from within the survey vehicle. The data collected along each lane/ offset is analyzed for pavement thickness. The layer thicknesses are reported at a prescribed interval (typically 50 feet) and presented in tabular format along with associated GPS coordinates and milepost reference.

Infrasense GPR Equipment for measuring pavement layer thicknesses and utility locations.

Data analysis is semi-automated and is carried out by viewing the GPR data, identifying the significant layers, "picking" these layers, and running the thickness reports. Determining layer structure type and understanding the significance of different types of layer boundaries is critical to generating accurate GPR pavement structure data. All GPR data are GPS tagged and summarized in tabular and GIS formats for easy analysis.



GPR data showing pavement thicknesses. All data are summarized in tabular and GIS formats for easy analysis.

Pavement Coring

For both FWD and GPR testing, it is good practice to extract representative cores to validate pavement thickness data. Coring locations are typically identified after GPR testing is completed, and the GPR analysis has identified areas that may not have clear pavement layer boundaries. Coring is most cost effectively performed by local contractors or by the agencies themselves. IMS will engage local firms of the agency to perform any needed coring activities. Traffic control will be coordinated with the agency, and additional traffic control provided by local vendors may be required.

Service Category #6: GIS Related Services

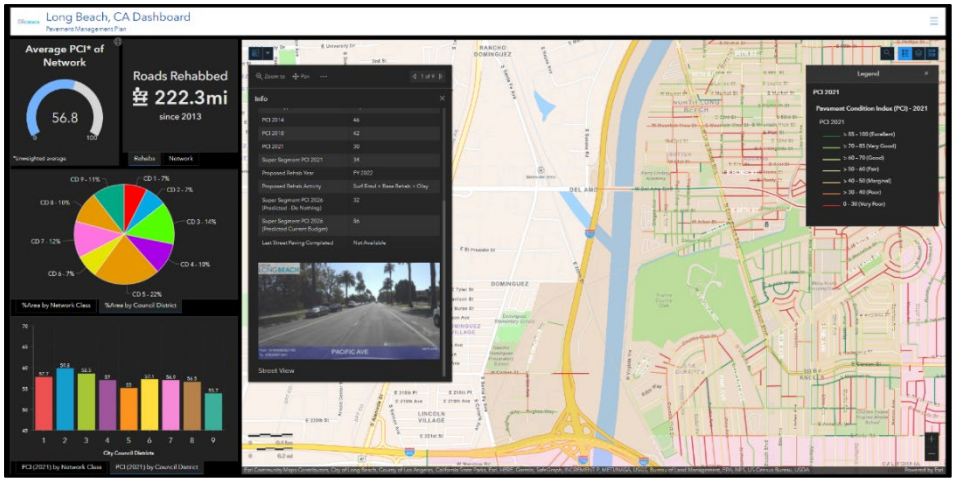
Our engineers and data processing team members are well versed in GIS. It is an essential skill given our reliance on GIS data for data collection, processing, reporting, and visualization. In fact, all the data that we collect and deliver – with almost no exceptions – is georeferenced data and may be easily integrated into an agency's existing GIS. Our team of thirteen (13) GIS technicians and analysts are fluent in providing an array of GIS consulting services, ranging from GIS centerline cleanup activities to developing sophisticated story maps and interactive dashboards for our clients.

Esri Bronze Partnership

As an Esri Bronze Partner, IMS uses Esri desktop software and ArcGIS Online – software that many agencies are already using – and we look for ways to leverage existing licensing, subscriptions, and infrastructure to elevate the data we are delivering. IMS has built story maps for clients to help explain to agency staff and citizens how a pavement condition and right of way asset surveys are performed, what the data means, how the analysis is performed, and how the maintenance and rehabilitation budgets are distributed to maximize the use of available funding. In addition to the story maps, we have also deployed agency-focused dashboards to enable managers to easily review the planned work, existing and forecasted conditions, and funding impacts on a map.

Story Maps and Dashboards

To make our data more easily accessible to agencies that may not have significant inhouse GIS expertise, we have recently started developing interactive story maps and dashboards for our clients, as shown below. These tools are available online and are extremely intuitive to navigate, both for agency staff as well as the public, if desired.

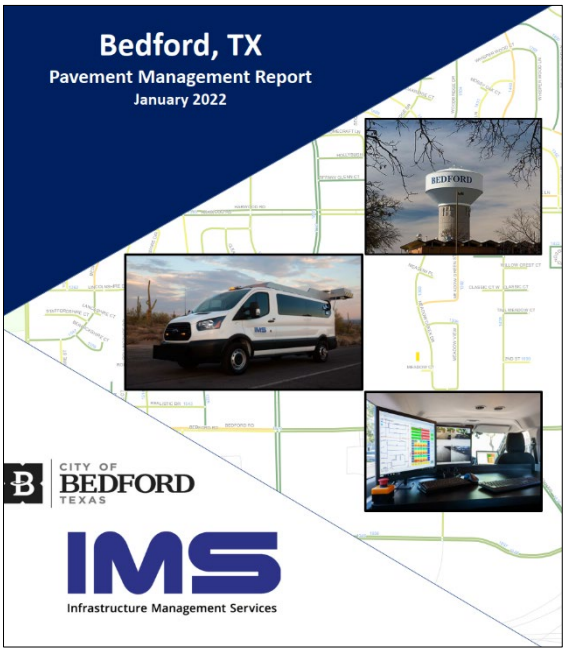


Interactive dashboard that IMS created for the City of Long Beach, CA for internal and external use.

Service Category #7: Value Added Services

Comprehensive Final Project Reports

IMS reports are comprehensive and include both summary and detailed pavement and asset inventory and condition data as well as analysis results and recommendation. IMS reports summarize the work performed, dates of field data collection, methods employed in the analysis, and results and recommendations. However, the level of detail often depends on the agency's needs. The following list details the information that is typically included in an IMS pavement analysis and final project report:



Final report recently submitted to the City of Bedford, TX through the existing TxShare program.

- Street ownership and inventory and attribute report
- Present condition ranking – Detailed and summary condition data, including Good, Fair, and Poor ratings (or any scale desired by the agency), Load Associated Distresses (LAD), Non-LAD, and network recommendations of each street in the network, as well as summary data for the network as a whole.
- "Fix all" budget analysis – This identifies the upper limit of spending by rehabilitating all streets assuming unlimited funding.
- "Do nothing" analysis – This identifies the effects of not performing roadway rehabilitation projects.
- "Steady state" rehabilitation life cycle analysis – This identifies the minimum amount of rehabilitation that must be completed to maintain the existing level of service over 3, 5, or 10 years.
- PCI targets and associated funding levels – What funding will be necessary to maintain a PCI of 75, 80, or 85, for example.
- Plus or minus 50% and other additional runs – Additional budget runs are completed at rates of +50% and -50% of the suggested steady state analysis. Up to 10 budget scenarios will be run.
- Integration of capital projects and Master Plans – Ongoing and proposed projects that affect roadway rehabilitation planning will be incorporated into the analysis.
- Draft multi-year rehabilitation and prioritized paving plans – Based on need, available budget, and level of service constraints; a minimum of three budget runs will be completed.
- Final prioritized paving plan – Incorporating feedback from stakeholder departments and utilities, complete with budget and level of service constraints.

IMS engineers and technical staff work collaboratively with the agency to ensure that the final report addresses the project goals and objectives.

Project Presentations

IMS engineers have extensive experience presenting the results of pavement and asset management projects to legislative bodies (e.g., city council meetings and county board meetings). Within the last

three months alone, the IMS team has presented city council presentations to the following agencies in Texas:

1. **City of Lancaster, TX** **Monday, 20 February 2023**
2. **City of Bedford, TX** **Tuesday, 17 January 2023**
3. **City of Allen, TX** **Tuesday, 13 December 2022**
4. **City of Euless, TX** **Tuesday, 25 October 2022**

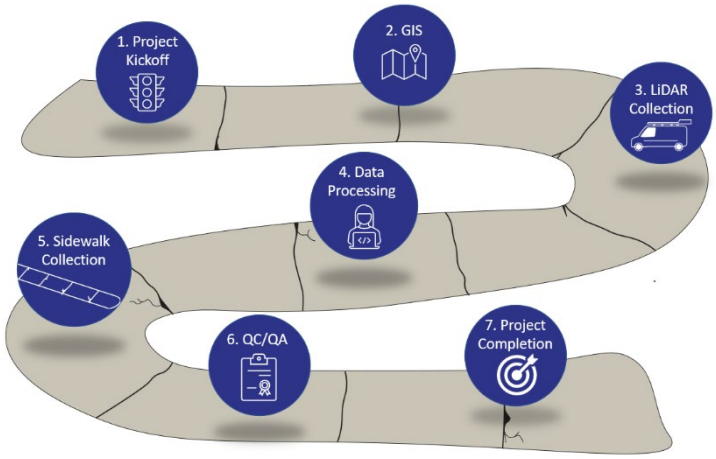
Project presentations are often the most collaborative part of a project. The way in which the project findings and recommendations are presented to elected officials can have a significant impact on the funding levels allocated to the agency's roadway network. It is during these meetings when agency staff show the progress that they have made with available funding over the preceding years and determine whether pavement conditions are improving, staying the same, or getting worse. Give the significant investment that agencies make in their pavement networks, it is critical that the information provided during these meetings is accurate and the recommendations provided are defensible.

Recent City Council presentation for the City of Bedford, TX.

For this reason, the IMS engineers work closely with agency staff to ensure that the most important talking points are addressed during the presentation and that the information is presented in a way that is easily understood by the decision-makers and public attending the meeting. It is not uncommon for the development of project presentations to take place over several weeks and involve the input from many stakeholders.

Provide Curb Ramp and ADA/Barrier Free Ramp Compliance Survey.

The IMS project approach for both sidewalk condition and curb ramp and ADA compliance projects typically follows the seven steps shown in the graphic below. In this section, we detail the specific tasks and milestones that will be required for the successful completion of this project.



Project Kickoff

IMS has standardized a project approach based upon our 37 years of pavement and asset management experience and the subsequent lessons learned after performing hundreds of projects. Detailed conversations with our clients allow us to tailor a solution to the specific needs of an individual municipality. A prerequisite for a successful project is an initial project meeting with the agency's team members and the IMS team. This early communication is critical to ensuring that we are fully aligned with the agency's overall vision for this project as well as the specific data needs for the agency. Through this project initiation process, we will prepare the project plan for overall implementation. The plan includes:

- Contacts and stakeholders
- Measurable tasks and milestones
- Approach and specific methods
- Master Asset List (MAL) detailing features and attribution.
- Allocation of resources, including personnel material, and tasks
- Deliverables and schedule
- Performance and schedule risks

We will ensure that the plan remains current with any further data needs. Our Project Initiation Form and GIS Setup Form are part of our process, where the outcome will include a final project plan and an approved schedule in collaboration with the agency's staff and stakeholders. This plan is established before any data collection begins. Project requirements are incorporated into the project plan. This ensures transparency and acts as a reference point for all stakeholders involved with the project.

Another critical component of project prep is ensuring the Master Asset List (MAL) is understood and accepted before the project begins. The MAL acts as a data dictionary and gives full transparency into what can be expected to be included in the final database that will be delivered. It also includes all assumptions made about each attribute domain and type, so any subjectivity during rating can be understood clearly.

Develop GIS Inventory

Our data collection plan relies on a complete and up to date GIS sidewalk centerline and ramp locations. We understand that sidewalk and ramp databases are difficult to maintain and often incomplete, so prior to deploying our Sidewalk Surface Testers (SST), we first drive our mobile lidar unit through the entirety of the public roadway network maintained by the agency. The vehicle drives in two directions on each road, collecting both point cloud data and spherical imagery from the Ladybug5+ camera. The spherical imagery is then post-processed and georeferenced, such that it can be used in conjunction with satellite imagery and any existing client GIS (if any) to create a comprehensive sidewalk GIS.

High-resolution spherical output from Ladybug5+ camera displayed in 2D.

We segment the network on a block-to-block basis with a few exceptions:

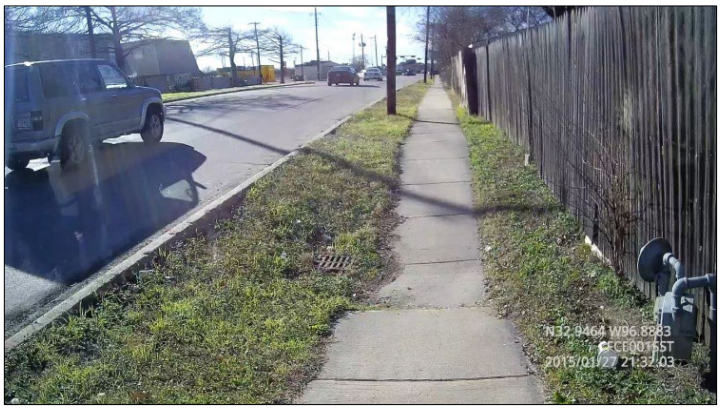
- if there are gaps in the sidewalk network,
- if the condition of the sidewalk changes significantly,
- or if the width of the sidewalk changes significantly.

Not only does this identify areas where there are gaps in the sidewalk network, but it ensures we do not waste time surveying areas without assets present when we deploy our SST, which results in cost and time savings passed along to the agency. This also ensures that condition or width observations do not get “washed out” when segment-level data is summarized.

