Dynatest North America, Inc.

Technical Proposal

PAVEMENT ASSESSMENT & MANAGEMENT PLAN

Prepared For

The City of Leander, Texas

January 24, 2020

DYNATEST NORTH AMERICA, INC.
2217 West Braker Lane
Austin, Texas 78758
January 24, 2020

Mrs. Gina M. Ellison, P.E.
Public Works Director
City of Leander
PO Box 319
Leander, Texas  78646
O: 512-259-2640 | C: 512-636-1895
Email: gellison@leandertx.gov

Dear Mrs. Ellison:

Dynatest North America, Inc. (Dynatest) is pleased to submit our cost proposal and technical approach to the City of Leander to provide automated ride, distress surveying, and analysis on approximately 279 centerline miles of paved roadway in City of Leander, Texas.

Dynatest has vast experience in collecting, analyzing and reporting ride, rut and pavement distress data for City, County, State and Toll road agencies around the world. Our projects range from less than 100 lane miles up to more than 90,000 lane miles per survey – all of them completed on-time and within budget. We are confident that we can exceed the expectations of the City of Leander on this current project.

Dynatest has significant experience working in the state of Texas. Dynatest has performed multiple pavement condition inspections for the City of Wichita Falls, City of Frisco, City of Tyler, City of Georgetown, and numerous other public and private entities. Additionally, our project manager, Reuben Williams, has performed dozens of implementations across the state of Texas over the past sixteen years.

We understand the technical requirements and delivery schedule deadlines required by the City of Leander, and we are confident that we can exceed your expectations on both fronts. The project understanding and our proposed approach are detailed in the following sections of this proposal.

We thank you for the opportunity to provide our services.

Sincerely,

DYNA TEST NORTH AMERICA INC.
TBPE Firm Registration No. F-17608

Robert R. Williams, P.E., APMP
Principal Engineer II
rwilliams@dynatestinternational.com
P: 512-579-7644
Task 1: Project Management

The objective of this task is to ensure the scope of work, data collection protocol, quality control/quality assurance, project schedule, traffic control plan, jurisdictional contacts, reporting requirements, and other project-specific requirements are adhered to throughout the project. In addition to the kick-off meeting and regular e-mail and telephone communications, up to five (5) additional meetings will occur throughout the project at completion of major tasks and to review budget and work plan recommendations.

Task 2: GIS & Inventory Review & Routing

An important step of this project that will take place prior to the data collection is an evaluation of the City’s current pavement management inventory and available data sources. This will require performing a thorough review of the City’s inventory information and setting up the data acquisition files for efficient navigation during data collection.

The City will need to provide the following information to facilitate the items to be performed by Dynatest on this task:

- Any reports that were delivered as part of the previous projects
- Pavement management database
- Shape files of road centerlines

Dynatest has developed route-optimization programs that minimize data collection times in the field. For Leander, we will develop routing plans that provide the most efficient route for data collection purposes. Based on our preliminary review of the City’s roadway inventory, we estimate approximately 370 test miles representing 279 centerline miles of roadway.

Task 3: Pavement Distress Survey

Dynatest will discuss specific details and restrictions for data collection during the kick-off meeting to ensure safety, efficiency, and quality during data collection. We are expecting 10 days for pavement data collection at a productivity rate of 40 test miles per day. Once all data is collected and distresses extracted from pavement imagery and sensors, a Pavement Condition Index score will be calculated.

Dynatest proposes to provide automated data collection using the Dynatest Pavement Condition Survey System (PCSS), equipped with either 2D Laser Road Imaging System (LRIS) or 3D Laser Crack Measurement System (LCMS). During data collection, this vehicle is driven at posted speed limits (up to 60 mph.) We do not anticipate any traffic control requirements. Our PCSS is equipped with appropriate flashing lights and sign markings for additional safety. Additionally, all vans used for collection are marked with the company name.

The PCSS is equipped with the latest sensors and hardware required for accurate, high-quality pavement data collection, including:

- INO’s Laser Road Imaging System and Laser Crack Measurement System: The imaging systems provide very high-resolution pavement images. The system is configured to capture 4m
(approximately 13 ft.) pavement width with 1mm resolution and can