Using the Ladybug imagery allows us to create a point inventory of every ramp location in the network, and locations where ramps are missing but should be installed. This allows us to target our ramp data extraction process when the point cloud is imported into CAD systems for measurement purposes, again resulting in greater efficiency during processing.

Once we have our GIS databases created, we import them into our NOMAD™ software onboard the SST, which allows our field operators to easily orient themselves in the network and make observations about each segment and ramp point as they encounter them.

Sidewalk Condition Survey



The Sidewalk Surface Tester (SST) is used to perform a condition survey by driving each linear mile of sidewalk and providing detailed data to determine if the sidewalks are compliant with current local standards. IMS will provide a Sidewalk Condition Index (SWCI) which is a 0-100 score that is like the Pavement Condition Index (PCI) used for assessing street pavements. The SWCI was developed by IMS in 2014 when we launched our SST platform. We have been able to provide our clients with an approach to sidewalk management that is like what is used for pavement management – detailed, objective, and repeatable surveys that provide a solid foundation for multi-year budgeting maintenance and rehabilitation planning.

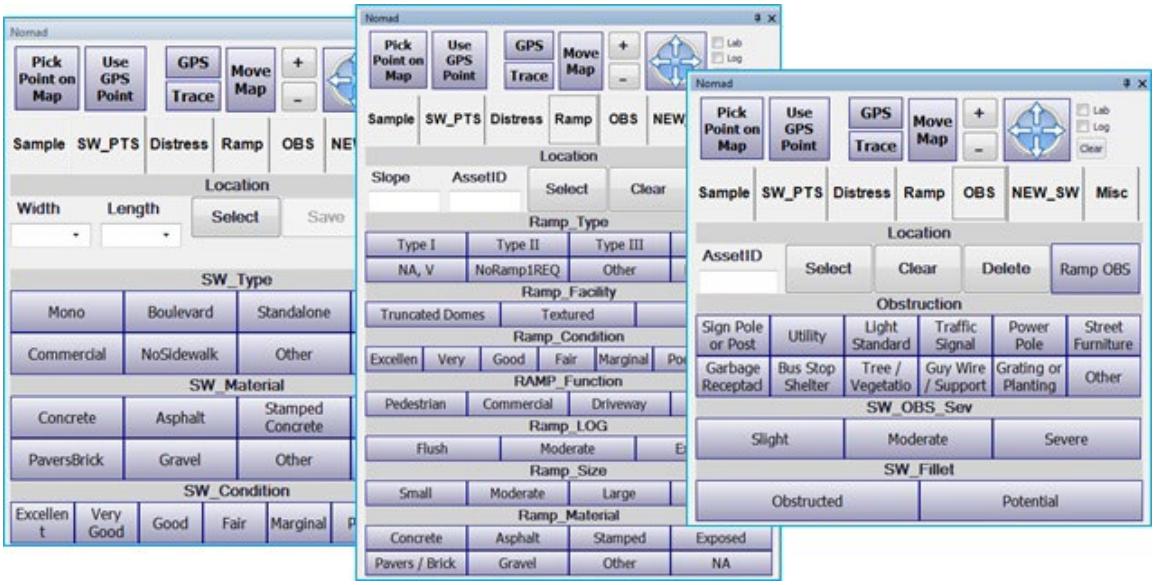
SST Mobile Mapping Technology: NOMAD™

IMS has developed a mobile mapping application called NOMAD™ that is used to capture sidewalk/ramp attributes in the field. The NOMAD™ software operates on a tablet PC and is customized to the needs of each client. NOMAD™ is integrated with GPS on the SST and is used to develop spatially accurate inventories and condition assessments for a variety of infrastructure assets in the field based on the required attributes as defined in the MAL.

In addition to the segment-level observations, the XY locations of the sidewalk distress data will be collected and provided as a GIS feature class. For the purposes of prioritization, they will also be summarized at the segment level in the analysis phase of the project.

If available, the Agency will provide IMS with all sidewalk maintenance activities that will be performed during the data collection and inventory development period. This step will ensure that the inventory is complete, and that any sidewalks installed or repaired after a particular section of sidewalk has been surveyed will be included in the final inventory database.

NOMAD™ is configured with a series of tabs that maintain the most efficient data entry in the field. The sidewalk and obstruction tabs are customizable for each project. Upon completion of the field data collection, the sidewalk attribute information is assembled and processed for condition and deficiency reporting purposes.



Sidewalk Ramp Collection

A pedestrian curb ramp is defined as an inclined plane needed wherever a sidewalk or other pedestrian walkway crosses a curb. Similarly to the pre-survey prep for the sidewalk assessment, IMS will create a review map of all current ramps to be condirmed by Agency staff as a function of our routing plan.

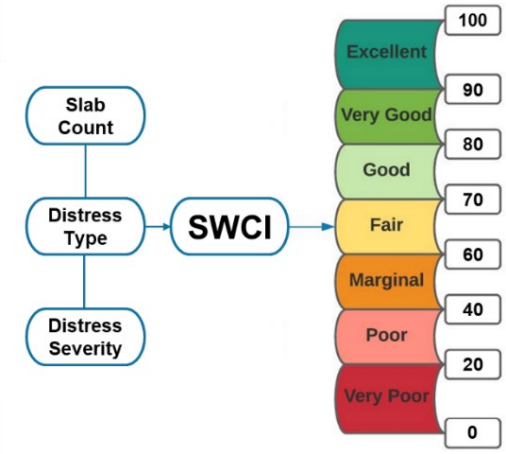
Ramp locations will be verified via the GPS-linked imagery and aerial photography. Updates to the existing database will be confirmed with County staff prior to any adjustments. The table structure for the ramp inventory is included on the next page. This will be modified to match the agency terminology, or any modifications made as a part of negotiations and reflected in the MAL.

The image at right is an example of the Ladybug camera image that the IMS technicians review to complete the measurements. The ramp condition assessment is completed via measurements derived from the point cloud captured by the mobile lidar unit.

Data Processing

Sidewalk Distresses

The sidewalk distress locations will be reported in a GIS database. We will also summarize these findings at the segment level for integration into the Easy Sidewalk Analysis spreadsheet for SWCI calculation purposes. The raw GIS files can be used for precisely locating slabs that need to be repaired, which can be used in conjunction with the spreadsheet deliverable, which will help to determine priority.



Compliance Report (ramps and sidewalks)

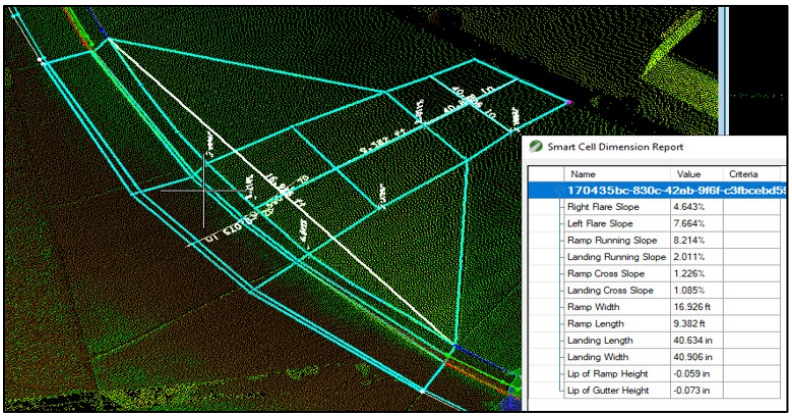
Upon completion of the data collection phase, IMS will process all data collected in the field to be displayed in GIS and for use in the analysis and prioritization routines for remediation. The end deliverable is an updated GIS database with sidewalk segments, ramp locations, obstruction locations, and distress locations, a prioritized ranking for ramp and sidewalk maintenance / rehabilitation, and a summarized report with the findings of the survey.

The prioritization rankings will be determined by the calculated SWCI, which factors in sidewalk condition, defects, and obstructions. The segments are then reported on a "worst-first" basis, along with recommended rehab strategies, and the estimated cost-of-repair, based on the agency's unit costs.

Curb Ramp Survey and ADA/Barrier Free Ramp Compliance Survey

Point Cloud Processing – The raw point cloud data from the lidar unit is processed into a useable format for use in TopoDOT for Microstation. Upon completion of the point cloud processing, IMS tiles the network for identification of the intersection ramps and delivery to our extraction team.

Smart Cell Extraction – The IMS extraction team uses a Smart Cell library developed by IMS. The Smart Cells are applied to each ramp in the point cloud and sized according to the visible geometry of the pedestrian curb ramp. Once sized, the Smart Cell auto calculates all the geometric units of measure identified in the Master Asset List (i.e., ramp slope, landing slope, flare slope, facility dimensions, etc.)

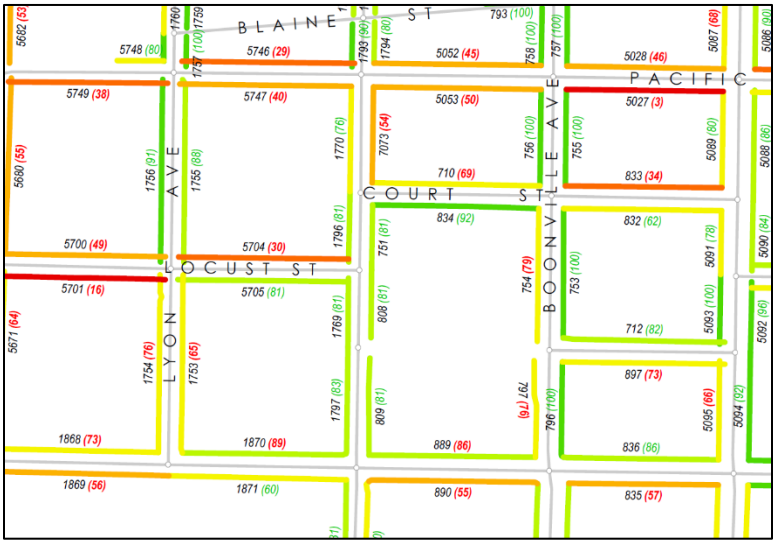


Ramp measurements are captured from the lidar point cloud using TopoDOT for Microstation.

Ramp Join & QC – The pedestrian curb ramp geometric attributes are joined to the appropriate ramp and assigned to a Curb Ramp QC technician who validates the geometry measurements captured during Smart Cell Extraction. Any error or anomalies found during QC are corrected using the point cloud collected in the field.

Quality Assurance and Quality Control of Final Deliverables
Sidewalk and ramp inventory and condition GIS data goes through a series of quality checks before it is delivered. These include:

General Review: The first QA/QC check involves an overall cursory scan of the dataset to visually identify any anomalies before proceeding with more detailed checks. This includes zooming to the extent of each feature class to ensure there are no extraneous features beyond the expected boundary of the data and opening each table and performing sample selections to ensure expected results are returned. A sort of each attribute should yield complete information without unexpected gaps. Any gaps are noted and further investigated in subsequent checks.



Example sidewalk condition survey deliverable.

Positional Accuracy: Positional accuracy checks ensure that features collected with mapping-grade GPS equipment reasonably align with aerial photographs and other relative datasets, such as street centerline.

Geometry Checks: Geometry checks ensure that features are of the expected geometry and that no invalid or null geometries exist. These checks can also include connectivity checks if delivered features have expected geometric relationships, such as the relationship of a ramp point to a sidewalk line.

Database Schema Checks: Schema checks ensure that the delivered geodatabase conforms to the schema specifications outlined in the Master Asset List (MAL) at the onset of the project. Checks include a review of features, feature types and naming, attribute types and naming, coordinate system, and allowed geometries.

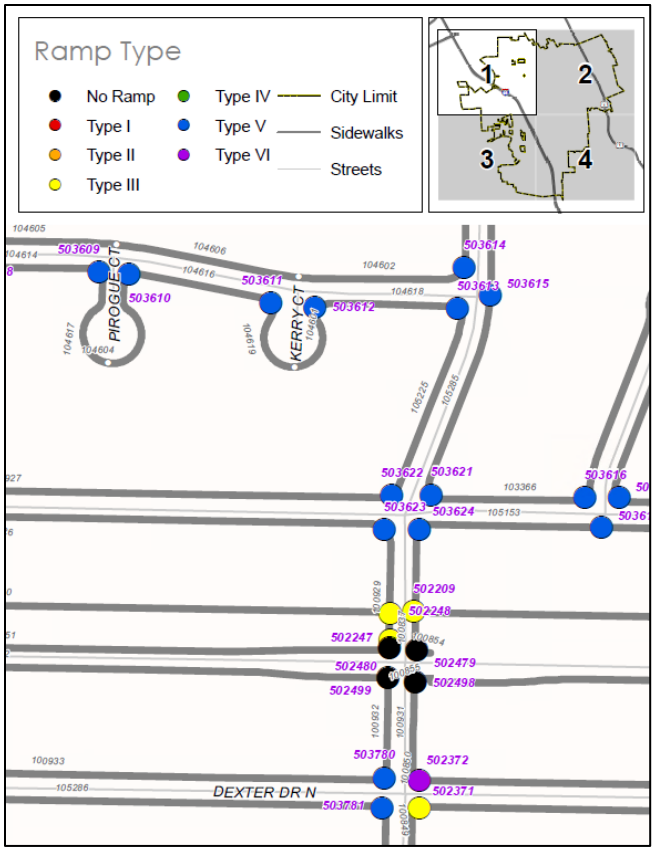
Attribute Completeness: Attribute completeness checks ensure that feature classes are fully populated according to domains outlines in the MAL. Logical consistency checks may be performed if a feature has multiple attribute relationships that need validated.

Attribute Accuracy: Attribute accuracy checks ensure that the data captured in the feature class agree with the source data used to create the feature, which in this case is most often aerial photography and right of way imagery. Checking a random sample set of features ensures correct data capture and adherence to the MAL.

Project Deliverables

Sidewalk and Ramp Rehabilitation Plan

Included with the sidewalk and ramp survey is the development of a prioritized sidewalk and ADA ramp rehabilitation and remediation plan. In addition to delivering a basic compliance report for each sidewalk section or ramp, IMS identifies the rehabilitation costs and develops a logical remaining service life for each sidewalk. The following information is included in the enhanced IMS sidewalk and ADA ramp report:



Curb ramp inventory and ADA classification.

1. **Sidewalk and ramp location inventory/attribute report**
2. **Missing sidewalk and ramp location inventory report**
3. **Analysis parameters –** will define/develop estimated average sidewalk life, rehab max life, sidewalk deterioration curves based upon IMS and staff outlooks, burden rates, and minimum percentage for gaps to be filled.
4. **Present condition ranking –** detailed and summary condition data including 0-100 SWCI, Good/Fair/Poor, distress types, material, reviews of each ramp and ranking of the ramps.
5. **Fix all deficiency costs –** this identifies the upper limit of spending by rehabilitating all ramps and sidewalks to meet ADA compliance requirements, assuming unlimited funding. This will be developed for sidewalks, gap filling, missing terminus, and ADA ramp compliance.
6. **Replacement program & funding levels –** what funding will be necessary to replace / repair what length of sidewalks and ramps over a set duration.
7. **Draft 5-year rehabilitation and prioritized sidewalk/ramp plans –** based on condition, available budget, and level of service constraints; three budget runs will be completed.

Final prioritized plan – incorporating feedback from stakeholder departments, complete with budget and level of service constraints.

Stand-alone Field Operation for Collection of Asset Inventory Only

In addition to collecting right-of-way imagery for asset inventories only with an RST, IMS also deploys 360-degree imaging systems integrated with mobile lidar for right-of-way asset surveys. These types of surveys – when data are extracted from the lidar point cloud – offer a higher level of accuracy than imagery only surveys. However, they are significantly more time consuming and expensive, and the added benefit from greater positional accuracy is not normally a benefit for when mapping grade asset positional data is all that is actually needed.

IMS mobile lidar system with integrated 360-degree imaging system.

Generic asset types: Allowing for any Item within Line of Sight of the Collection Vehicle.

IMS can extract assets from collected imagery or lidar data following the same approaches outlined in Service Category #2: Asset Inventory (from right-of-way imagery) or from collected lidar data using the lidar data extraction tools described earlier in this section for extracting detailed ramp measurements. While IMS does use lidar data for ramp measurements, we find that it is often not the best dataset from which to extract right-of-way asset data unless highly accurate measurements are required. For generic asset surveys, we recommend right-of-way imagery as the source dataset from which to harvest asset data.

Provide Consultancy Services to Develop Linework in GIS for Missing Sidewalks

IMS can develop linework in GIS for missing sidewalks based on right-of-way imagery collected during either a pavement survey or a lidar survey. If the agency has not performed either type of survey, IMS can attempt to develop linework based on aerial imagery. However, it has been our experience that aerial imagery is often difficult to interpret, especially in heavily wooded communities.

Project Understanding and Project Manager/Task Leader Experience

The proposed IMS has worked on more than 40 projects in Texas over the past five years and have successfully delivered more than 350 similar pavement and asset management projects across the United States. This projects below are a select list of similar projects in Texas that the IMS team has successfully delivered since 2018. The key project members involved and their role(s) in the project are summarized below. Resumes for key project personnel may be found in Tab B. *(Note: * indicates TxShare projects.)*

Texas Agency	Miles	Services	Recent Year	Team Member / Role
Aledo*	31	Pavement condition assessment, analysis, and reporting.	2022	K. Keifer – Principal Engineer M. Nakhaei – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Allen* (In progress)	660	Pavement condition assessment, analysis, and reporting; asset survey; pavement striping reflectivity.	2023	K. Keifer – Principal Engineer M. Nakhaei – Project Manager C. Parsons – Asset/GIS Team Lead L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Angelina County (In progress)	251	Pavement condition assessment, analysis, and reporting.	2023	K. Keifer – Principal Engineer M. Foshee – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Baytown	192	Sidewalk and ramp survey with lidar	2023	C. Parsons – Project Manager and Asset/GIS Team Lead M. Powell – Director of Field Operations
Bedford*	232	Pavement condition assessment, analysis, and reporting.	2023	K. Keifer – Principal Engineer A. Ghanbari – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Brenham	118	Pavement condition assessment (including structural testing), analysis and reporting.	2021	K. Keifer – Principal Engineer D. Bratton – Project Manager C. Parsons – Asset/GIS Team Lead L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Cameron County	869	Pavement condition assessment, analysis, and reporting.	2021	K. Keifer – Principal Engineer D. Butler – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Carrollton* (In progress)	732	Pavement condition assessment, analysis, and reporting.	2023	K. Keifer – Principal Engineer D. Bratton – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Celina*	77	Pavement condition assessment, analysis, and reporting.	2019	D. Butler – Project Manager M. Powell – Director of Field Operations
Cleburne*	222	Pavement condition assessment, analysis, and reporting.	2021	D. Butler – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Dallas* (In progress)	6,000	Pavement condition assessment, analysis, and reporting; sidewalk inventory; GPR study.	2023	K. Keifer – Principal Engineer A. Ghanbari – Project Manager C. Parsons – Asset/GIS Team Lead L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations

(Table Cont.)				
Texas Agency	**Miles**	**Services**	**Recent Year**	**Team Member / Role**
Denton*	913	Pavement condition assessment, analysis, and reporting (including structural testing); asset survey.	2022	K. Keifer – Principal Engineer D. Bratton – Project Manager C. Parsons – Asset/GIS Team Lead L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Denton County*	558	Pavement condition assessment, analysis, and reporting.	2022	K. Keifer – Principal Engineer D. Bratton – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
DeSoto*	37	Sidewalk and ramp survey with lidar	2021	C. Parsons – Project Manager and Asset/GIS Team Lead M. Powell – Director of Field Operations
Euless*	184	Pavement condition assessment, analysis, and reporting.	2022	K. Keifer – Principal Engineer M. Nakhaei – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Flower Mound*	525	Pavement condition assessment, analysis, and reporting.	2023	K. Keifer – Principal Engineer D. Bratton – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Fort Worth (In progress)	4,250	Pavement condition assessment; comprehensive asset survey; sidewalk and ramp survey, with lidar	2022	K. Keifer – Project Manager D. Bratton – Project Engineer C. Parsons – Asset/GIS Team Lead L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Grand Prairie*	354	Pavement condition assessment, analysis, and reporting.	2021	K. Keifer – Principal Engineer S. Khosravifar – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Huntsville	183	Pavement condition assessment, analysis, and reporting (including structural testing)	2021	D. Butler – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Keller*	260	Pavement condition assessment, analysis, and reporting (including structural testing)	2020	D. Butler – Project Manager M. Powell – Director of Field Operations
Kingsville	132	Pavement condition assessment, analysis, and reporting.	2020	D. Butler – Project Manager M. Powell – Director of Field Operations
Lancaster*	320	Pavement condition assessment, analysis, and reporting; asset inventory.	2022	K. Keifer – Principal Engineer A. Ghanbari – Project Manager C. Parsons – Asset/GIS Team Lead L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Lubbock	1500	Pavement condition assessment, analysis, and reporting (including structural testing)	2022	K. Keifer – Principal Engineer D. Bratton – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Mansfield*	320	Pavement condition assessment, analysis, and reporting.	2023	K. Keifer – Principal Engineer S. Khosravifar – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
McAllen	744	Pavement condition assessment, analysis, and reporting.	2021	D. Butler – Project Manager M. Powell – Director of Field Operations
Murphy*	92	Pavement condition assessment, analysis, and reporting (including structural testing)	2021	D. Bratton – Project Manager M. Powell – Director of Field Operations

(Table Cont.)				
Texas Agency	**Miles**	**Services**	**Recent Year**	**Team Member / Role**
Pearland (In progress)	455	Pavement condition assessment, analysis, and reporting; asset inventory.	2022	K. Keifer – Principal Engineer S. Khosravifar – Project Manager C. Parsons – Asset/GIS Team Lead L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Plainview	133	Pavement condition assessment, analysis, and reporting.	2022	D. Butler – Project Manager M. Powell – Director of Field Operations
Port Arthur	540	Pavement condition assessment, analysis, and reporting.	2020	D. Butler – Project Manager M. Powell – Director of Field Operations
Prosper* (In progress)	270	Pavement condition assessment, analysis, and reporting (including structural testing); asset inventory	2023	D. Bratton – Project Manager C. Parsons – Asset/GIS Team Lead L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Texas Tech University	72	Pavement condition assessment, analysis, and reporting; parking lot survey.	2022	K. Keifer – Principal Engineer S. Khosravifar – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations
Victoria	278	Pavement condition assessment, analysis, and reporting.	2021	D. Bratton – Project Manager M. Powell – Director of Field Operations
Waxahachie	264	Pavement condition assessment, analysis, and reporting.	2023	K. Keifer – Principal Engineer T. Rahman – Project Manager L. Ramirez – Senior QA/QC Technician M. Powell – Director of Field Operations

Quality Assurance and Quality Control Procedures

Quality Management Plan (QMP) Development

Based on discussions with the member agency during the project initiation and kickoff meetings, IMS will either use our standard QMP or develop a project-specific version of our standard QMP. The plan will address the following:

- How the data collection equipment will be calibrated and certified,
- What data quality control measures will be conducted before data collection begins and periodically during data collection,
- How data will be sampled, reviewed, and checked for quality,
- What error resolution procedures will be followed,
- How data will be accepted.

Prior to data collection beginning, we will submit a customized QMP for approval by the agency.

IMS' standard Quality Management Plan (QMP) document that is customized for each project.

Data Quality Monitoring

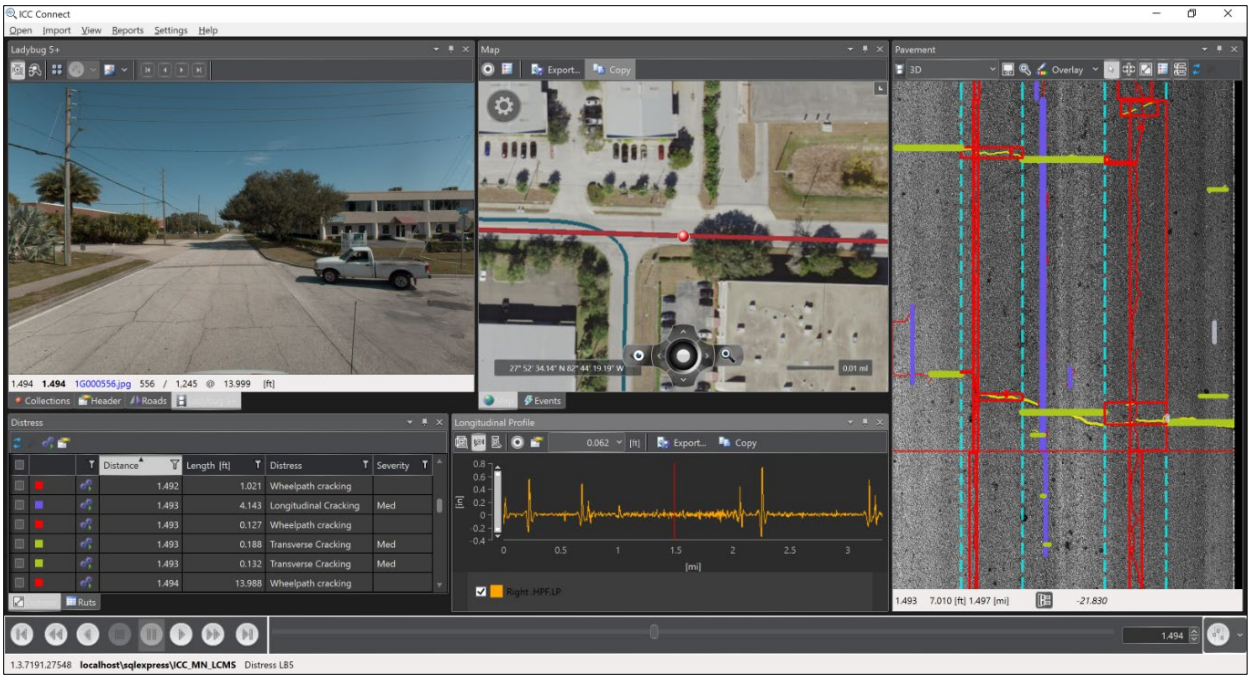
During the collection and processing workflow, data discrepancies are detected in three ways:

1. During data collection by means of real-time health monitoring systems onboard the data collection vehicle,
2. During data processing in Connect's data import module by means of data quality checks which include data completeness and data synchronization validation, and
3. During data reporting in Connect's report generation module by means of sensibility and range checks.

These processes are run on 100% of the collected and processed data. Any road sections with data discrepancies arising from sensors, systems, or processing that exceed the defined thresholds will be recollected and/or reprocessed, as necessary.

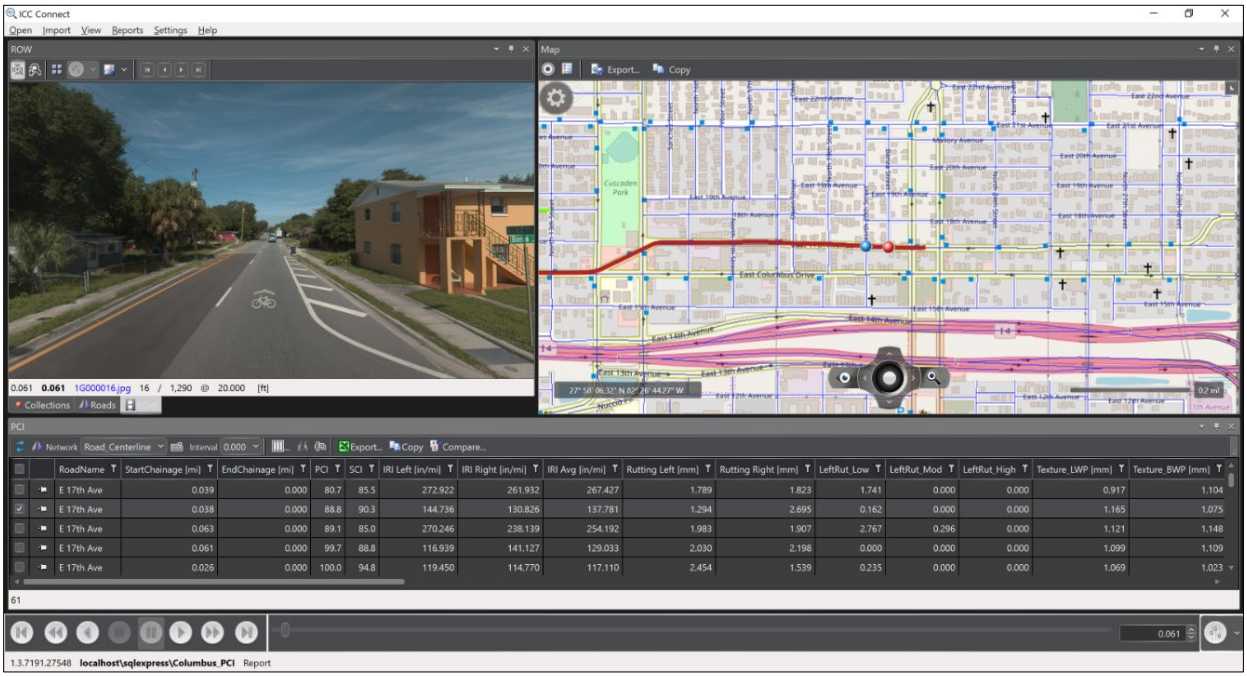
Image Sample Checking and Distance/Location Verification

Connect™ will facilitate the quality control process by allowing for a review of a random sample of pavement images to confirm the accuracy of reported distress data. The detailed distress data for each image, including both cracking and the classified and rated distresses, are shown superimposed on the pavement image. They are also shown in a table. This allows a user to efficiently review and confirm that the condition of the road has been surveyed accurately.



Connect™ with pavement distress data review.

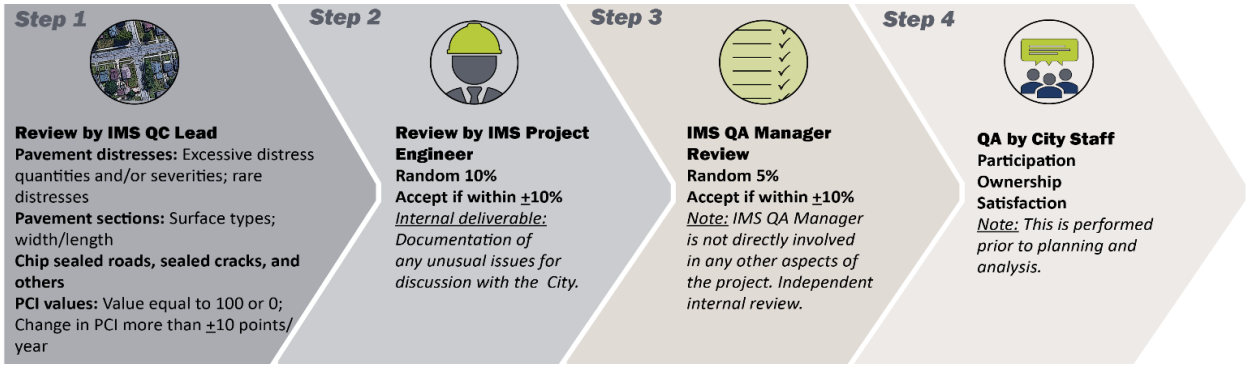
Our Connect™ software also shows the vehicle GPS traces (i.e., collection polylines) overlaid on a street view map or an aerial image. They are shown together with the GIS shapefile polylines provided by the agency, so that it can quickly be verified that the correct sections were driven, that section limits are correctly identified, and that the vehicle GPS is accurate. This all-in-one processing software makes location errors and misplaced sections things of the past, and the transparency improves client confidence in the delivered data.



Connect™ with shapefile and GPS trace.

IMS' Signature Semi-Automated QA/QC Process

IMS has developed a unique approach to pavement condition assessments by coupling manual review of distress data with automated algorithms. This more rigorous QA/QC process ensures that the automated distress detection and classification algorithms that we use work correctly. Our Pavement Engineering team fully understands the capabilities and limitations of the state-of-the-art LCMS-2 technologies and sophisticated algorithms that we employ, and our QA/QC steps are extremely important in ensuring the success of the project.



IMS' multi-step approach to QA/QC of pavement condition data to ensure ASTM D6433 and E3303 compliant data.

The IMS QA/QC process is comprehensive and makes use of field observations, automated data processing tools, manual data review by our QC team, independent review by our QA manager, and lastly, final review by the agency. There are QA/QC checks at each stage of the project to ensure data quality before the data is moved into the next steps.

IMS supplemental QA/QC interface for manually reviewing automated distress detection and classification results.

Machine learning and artificial intelligence have made leaps and bounds in speeding up distress identification. And when supplemented with trained pavement raters, field staff, and expert engineers, they establish high data confidence and integrity. The final quality assurance performed by agency personnel will ensure that the agency has confidence in and takes ownership of the condition data. We understand that others may view the IMS QA/QC process as intense, however, we have found over the years that having a multi-step process like this ensures that quality data is consistently delivered.

Assumptions

IMS Infrastructure Management Services has made no assumptions regarding our response to the requirements of RFP No. 2022-063.

Service Areas

IMS Infrastructure Management Services can provide all services in all seven categories anywhere in the United States.

Exceptions

IMS Infrastructure Management Services takes no exceptions to any part of RFP No. 2022-063.

Optional Services

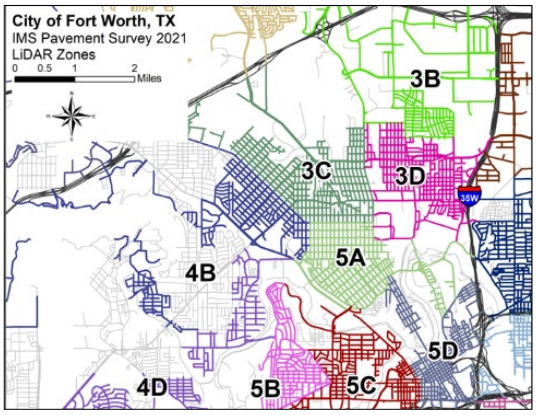
In addition to the primary services requested in the RFP, IMS proposes the following services:

1. **Sidewalk condition surveys using Sidewalk Surface Testers (SST) developed by IMS:** SST-based sidewalk surveys proved comprehensive imagery and condition data for sidewalk and pedestrian ramps. These surveys are used by agencies that require comprehensive sidewalk and ramp data for maintenance and rehabilitation planning and to assess and correct ADA compliance issues. This approach to sidewalk surveys is described in Tab D, Service Category #7.
2. **Esri Story Maps and Dashboards:** To make our data more easily accessible to agencies that may not have significant inhouse GIS expertise, we have recently started developing interactive story maps and dashboards for our clients. These tools are available online and are extremely intuitive to navigate, both for agency staff as well as the public, if desired. Our Story Maps and Dashboards are described in Tab D, Service Category #6: GIS Related Services.
3. **Enhanced Pavement Data QA/QC, Processing, and Formatting:** This approach to QA/QC for agencies that use their pavement condition data to track pavement performance more accurately over time. This approach considers the automated data collected with the state-of-the-art imaging systems and includes supplemental field observations and intensive manual QA/QC of all collected data by independently certified pavement raters. This approach is described in Tab D, in the subsection titled, “IMS’ Signature Semi-Automated QA/QC Process.”
4. **Inform™ cloud hosted software for pavement data visualization and analysis:** IMS offers a convenient, web-based tool for reviewing pavement condition data and associated imagery. The software enables agencies to review all collected pavement data, including cracking, rutting, and roughness data together, in a geocentric environment. The system was just released in early 2023 and will be available to all IMS clients moving forward. The Inform™ software is shown here: https://www.internationalcybernetics.com/inform/

Pricing for these services and others are provided in the “Additional IMS Value Added Services” section (i.e., last page) of Attachment A “Pricing Proposal Form” in Tab F.

Tab E – References

City of Fort Worth, Texas - 2021



4,250+ miles of roadway.

ASTM D6433 Pavement condition survey.

ROW asset extraction including streetlights, markings and striping, signs and supports, and ADA ramp compliance.

Deliverables: All data compatible with VUEworks.

Contact: Elizabeth Young – Project Manager
Phone: (817) 233-9866
Email: elizabeth.young@fortworthtexas.gov
Address: 200 Texas Street, Fort Worth, TX 76102

City of Bedford, Texas - 2022

Approximately 232 miles of roadway.

Linear pavement condition survey.

Software: Utilized Easy Street Analysis (ESA) spreadsheet for the pavement analysis.

Deliverables: 5-year analysis and report; updated GIS; Council presentation; onsite software training.

Contact: Cheryl Taylor – Director of Public Works
Phone: (817) 952-2256-3752
Email: Cheryl.taylor@bedfordtx.gov
Address: 1805 L. Don Dodson Drive, Bedford, TX 76021

City of Allen, Texas - 2022

Approximately 660 miles of roadway.

Linear pavement condition survey.

Visual Assessment of ROW Sidewalk condition and attributes.

Software: Easy Street Analysis (ESA).

Deliverables: 5-year pavement analysis and report; updated GIS; Images linked to GIS; Council presentation.

Contact: Chris Flanigan – Director of Public Works
Phone: (214) 509-4578
Email: cflanigan@cityofallen.org
Address: 305 Century Parkway, Allen, TX 75013

City of Euless, Texas – 2014, 2017, 2022

ASTM D6433 Pavement condition survey of 184 miles of roadway.

Deflection testing on 81 miles of major roads.

Analysis performed with IMS' Easy Street Analysis (ESA).

Council presentation prepared and delivered summarizing pavement program and 5-year recommendations.

Significant concrete component of road network.

Contact: Major Jones – Public Works Director
Phone: (817) 685-1877
Email: mjones@eulesstx.gov
Address: 201 N Ector, Euless, TX 76039

City of Grand Prairie, Texas – 2016, 2021

ASTM D6433 Pavement condition survey of 360 survey miles of roadway.

Analysis performed with PAVER.

Council presentation prepared and delivered summarizing pavement program and 5-year recommendations.

Contact: Dane Stovall – Street Services Manager
Phone: (972) 237-8526
Email: dstovall@gptx.org
Address: 206 W Church St, Grand Prairie, TX 75050

Tab F – Proposal Pricing

RFP 2022-063 Pavement Analysis and Related Services

Attachment A (per Exhibit D) - Pricing Proposal Form

Proposed prices shall include all field inspectors, vehicles, tools, equipment, traffic control, contractor maintenance, and customer service support necessary to provide the desired services.
Respondents must not include mobilization fees in their pricing and may not include them in any contract(s) that result from this RFP.

If a respondent elects to submit a percentage discount off their catalog pricing for any or all of their services, the corresponding price for each numbered activity listed in Attachment A must account for the proposed discount listed in Exhibit C.
If you are not proposing a percentage-discount, please use your established list price for each for each numbered pavement analysis and related services activity.
[Example: If your catalog price is $100 per unit, and you indicate a 5% discount from catalog pricing in Exhibit C, your pricing form in Attachment A should reflect a unit price of $95.
Conversely, if your catalog price is $100 per unit, and you indicate a 0% discount or N/A in Exhibit C, your pricing form in Attachment A should reflect a unit price of $100.]

Service Category #1: Pavement Data Collection

			Provide Price Per Tiered Group				A	B	C=AxB
Activity #	Activity Description	Unit	Unit Base Cost ($)	Unit Cost ($) 0-200 Lane Miles	Unit Cost ($) 201-700 Lane Miles	Unit Cost ($) 700+ Lane Miles	Total Units	Agreed Upon Cost ($)/Unit	Total Agreed Upon Cost ($)
1	Automatically and continuously measure pavement cracking, texture, rutting and geometrics. Equipment used for rut measurement shall be capable of measuring both wheel track ruts simultaneously.	Lane Mile [1]		$140.00	$115.00	$100.00			0
2	Collect pavement surface distress and structural condition information through automated means for all Participant-owned roadways.	Lane Mile [1]		$1.00	$1.00	$1.00			0
3	Provide a customized digital condition rating system to collect user defined severity/extent based pavement distresses and pertinent roadway attributes to accommodate a standardized approach to collecting data	Lump Sum	$2,500.00						0
4	Collect dual-wheel path roughness data to International Roughness Index standards.	Lane Mile [1]		$1.00	$1.00	$1.00			0
5	Collect pavement performance information that includes rutting using a minimum of seven (7) sensors (include pricing for nine (9) sensors as well), fatigue cracking, transverse cracking using a minimum of four (4) sensors, and longitudinal cracking	Lane Mile [1]		$1.00	$1.00	$1.00			0
6	Perform friction testing	Lane Mile [1]	See IMS Value Added Item 56 below	See IMS Value Added Item 56 below	See IMS Value Added Item 56 below	See IMS Value Added Item 56 below			0
7	Measure lane striping reflectivity quality	Lane Mile [1]		$50.00	$50.00	$50.00			0

Service Category #2: Asset Inventory

			Provide Price Per Tiered Group				A	B	C=AxB
Activity #	Activity Description	Unit	Unit Base Cost ($)	Unit Cost ($) 0-200 Lane Miles	Unit Cost ($) 201-700 Lane Miles	Unit Cost ($) 700+ Lane Miles	Total Units	Agreed Upon Cost ($)/Unit	Total Agreed Upon Cost ($)
8	Collect sidewalk data to include location, length, width, location in relation to curb and if greenspaces exist between curb and sidewalk, and sidewalk condition to create shape (.shp) files for incorporation into the Participant's GIS system, if applicable	Lane Mile [1]		$27.60	$27.60	$27.60			0
9	Collect sidewalk Barrier Free Ramp data to include location, configuration, presence of truncated domes or other detectable warning feature, and condition and create shape (.shp) files for incorporation into the Participant's GIS system, if applicable	Lane Mile 1	$25.60						0
10	Collect roadway sign data to include type and location and create shape (.shp) files for incorporation into the Participant's GIS system, if applicable.	Lane Mile 1	$40.80						0
11	Collect photos of Barrier Free Ramps, sidewalks, curb condition, drive approach, and/or roadway signs inventoried under items 8, 9, and 10 above.	Lane Mile 1	$1.00						0
12	Collect location of curb and gutter and create shape (.shp) files for incorporation into the Participant's GIS system, if applicable.	Linear Feet	$1.00						0
13	Collect location and type of visible in-pavement features such as valves, manhole covers, etc. and create shape (.shp) files for incorporation into the Participant's GIS system, if applicable.	Lane Mile 1	$27.20						0
14	Collect locations of trees, including height and spread	Lane Mile 1	$51.00						0
15	Collect bike lane locations, including width, length, and associated signage and striping.	Linear Feet	$1.00						0
16	Utilize Ground Penetrating Radar for relocating utilities (for maintenance plans).	Linear Feet	See IMS Value Added Item 54 below						0
17	Collect data on location and surface condition of bridge approaches	Each	$3.90						0
18	Collect information on bridge deck condition	Each	$3.90						0
19	Perform Parking Lot Pavement Condition Assessment (Thru-Travel Lanes) w/ Inventory, Attribute, & Geodatabase Development	Square Yard	See IMS Value Added Item 57 below						0
20 (a-v) below:	Right of Way Assets Database Development (GPS & Camera Configuration):								
20a	Sign & Support Database Development	Each	$1.70						0
20b	Markings & Striping Database Development	Each	$3.90						0
20c	Traffic Signals/ Flashers and Controllers Database Development	Each	$1.70						0
20d	Street Lights Database Development	Each	$1.70						0
20e	Drop Inlets Database Development	Each	$1.70						0
20f	Drive pads Database Development	Each	$1.70						0
20g	Bridges Database Development	Each	$2.20						0
20h	Speed Humps Database Development	Each	$1.70						0
20i	Street Furniture Database Development	Each	$1.70						0
20j	Cattle Guards Database Development	Each	$1.70						0
20k	Guardrails & Roadside Pedestrian Fence Database Development	Each	$2.20						0
20l	Culverts and Ditches Database Development	Each	$1.70						0
20m	Cabinets Database Development	Each	$1.70						0

20n	Utility Poles Database Development	Each	$1.70						0
20o	Fire Hydrant Database Development	Each	$1.70						0
20p	Medians Database Development	Each	$1.70						0
20q	Valves Database Development	Each	$1.70						0
20r	Manhole Covers Database Development	Each	$1.70						0
20s	Trees Database Development	Each	$1.70						0
20t	Catch Basins/ Drainage Inlets from Master Drainage Plan Database Development	Each	$2.20						0
20u	Sidewalk Database Development	Each	$2.20						0
20v	Curb & Gutter Database Development	Each	$2.20						0
Service Category #3: Pavement Management Analysis									
			Provide Price Per Tiered Group				**A**	**B**	**C=AxB**
Activity #	**Activity Description**	**Unit**	**Unit Base Cost ($)**	**Unit Cost ($) 0-200 Lane Miles**	**Unit Cost ($) 201-700 Lane Miles**	**Unit Cost ($) 700+ Lane Miles**	**Total Units**	**Agreed Upon Cost ($)/Unit**	**Total Agreed Upon Cost ($)**
21	Calculate the International Roughness Index (IRI)for each road segment in accordance with ASTM E1926. Provide results compatible with the Participant's GIS database, if applicable.	Lane Mile [1]		$1.00	$1.00	$1.00			0
22	Calculate a Pavement Condition Index (PCI) score for each road segment using an approved pavement management system and in accordance with ASTM D6433 or ASTM E3303. Provide results compatible with the Participant's GIS database, if applicable.	Lane Mile [1]		$20.00	$15.00	$12.00			0
23	With input from Participant's staff, devise a weighing system taking into account PCI, IRI, average daily traffic for thoroughfares (traffic count raw data provided by Participant), public safety emergency routes, and apply this 0-100 numeric index to the roadway information collected for the entire jurisdiction. Provide results compatible with the Participant's GIS database, if applicable.**Cost includes base cost plus lane mile unit cost.**	Lane Mile [1]	$2,000.00	$0.00	$1.00	$1.00			0
24	Estimate the annual budget required to meet the long-term goals regarding desired pavement condition levels**Cost includes base cost plus lane mile unit cost.**	Each Participant	$4,500.00	$0.00	$1.50	$2.00			0
25	Create a five year and ten year pavement rehabilitation plan with input from Participant's staff**Cost includes base cost plus lane mile unit cost.**	Each Participant	$3,000.00	$0.00	$1.50	$2.00			0
26	Recommend the computer hardware and software needed for successful implementation, potentially including recommendations for licenses of pavement management system software and other geodatabase software as needed.	Each Participant	$1,500.00						0
27	Train Participant staff and provide assistance to the Public Works and IT Department as needed for the use of data collected through the fully automated system**(20 person maximum per class)**	Day	$3,500.00						0
Service Category #4: Electronic Products									
			Provide Price Per Tiered Group				**A**	**B**	**C=AxB**
Activity #	**Activity Description**	**Unit**	**Unit Base Cost ($)**	**Unit Cost ($) 0-200 Lane Miles**	**Unit Cost ($) 201-700 Lane Miles**	**Unit Cost ($) 700+ Lane Miles**	**Total Units**	**Agreed Upon Cost ($)/Unit**	**Total Agreed Upon Cost ($)**
28	Roadway information that shall be collected and provided to the Participant at a minimum includes items a. through i. in Exhibit B	Lane Mile [1]		$5.00	$3.00	$2.00			0
29	Collect digital images at 25-foot intervals of the road surface condition and link to a geodatabase (minimum forward facing imagery).	Lane Mile [1]		$5.00	$5.00	$5.00			0
30	Load assessment data for all Participant-maintained pavements into a pavement management system required by local government Participant(s), if applicable. (Example: MicroPaver). The assessment data shall include visual observations, photographs and measurements collected by instrumentation**Cost includes base cost plus lane mile unit cost.**	Each Participant	$3,500.00	$5.00	$4.00	$3.00			0
31	Implement map module so that pavement condition and other data can be integrated, displayed, and accessed through the map interface in a format consistent with the Participant's horizontal and vertical control network system, if applicable.**Cost includes base cost plus lane mile unit cost.**	Each Participant	$7,000.00	$0.00	$5.00	$5.00			0
32	Provide to the Participant the pavement condition data in a pavement management system database approved by Participant. Coordinate with the Participant's IT department to provide pavement condition data in a format compatible with the Participant's Environmental Systems Research Institute (ESRI) GIS database, if applicable. **Cost includes base cost plus lane mile unit cost.**	Each Participant	$1,500.00	$10.00	$8.00	$5.00			0
33	Provide asset management tools or systems (not just collection) (i.e., 15-year plan about how to fix or repair assets)**Cost includes base cost plus lane mile unit cost.**	Each Participant	$2,500.00	$0.00	$0.00	$0.00			0
Service Category #5: Pavement Structural Analysis									
			Provide Price Per Tiered Group				**A**	**B**	**C=AxB**
Activity #	**Activity Description**	**Unit**	**Unit Base Cost ($)**	**Unit Cost ($) 0-200 Lane Miles**	**Unit Cost ($) 201-700 Lane Miles**	**Unit Cost ($) 700+ Lane Miles**	**Total Units**	**Agreed Upon Cost ($)/Unit**	**Total Agreed Upon Cost ($)**
34	Collect and analyze pavement structural condition information through the use of a falling weight deflectometer in accordance with industry standards on designated participant-owned roadways.	**							0
35	Collect and analyze pavement structural condition information through the use of Ground Penetrating Radar (GPR) in accordance with industry standards on designated participant-owned roadways.	**							0
36	Collect and analyze pavement structural condition information through the use of pavement cores in accordance with industry standards on designated participant-owned roadways (traffic control included)[2]	**							0
Service Category #6: GIS Related Services									
			Provide Price Per Tiered Group				**A**	**B**	**C=AxB**
Activity #	**Activity Description**	**Unit**	**Unit Base Cost ($)**	**Unit Cost ($) 0-200 Lane Miles**	**Unit Cost ($) 201-700 Lane Miles**	**Unit Cost ($) 700+ Lane Miles**	**Total Units**	**Agreed Upon Cost ($)/Unit**	**Total Agreed Upon Cost ($)**
37	GIS Clean-Up Services	Each Participant	$170 per Hour						0
38	GIS Support Services	Each Participant	$170 per Hour						0
39	GIS Remote Training Sessions from IMS GIS Manager/ Expert (2-Hour Sessions)	Each Participant	$170 per Hour						0

Service Category #7: Value Added Services									
			Provide Price Per Tiered Group				A	B	C=AxB
Activity #	Activity Description	Unit	Unit Base Cost ($)	Unit Cost ($) 0-200 Lane Miles	Unit Cost ($) 201-700 Lane Miles	Unit Cost ($) 700+ Lane Miles	Total Units	Agreed Upon Cost ($)/Unit	Total Agreed Upon Cost ($)
40	Full Written Final Report- Firm shall prepare and submit a written project report summarizing the work performed, dates of collection, methodology, and results.	Each Participant	$3,500.00						0
41	Project Presentation- Firm shall prepare and present a written project report summarizing the work performed, dates of collection, methodology, and results to the Participant's legislative body.	Each Participant	$3,500.00						0
42	Provide Curb Ramp and ADA/Barrier Free Ramp Compliance Survey	Each Participant	See IMS Value Added Item 48 below						0
43	Stand-alone field operation for collection of asset inventory only, with different levels of position accuracy and abilities to use data for attribute registration and conditions. **Cost includes base cost plus lane mile unit cost.** a.Photogrammetry b.Mobile Lidar	Lane Mile [1]	a. $7,500.00 b. (See IMS Value Added Item 49 below)	a. $100.00 b. (See IMS Value Added Item 49 below)	a. $ 90.00 b. (See IMS Value Added Item 49 below)	a. $ 80.00 b. (See IMS Value Added Item 49 below)			0
44	Generic asset types, allowing for any item within line of sight of the collection vehicle. Asset types include items a. through d. in Exhibit B. **Cost includes base cost plus lane mile unit cost.**	Lane Mile [1]	$1,500.00	(See IMS Value Added Items 50a-v Pricing below)	(See IMS Value Added Items 50a-v Pricing below)	(See IMS Value Added Items 50a-v Pricing below)			0
45	Provide consultancy services to develop linework in GIS for missing sidewalks in order to quantify and identify on a map	Hour	$170.00						0
						TOTAL			0

[1] Lane mile is to be defined as a mile traveled as

1. A single pass on alleyways

2. A centered single pass on residential streets

3. Includes the outside lane in each direction for collectors and arterials (2 total).

[2]Spacing for pavement cores to be negotiated with each participant.

**** The awarded Contractor(s) shall provide all necessary field inspectors, vehicles, tools, equipment, traffic control and other services required to perform this work. No engineering services are available under this contact. Any activities that Participant and/or Contractor deem to require the service(s) of an engineer must be procured separately and are the sole responsibility of that party."**

Additional IMS Value Added Services									
			Provide Price Per Tiered Group				A	B	C=AxB
Activity #	Activity Description	Unit	Unit Base Cost ($)	Unit Cost ($) 0-200 Lane Miles	Unit Cost ($) 201-700 Lane Miles	Unit Cost ($) 700+ Lane Miles	Total Units	Agreed Upon Cost ($)/Unit	Total Agreed Upon Cost ($)
46	Enhanced Pavement Data QA/QC, Processing, & Formatting (Fully Automated + Additional Field Observations + Manual QA/QC)	Lane Mile [1]		$20.00	$20.00	$20.00			0
47	Full Stand-Alone Pedestrian Network (Sidewalks, Obstructions, Ramps) Condition Assessment Using Sidewalk Surface Tester (SST) and Lidar. Deliverables Include Sidewalk Distresses & Ramp Measurements in Tabular & GIS Formats.**Cost includes base cost plus sidewalk mile unit cost.**	Lane Mile [1]	$42,500.00	$450.00	$450.00	$450.00			0
48	Barrier-Free Curb Ramp Inventory and Survey Using Lidar. Deliverables Include Ramp Inventory, Ramp Geometric Measurements and Attributes in Tabular & GIS Formats. **Cost includes base cost plus sidewalk mile unit cost.**	Lane Mile [1]	$32,500.00	$100.00	$100.00	$100.00			0
49	Stand-alone field operation for collection of asset inventory development only with Mobile Lidar. Pricing will vary depending on level of positional accuracy required and asset attribution detail.	**							0
50 (a-v)	**Right of Way Assets Data Collection (by per lane/ survey mile):** ***Assumes 3 Attributes per Asset***								
50a	Sign & Support Database Development	Lane Mile [1]		$57.80	$57.80	$57.80			0
50b	Markings & Striping Database Development	Lane Mile [1]		$36.89	$36.89	$36.89			0
50c	Traffic Signals/ Flashers and Controllers Database Development	Lane Mile [1]		$17.34	$17.34	$17.34			0
50d	Street Lights Database Development	Lane Mile [1]		$34.68	$34.68	$34.68			0
50e	Drop Inlets Database Development	Lane Mile [1]		$14.45	$14.45	$14.45			0
50f	Drive pads Database Development	Lane Mile [1]		$14.45	$14.45	$14.45			0
50g	Bridges Database Development	Lane Mile [1]		$17.34	$17.34	$17.34			0
50h	Speed Humps Database Development	Lane Mile [1]		$17.34	$17.34	$17.34			0
50i	Street Furniture Database Development	Lane Mile [1]		$17.34	$17.34	$17.34			0
50j	Cattle Guards Database Development	Lane Mile [1]		$14.96	$14.96	$14.96			0
50k	Guardrails & Roadside Pedestrian Fence Database Development	Lane Mile [1]		$14.96	$14.96	$14.96			0
50l	Culverts and Ditches Database Development	Lane Mile [1]		$14.96	$14.96	$14.96			0
50m	Cabinets Database Development	Lane Mile [1]		$14.96	$14.96	$14.96			0
50n	Utility Poles Database Development	Lane Mile [1]		$34.68	$34.68	$34.68			0
50o	Fire Hydrant Database Development	Lane Mile [1]		$14.96	$14.96	$14.96			0
50p	Medians Database Development	Lane Mile [1]		$14.96	$14.96	$14.96			0
50q	Valves Database Development	Lane Mile [1]		$23.12	$23.12	$23.12			0
50r	Manhole Covers Database Development	Lane Mile [1]		$14.96	$14.96	$14.96			0
50s	Trees Database Development	Lane Mile [1]		$43.35	$43.35	$43.35			0
50t	Catch Basins/ Drainage Inlets from Master Drainage Plan Database Development	Lane Mile [1]		$14.96	$14.96	$14.96			0
50u	Sidewalk Database Development	Lane Mile [1]		$14.96	$14.96	$14.96			0
50v	Curb & Gutter Database Development	Lane Mile [1]		$14.96	$14.96	$14.96			0

51	ROW Assets - Additional Attributes for Any Selected Asset "per Each"	Lane Mile [1]		**$0.50**	**$0.50**	**$0.50**			**0**
52	Collect and analyze pavement structural condition w/ falling weight deflectometer (FastFWD) in accordance with industry standards on designated participant-owned roadways. **Cost includes base cost plus lane mile unit cost.**	Lane Mile [1]	**$5,000.00**	**$180.00**	**$160.00**	**$140.00**			**0**
53	Collect and analyze pavement structural condition information through the use of Ground Penetrating Radar (GPR) in accordance with industry standards on designated roadways. **Cost includes base cost plus lane mile unit cost.**	Lane Mile [1]	**$11,500.00**	**$120.00**	**$110.00**	**$100.00**			**0**
54	Utilize Ground Penetrating Radar for**Relocating Utilities** (for maintenance plans) **Cost includes base cost plus lane mile unit cost.**	Linear Foot	**$11,500.00**	**$20.00**	**$20.00**	**$20.00**			**0**
55	Collect and analyze pavement structural condition information through the use of pavement cores in accordance with industry standards on designated roadways (incl. traffic control)[2] **Cost includes base cost plus lane mile unit cost.**	**							**0**
56	Collect and analyze pavement surface condition information through the use of Friction Testing in accordance with industry standards on designated roadways. **Cost includes base cost plus lane mile unit cost.**	Lane Mile [1]	**$4,500.00**	**$156.00**	**$147.00**	**$139.00**			**0**
57	Perform Parking Lot Pavement Condition Assessment (Thru-Travel Lanes) w/ Inventory, Attribute, & Geodatabase Development **Cost includes base cost plus square yard unit cost.**	Square Yard	**$12,500.00**	**$0.20**	**$0.20**	**$0.20**			**0**
58	Inform(tm) Solution for Making the Collected Image Data Available to Clients. **Cost includes annual hosting cost plus lane mile unit cost per network lane mile quantities below (a - g).** **a. < 400 lane miles** **b. 400 - 800** **c. 801 - 1,200** **d. 1,201 - 2,400** **e. 2,401 - 4,800** **f. 4,801 - 9,600** **g. > 9,600**	(See notes to left.) Lane Mile [1]	**a. $2,000.00** **b. $4,000.00** **c. $6,000.00** **d. $8,000.00** **e. $10,000.00** **f. $14,000.00** **g. $20,000.00**	**$0.00**	**$0.00**	**$0.00**			**0**
						TOTAL			**0**

Tab G – Required Attachments

Attachment I. Instructions for Proposals Compliance and Submittal

ATTACHMENT I:
INSTRUCTIONS FOR PROPOSALS COMPLIANCE AND SUBMITTAL

Compliance with the Solicitation

Submissions must be in strict compliance with this solicitation. Failure to comply with all provisions of the solicitation may result in disqualification.

Acknowledgment of Insurance Requirements

By signing its submission, Offeror acknowledges that it has read and understands the insurance requirements for the submission. Offeror also understands that the evidence of required insurance may be requested to be submitted within ten (10) working days following notification of its offer being accepted; otherwise, NCTCOG may rescind its acceptance of the Offeror's proposals. The insurance requirements are outlined in Section 6.04.

Name of Organization/Contractor(s):

IMS Infrastructure Management Services, LP

Signature of Authorized Representative:

Date: February 24, 2023

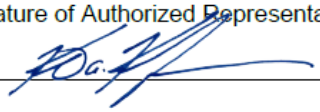
Attachment II. Certifications of Offeror

ATTACHMENT II:
CERTIFICATIONS OF OFFEROR

Name of Organization/Contractor(s):

IMS Infrastructure Management Services, LP

Signature of Authorized Representative:



Date: February 24, 2023

Attachment III. Certification Regarding Debarment, Suspension and other Responsibility Matters

ATTACHMENT III:
CERTIFICATION REGARDING DEBARMENT, SUSPENSION AND OTHER RESPONSIBILITY MATTERS

This certification is required by the Federal Regulations Implementing Executive Order 12549, Debarment and Suspension, 45 CFR Part 93, Government-wide Debarment and Suspension, for the Department of Agriculture (7 CFR Part 3017), Department of Labor (29 CFR Part 98), Department of Education (34 CFR Parts 85, 668, 682), Department of Health and Human Services (45 CFR Part 76).

The undersigned certifies, to the best of his or her knowledge and belief, that both it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency;

2. Have not within a three-year period preceding this contract been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or Local) transaction or contract under a public transaction, violation of federal or State antitrust statues or commission of embezzlement, theft, forgery, bribery, falsification, or destruction of records, making false Proposals, or receiving stolen property;

3. Are not presently indicated for or otherwise criminally or civilly charged by a government entity with commission of any of the offense enumerated in Paragraph (2) of this certification; and,

4. Have not within a three-year period preceding this contract had one or more public transactions terminated for cause or default.

Where the prospective recipient of federal assistance funds is unable to certify to any of the qualifications in this certification, such prospective recipient shall attach an explanation to this certification form.

Name of Organization/Contractor(s):

IMS Infrastructure Management Services, LP

Signature of Authorized Representative:

Date: February 24, 2023

Attachment IV. Restrictions on Lobbying

ATTACHMENT IV:
RESTRICTIONS ON LOBBYING

Section 319 of Public Law 101-121 prohibits recipients of federal contracts, grants, and loans exceeding $100,000 at any tier under a federal contract from using appropriated funds for lobbying the Executive or Legislative Branches of the federal government in connection with a specific contract, grant, or loan. Section 319 also requires each person who requests or receives a federal contract or grant in excess of $100,000 to disclose lobbying.

No appropriated funds may be expended by the recipient of a federal contract, loan, or cooperative agreement to pay any person for influencing or attempting to influence an officer or employee of any federal executive department or agency as well as any independent regulatory commission or government corporation, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered federal actions: the awarding of any federal contract, the making of any federal grant, the making of any federal loan the entering into of any cooperative agreement and the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.

As a recipient of a federal grant exceeding $100,000, NCTCOG requires its subcontractors of that grant to file a certification, set forth in Appendix B.1, that neither the agency nor its employees have made, or will make, any payment prohibited by the preceding paragraph.

Subcontractors are also required to file with NCTCOG a disclosure form, set forth in Appendix B.2, if the subcontractor or its employees have made or have agreed to make any payment using nonappropriated funds (to include profits from any federal action), which would be prohibited if paid for with appropriated funds.

LOBBYING CERTIFICATION
FOR CONTRACTS, GRANTS, LOANS, AND COOPERATIVE AGREEMENTS

The undersigned certifies, to the best of his or her knowledge or belief, that:

1. No federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an officer or employee of a Member of Congress in connection with the awarding of any federal contract, the making of any federal loan, the entering into of any cooperative Contract, and the extension, continuation, renewal, amendment, or modification or any federal contract, grant, loan, or cooperative contract; and

2. If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this federal contract, grant, loan, and or cooperative contract, the undersigned shall complete and submit Standard Form – LLL, "Disclosure Form to Report Lobbying", in accordance with the instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers and that all sub-recipients shall certify accordingly.

Name of Organization/Contractor(s):

IMS Infrastructure Management Services, LP

Signature of Authorized Representative:

Date: February 24, 2023

Attachment V. Drug-Free Workplace Certification

ATTACHMENT V:
DRUG-FREE WORKPLACE CERTIFICATION

The IMS Infrastructure Management Services, LP (company name) will provide a Drug Free Work Place in compliance with the Drug Free Work Place Act of 1988. The unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited on the premises of the IMS Infrastructure Management Services, LP (company name) or any of its facilities. Any employee who violates this prohibition will be subject to disciplinary action up to and including termination. All employees, as a condition of employment, will comply with this policy.

CERTIFICATION REGARDING DRUG-FREE WORKPLACE

This certification is required by the Federal Regulations Implementing Sections 5151-5160 of the Drug-Free Workplace Act, 41 U.S.C. 701, for the Department of Agriculture (7 CFR Part 3017), Department of Labor (29 CFR Part 98), Department of Education (34 CFR Parts 85, 668 and 682), Department of Health and Human Services (45 CFR Part 76).

The undersigned subcontractor certifies it will provide a drug-free workplace by:

Publishing a policy Proposal notifying employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the workplace and specifying the consequences of any such action by an employee;

Establishing an ongoing drug-free awareness program to inform employees of the dangers of drug abuse in the workplace, the subcontractor's policy of maintaining a drug-free workplace, the availability of counseling, rehabilitation and employee assistance programs, and the penalties that may be imposed on employees for drug violations in the workplace;

Providing each employee with a copy of the subcontractor's policy Proposal;

Notifying the employees in the subcontractor's policy Proposal that as a condition of employment under this subcontract, employees shall abide by the terms of the policy Proposal and notifying the subcontractor in writing within five days after any conviction for a violation by the employee of a criminal drug abuse statue in the workplace;

Notifying the Board within ten (10) days of the subcontractor's receipt of a notice of a conviction of any employee; and,

Taking appropriate personnel action against an employee convicted of violating a criminal drug statue or requires such employee to participate in a drug abuse assistance or rehabilitation program.

Name of Organization/Contractor(s):

IMS Infrastructure Management Services, LP

Signature of Authorized Representative:

Date: February 24, 2023

Attachment VI. Certification Regarding Disclosure of Conflict of Interest

ATTACHMENT VI:
CERTIFICATION REGARDING DISCLOSURE OF CONFLICT OF INTEREST

The undersigned certifies that, to the best of his or her knowledge or belief, that:

"No employee of the contractor, no member of the contractor's governing board or body, and no person who exercises any functions or responsibilities in the review or approval of the undertaking or carrying out of this contract shall participate in any decision relating to this contract which affects his/her personal pecuniary interest.

Executives and employees of contractor shall be particularly aware of the varying degrees of influence that can be exerted by personal friends and associates and, in administering the contract, shall exercise due diligence to avoid situations which give rise to an assertion that favorable treatment is being granted to friends and associates. When it is in the public interest for the contractor to conduct business with a friend or associate of an executive or employee of the contractor, an elected official in the area or a member of the North Central Texas Council of Governments, a permanent record of the transaction shall be retained.

Any executive or employee of the contractor, an elected official in the area or a member of the NCTCOG, shall not solicit or accept money or any other consideration from a third person, for the performance of an act reimbursed in whole or part by contractor or Department. Supplies, tools, materials, equipment or services purchased with contract funds shall be used solely for purposes allowed under this contract. No member of the NCTCOG shall cast a vote on the provision of services by that member (or any organization which that member represents) or vote on any matter which would provide a direct or indirect financial benefit to the member or any business or organization which the member directly represents".

No officer, employee or paid consultant of the contractor is a member of the NCTCOG.

No officer, manager or paid consultant of the contractor is married to a member of the NCTCOG.

No member of NCTCOG directly owns, controls or has interest in the contractor.

The contractor has disclosed any interest, fact, or circumstance that does or may present a potential conflict of interest.

No member of the NCTCOG receives compensation from the contractor for lobbying activities as defined in Chapter 305 of the Texas Government Code.

Should the contractor fail to abide by the foregoing covenants and affirmations regarding conflict of interest, the contractor shall not be entitled to the recovery of any costs or expenses incurred in relation to the contract and shall immediately refund to the North Central Texas Council of Governments any fees or expenses that may have been paid under this contract and shall further be liable for any other costs incurred or damages sustained by the NCTCOG as it relates to this contract.

Name of Organization/Contractor(s):

IMS Infrastructure Management Services, LP

Signature of Authorized Representative:

Date: February 24, 2023

Attachment VII. Certification of Fair Business Practices

ATTACHMENT VII:
CERTIFICATION OF FAIR BUSINESS PRACTICES

That the submitter has not been found guilty of unfair business practices in a judicial or state agency administrative proceeding during the preceding year. The submitter further affirms that no officer of the submitter has served as an officer of any company found guilty of unfair business practices in a judicial or state agency administrative during the preceding year.

Name of Organization/Contractor(s):

IMS Infrastructure Management Services, LP

Signature of Authorized Representative:

Date: February 24, 2023

Attachment VIII. Certification of Good Standing Texas Corporate Franchise Tax Certification

ATTACHMENT VIII:
CERTIFICATION OF GOOD STANDING
TEXAS CORPORATE FRANCHISE TAX CERTIFICATION

Pursuant to Article 2.45, Texas Business Corporation Act, state agencies may not contract with for profit corporations that are delinquent in making state franchise tax payments. The following certification that the corporation entering into this offer is current in its franchise taxes must be signed by the individual authorized on Form 2031, Corporate Board of Directors Resolution, to sign the contract for the corporation.

The undersigned authorized representative of the corporation making the offer herein certified that the following indicated Proposal is true and correct and that the undersigned understands that making a false Proposal is a material breach of contract and is grounds for contract cancellation.

Indicate the certification that applies to your corporation:

✓ The Corporation is a for-profit corporation and certifies that it is not delinquent in its franchise tax payments to the State of Texas.

_____ The Corporation is a non-profit corporation or is otherwise not subject to payment of franchise taxes to the State of Texas.

Type of Business (if not corporation):

- ☐ Sole Proprietor
- ☒ Partnership
- ☐ Other

Pursuant to Article 2.45, Texas Business Corporation Act, the North Central Texas Council of Governments reserves the right to request information regarding state franchise tax payments.

Kurt Keifer, PhD, PE , President
(Printed/Typed Name and Title of Authorized Representative)

Signature

Date: February 24, 2023

Attachment IX. HUB, M/W/DBE – IMS Infrastructure Management Services

ATTACHMENT IX:
HISTORICALLY UNDERUTILIZED BUSINESSES, MINORITY OR WOMEN-OWNED OR DISADVANTAGED BUSINESS ENTERPRISES

Historically Underutilized Businesses (HUBs), minority or women-owned or disadvantaged businesses enterprises (M/W/DBE) are encouraged to participate in the solicitation process. Representatives from HUB companies should identify themselves and submit a copy of their certification.

NCTCOG recognizes the certifications of both the State of Texas Program and the North Central Texas Regional Certification Agency. Companies seeking information concerning HUB certification are urged to contact:

State of Texas HUB Program
Texas Comptroller of Public Accounts
Lyndon B. Johnson State Office Building
111 East 17th Street
Austin, Texas 78774
(512) 463-6958
http://www.window.state.tx.us/procurement/prog/hub/

Local businesses seeking M/W/DBE certification should contact:

North Central Texas Regional Certification Agency
624 Six Flags Drive, Suite 100
Arlington, TX 76011
(817) 640-0606
http://www.nctrca.org/certification.html

Submitter must include a copy of its minority certification documentation as part of this solicitation. If your company is already certified, attach a copy of your certification to this form and return with your proposal.

Indicate all that apply: Not Applicable

_____Minority-Owned Business Enterprise

_____Women-Owned Business Enterprise

_____Disadvantaged Business Enterprise

ATTEST TO Attachments of Certification:

_____
Authorized Signature

_____ _____
Typed Name Date

Subscribed and sworn to before me this _____day of _____ (month), 20__ in

_____ (city), _____ (county), _____ (state).

SEAL

Notary Public in and for _____ (County),
State of _____ Commission expires: _____

Attachment IX. HUB, M/W/DBE –
Gorrondona and Associates, Inc.

ATTACHMENT IX:
HISTORICALLY UNDERUTILIZED BUSINESSES, MINORITY OR WOMEN-OWNED OR DISADVANTAGED BUSINESS ENTERPRISES

Historically Underutilized Businesses (HUBs), minority or women-owned or disadvantaged businesses enterprises (M/W/DBE) are encouraged to participate in the solicitation process. Representatives from HUB companies should identify themselves and submit a copy of their certification.

NCTCOG recognizes the certifications of both the State of Texas Program and the North Central Texas Regional Certification Agency. Companies seeking information concerning HUB certification are urged to contact:

State of Texas HUB Program
Texas Comptroller of Public Accounts
Lyndon B. Johnson State Office Building
111 East 17th Street
Austin, Texas 78774
(512) 463-6958
http://www.window.state.tx.us/procurement/prog/hub/

Local businesses seeking M/W/DBE certification should contact:

North Central Texas Regional Certification Agency
624 Six Flags Drive, Suite 100
Arlington, TX 76011
(817) 640-0606
http://www.nctrca.org/certification.html

Submitter must include a copy of its minority certification documentation as part of this solicitation. If your company is already certified, attach a copy of your certification to this form and return with your proposal.

Indicate all that apply:

__x__ Minority-Owned Business Enterprise

Gorrondona & Associates, Inc.

_____ Women-Owned Business Enterprise

_____ Disadvantaged Business Enterprise

ATTEST TO Attachments of Certification:

W. Truett Wilson
Authorized Signature

W. Truett Wilson, RPLS — Typed Name
02/03/2023 — Date

Subscribed and sworn to before me this 3rd day of February (month), 2023 in

Fort Worth (city), Tarrant (county), Texas (state).

SEAL

Notary Public in and for Tarrant (County),
State of Texas Commission expires: 04/06/2023

DAWN R. MCMICHAEL NOTARY PUBLIC STATE OF TEXAS ID 13017961-6 EXP. 04-06-2023

Dawn R. McMichael

Attachment X. Attestation of Contracts Nullifying Activity

ATTACHMENT X
ATTESTATION OF CONTRACTS NULLIFYING ACTIVITY

The following provisions are mandated by Federal and/or State of Texas law. Failure to certify to the following will result in disqualification of consideration for contract. Entities or agencies that are not able to comply with the following will be ineligible for consideration of contract award.

PROHIBITED TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT CERTIFICATION

This Contract is subject to the Public Law 115-232, Section 889, and 2 Code of Federal Regulations (CFR) Part 200, including §200.216 and §200.471, for prohibition on certain telecommunications and video surveillance or equipment.

Public Law 115-232, Section 889, identifies that restricted telecommunications and video surveillance equipment or services (e.g. phones, internet, video surveillance, cloud servers) include the following:

A) Telecommunications equipment that is produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliates of such entities).

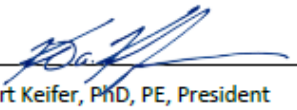
B) Video surveillance and telecommunications equipment produced by Hytera Communications Corporations, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliates of such entities).

C) Telecommunications or video surveillance services used by such entities or using such equipment.

D) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, Director of the National Intelligence, or the Director of the Federal Bureau of Investigation reasonably believes to be an entity owned or controlled by the government of a covered foreign country.

The entity identified below, through its authorized representative, hereby certifies that no funds under this Contract will be obligated or expended to procure or obtain telecommunication or video surveillance services or equipment or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as a critical technology as part of any system prohibited by 2 CFR §200.216 and §200.471, or applicable provisions in Public Law 115-232 Section 889.

☒ The Contractor or Subrecipient hereby certifies that it does comply with the requirements of 2 CFR §200.216 and §200.471, or applicable regulations in Public Law 115-232 Section 889.

SIGNATURE OF AUTHORIZED PERSON: 

NAME OF AUTHORIZED PERSON: Kurt Keifer, PhD, PE, President

NAME OF COMPANY: IMS Infrastructure Management Services, LP

DATE: February 21, 2023

Exhibit A – Service Area Designation Forms

EXHIBIT A
Service Area Designation Forms

RFP 2022-063	Texas Service Area Designation or Identification		
Respondent Name:	IMS Infrastructure Management Services, LP		
Notes:	Indicate in the appropriate box whether you are proposing to service the entire State of Texas		
	Will service the entire State of Texas	Will not service the entire State of Texas	
	YES		
	If you are not proposing to service the entire State of Texas, designate on the form below the regions that you are proposing to provide goods and/or services to. By designating a region or regions, you are certifying that you are willing and able to provide the proposed goods and services.		
Item	**Region**	**Metropolitan Statistical Areas**	**Designated Service Area**
1.	North Central Texas	16 counties in the Dallas-Fort Worth Metropolitan area	
2.	High Plains	Amarillo Lubbock	
3.	Northwest	Abilene Wichita Falls	
4.	Upper East	Longview Texarkana, TX-AR Metro Area Tyler	
5.	Southeast	Beaumont-Port Arthur	
6.	Gulf Coast	Houston-The Woodlands-Sugar Land	
7.	Central Texas	College Station-Bryan Killeen-Temple Waco	
8.	Capital Texas	Austin-Round Rock	
9.	Alamo	San Antonio-New Braunfels Victoria	
10.	South Texas	Brownsville-Harlingen Corpus Christi Laredo McAllen-Edinburg-Mission	
11.	West Texas	Midland Odessa San Angelo	
12.	Upper Rio Grande	El Paso	

RFP 2022-063	**Nationwide Service Area Designation or Identification Form**		
Respondent Name:	IMS Infrastructure Management Services, LP		
Notes:	Indicate in the appropriate box whether you are proposing to provide service to all Fifty (50) States.		
	Will service all Fifty (50) States	Will not service Fifty (50) States	
	YES		
	If you are not proposing to service to all Fifty (50) States, then designate on the form below the States that you will provide service to. By designating a State or States, you are certifying that you are willing and able to provide the proposed goods and services in those States. If you are only proposing to service a specific region, metropolitan statistical area (MSA), or city in a State, then indicate as such in the appropriate column box.		

Item	State	Region/MSA/City	Designated as a Service Area
1.	Alabama		
2.	Alaska		
3.	Arizona		
4.	Arkansas		
5.	California		
6.	Colorado		
7.	Connecticut		
8.	Delaware		
9.	Florida		
10.	Georgia		
11.	Hawaii		
12.	Idaho		
13.	Illinois		
14.	Indiana		
15.	Iowa		
16.	Kansas		
17.	Kentucky		
18.	Louisiana		
19.	Maine		
20.	Maryland		
21.	Massachusetts		

22.	Michigan		
23.	Minnesota		
24.	Mississippi		
25.	Missouri		
26.	Montana		
27.	Nebraska		
28.	Nevada		
29.	New Hampshire		
30.	New Jersey		
31.	New Mexico		
32.	New York		
33.	North Carolina		
34.	North Dakota		
35.	Ohio		
36.	Oregon		
37.	Oklahoma		
38.	Pennsylvania		
39.	Rhode Island		
40.	South Carolina		
41.	South Dakota		
42.	Tennessee		
43.	Texas		
44.	Utah		
45.	Vermont		
46.	Virginia		
47.	Washington		
48.	West Virginia		
49.	Wisconsin		
50.	Wyoming		

Exhibit C – Service Questionnaire

EXHIBIT C
Service Questionnaire

Respondents are encouraged to consider that cooperative contracts are able to be offered to any public-sector agency that can benefit from them, anywhere in the nation.

For any or all of their services, respondents may therefore provide a percentage discount off of catalog pricing. A 0% discount must still be denoted on the line item(s) with the number zero. Respondents are **not** required to propose a discount.

Indicate the services you are able to offer, as well as any proposed discounts. If you are not proposing a percentage-discount, please mark that field N/A.

Category #	Description	Yes	No	Proposed % Discount
1	Pavement Data Collection	✓		0 %
2	Asset Inventory Management	✓		0 %
3	Pavement Management Analysis	✓		0 %
4	Electronic Products	✓		0 %
5	Pavement Structural Evaluations	✓		0 %
6	GIS Related Services	✓		0 %
7	Value Added Services	✓		0 %

Respondents should address the following items in Tab D: Technical Proposal if they are applicable for the service(s) being proposed.

- Respondents are asked to identify services that they are able to provide.
- Respondents are not required to be able to respond to all services in order to provide a proposal to this RFP.
- Those Respondents that are capable of providing more than a single service, indicate which in the table above, and provide an individual narrative relating to the needs of each Service Category as described in Exhibit B.
- Responses should consist of detailed descriptions of what a Respondent's firm is capable of providing to the TXShare Public Purchasing Cooperative. The numbered activities in each Service Category must be addressed, but Respondents are encouraged to provide additional detail about their operation and capabilities.
- Respondents who wish to propose additional services or pavement analysis services are encouraged to do so by attaching additional (as many as necessary) to describe said products or services and their associated pricing structures.

Note: Respondent is not required to complete any questions that are not applicable to the services you are bidding.

Exhibit D – TXShare Pricing Proposal Instructions

EXHIBIT D
Pricing Proposal/Attachment A Instructions

Submissions must include Attachment A, RFP 2022-063 Pricing Proposal Form, which is located on the Public Purchase project page. Respondents may provide pricing that is the most compatible with their business model if they maintain consideration for geographic coverage for TXSHARE participants and evolution of the service throughout the contract lifecycle

Attachment A contains predetermined criteria for your firm to price. Respondents are to provide tiered pricing based on the base cost and/or range of lane miles for each numbered pavement analysis and related services activity.

**Respondents must not include mobilization fees in their pricing and may not include them in any contract(s) that result from this RFP.

If a respondent elects to submit a percentage discount off their catalog pricing for any or all of their services, the corresponding price for each numbered activity listed in Attachment A must account for the proposed discount listed in Exhibit C. If you are not proposing a percentage-discount, please use your established list price for each numbered pavement analysis and related services activity.

Example: If your catalog price is $100 per unit, and you indicate a 5% discount from catalog pricing in Exhibit C, your pricing form in Attachment A should reflect a unit price of $95. Conversely, if your catalog price is $100 per unit, and you indicate a 0% discount or N/A in Exhibit C, your pricing form in Attachment A should reflect a unit price of $100.

Form 1295 – Certificate of Interested Parties

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

1 of 1

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY
CERTIFICATION OF FILING

Certificate Number:
2023-984741

Date Filed:
02/17/2023

Date Acknowledged:

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.
IMS Infrastructure Management Services
Tempe, AZ United States

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.
North Central Texas Council of Governments

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.
RFP # 2022-063
PAVEMENT ANALYSIS AND RELATED SERVICES

4 Name of Interested Party	City, State, Country (place of business)	Nature of interest (check applicable)	
		Controlling	Intermediary

5 Check only if there is NO Interested Party. [X]

6 UNSWORN DECLARATION

My name is Kurt Keifer, and my date of birth is 09/27/1975.

My address is 13302 Marrero Drive (street), Austin (city), TX (state), 78729 (zip code), USA (country).

I declare under penalty of perjury that the foregoing is true and correct.

Executed in Travis County, State of Texas, on the 24 day of February (month), 2023 (year).

Signature of authorized agent of contracting business entity
(Declarant)

Forms provided by Texas Ethics Commission www.ethics.state.tx.us Version V3.5.1.3ac88bc0

Boycotting of Certain Energy Companies

BOYCOTTING OF CERTAIN ENERGY COMPANIES

This contract is subject to the Texas Local Government Code chapter 809, Subtitle A, Title 8, prohibiting contracts with companies who boycott certain energy companies.

TLGC chapter Code chapter 809, Subtitle A, Title 8, identifies that "boycott energy company" means, without an ordinary business purpose, refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations with a company because the company:

I. engages in the exploration, production, utilization, transportation, sale, or manufacturing of fossil fuel-based energy and does not commit or pledge to meet environmental standards beyond applicable federal and state law; and

II. does business with a company described by paragraph (I).

The entity identified below, through its authorized representative, hereby certifies that they do not boycott energy companies, and that they will not boycott energy companies during the term of the contract as prohibited by Chapter 809, Subtitle A, Title 8 of the Texas Local Government Code.

☑ The Contractor or Subrecipient hereby certifies that it does comply with the requirements of Chapter 809, Subtitle A, Title 8.

SIGNATURE OF AUTHORIZED PERSON: 

NAME OF AUTHORIZED PERSON: Kurt Keifer, PhD, PE

NAME OF COMPANY: IMS Infrastructure Management Services, LP

DATE: February 21, 2023

-OR-

☐ The Contractor or Subrecipient hereby certifies that it cannot comply with the requirements of Chapter 809, Subtitle A, Title 8.

SIGNATURE OF AUTHORIZED PERSON: _____

NAME OF AUTHORIZED PERSON: _____

NAME OF COMPANY: _____

DATE: _____

Discrimination Against Firearms Entities of Firearms Trade Associations

DISCRIMINATION AGAINST FIREARMS ENTITIES OR FIREARMS TRADE ASSOCIATIONS

This contract is subject to the Texas Local Government Code chapter 2274, Subtitle F, Title 10, prohibiting contracts with companies who discriminate against firearm and ammunition industries.

TLGC chapter 2274, Subtitle F, Title 10, identifies that "discrimination against a firearm entity or firearm trade association" includes the following:

A) means, with respect to the entity or association, to:
   I. refuse to engage in the trade of any goods or services with the entity or association based solely on its status as a firearm entity or firearm trade association; and
   II. refrain from continuing an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association; or
   III. terminate an existing business relationship with the entity or association based solely on its status as a firearm entity or firearm trade association.

B) An exception to this provision excludes the following:
   I. contracts with a sole-source provider; or
   II. the government entity does not receive bids from companies who can provide written verification.

The entity identified below, through its authorized representative, hereby certifies that they have no practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association; and that they will not discriminate during the term of the contract against a firearm entity or firearm trade association as prohibited by Chapter 2274, Subtitle F, Title 10 of the Texas Local Government Code.

☑ The Contractor or Subrecipient hereby certifies that it does comply with the requirements of Chapter 2274, Subtitle F, Title 10.

SIGNATURE OF AUTHORIZED PERSON: 

NAME OF AUTHORIZED PERSON: Kurt Keifer, PhD, PE

NAME OF COMPANY: IMS Infrastructure Management Services, LP

DATE: February 21, 2023

-OR-

☐ The Contractor or Subrecipient hereby certifies that it cannot comply with the requirements of Chapter 2274, Subtitle F, Title 10.

SIGNATURE OF AUTHORIZED PERSON: _____

NAME OF AUTHORIZED PERSON: _____

NAME OF COMPANY: _____

DATE: _____

Appendix A: Example Equipment Certifications

National Center for Asphalt Technology
NCAT
at AUBURN UNIVERSITY
277 Technology Parkway
Auburn, Alabama 36830

March 23, 2022

Mr. Chase Fleeman
International Cybernetics Co., LP
10630 75th St N
Largo, FL 33777

Re: Inertial Profiler Certification at the NCAT Pavement Test Track

Dear Mr. Fleeman,

This letter is written to document results from the inertial profiler certification attempt made on March 21, 2022.

To certify according to the criteria outlined in AASHTO R 56-14, the profiler must first pass a vertical verification, commonly called a "block test", as well as an accelerometer verification or "bounce test". The distance measuring instrument (DMI) is then verified for longitudinal accuracy. Passing criteria for the DGA sections are ten (10) runs on each of the three dense-graded asphalt (DGA) sections, yielding cross-correlation values of 92% repeatability and 90% accuracy when compared to the reference profiler. Passing criterion for the open-graded friction course (OGFC) section is outlined in ALDOT Procedure 448. This method requires ten (10) runs averaging less than 5% error to a direct International Roughness Index (IRI) comparison to the IRI obtained by the reference profiler.

NCAT's Profiler Certification Program consists of three DGA test sections and an OGFC test section. The DGA sections are: smooth (IRI 30 to 75 in/mile), medium-smooth (95 to 135 in/mile), and a medium-rough (135 to 200 in/mile). The IRI of the OGFC section falls within the "smooth" range. The certification procedure is further detailed in AASHTO R 56.

Results

Two IrisPRO Pave Class I inertial profiler systems manufactured by International Cybernetics Co., LP attempted certification on March 21, 2022. The equipment information for these profilers are shown in Table 1.

Table 1: Profiler Information

Unit ID	ICC 21	ICC 22
Unit Serial Number	I3309100	I3309200
Model	IrisPRO Pave	IrisPRO Pave
VIN	1FBZX2ZM9KKB64380	1FBZX2ZM8KK805868

The profiler achieved satisfactory results for the vertical verification, longitudinal verification, and accelerometer verification. A SurPRO 4000 was used to generate baseline profile data, and ProVAL was used to evaluate cross-correlation for the 10 repeat runs. The repeatability and accuracy values are given in Table 2 and Table 3 below.

Table 2: Cross-Correlation Results for ICC #21

Cross-Correlation	Rough	Medium	Smooth	OGFC
Repeatability, %	97	98	94	4.5%
Accuracy, %	97	97	94	

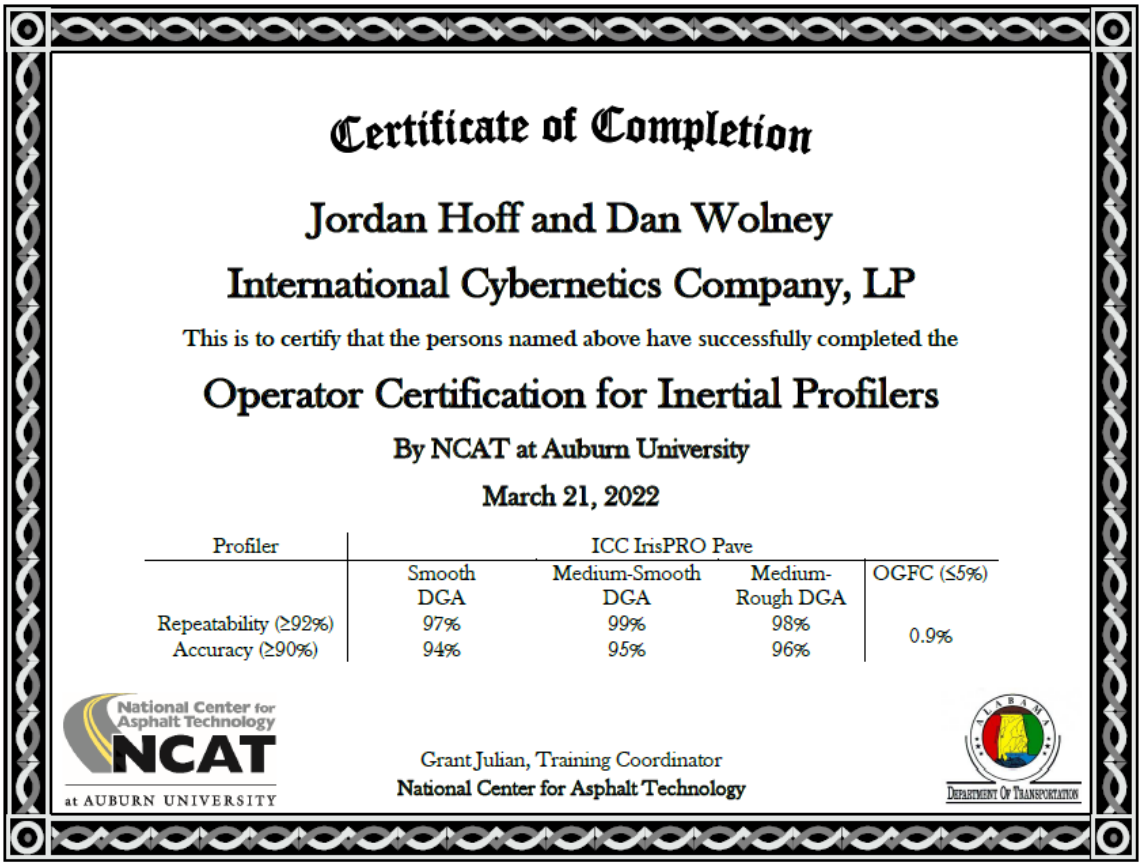
Table 3: Cross-Correlation Results for ICC #22

Cross-Correlation	Rough	Medium	Smooth	OGFC
Repeatability, %	98	99	97	0.9%
Accuracy, %	96	95	94	

The data in Tables 2 and 3 meets the requirements of certification outlined above. Based on these results, each profiler has been issued an AASHTO R 56, Class 1 certification.

Sincerely,

Mr. Grant Julian, PE
NCAT Assistant Research Engineer
Inertial Profiler Training Coordinator



Certificate of Completion

Jordan Hoff and Dan Wolney

International Cybernetics Company, LP

This is to certify that the persons named above have successfully completed the

Operator Certification for Inertial Profilers

By NCAT at Auburn University

March 21, 2022

Profiler	ICC IrisPRO Pave			
	Smooth DGA	Medium-Smooth DGA	Medium-Rough DGA	OGFC (≤5%)
Repeatability (≥92%)	97%	99%	98%	0.9%
Accuracy (≥90%)	94%	95%	96%	

National Center for Asphalt Technology NCAT at AUBURN UNIVERSITY

Grant Julian, Training Coordinator
National Center for Asphalt Technology

Department Of Transportation

OPERATOR CERTIFICATION FOR INERTIAL PROFILER

Operators: Jordan Hoff and Dan Wolney
Company: International Cybernetics Company, LP
Profiler: ICC IrisPRO Pave
Surfaces: DGA and OGFC
Certification Expires: March 2025

National Center for Asphalt Technology NCAT at AUBURN UNIVERSITY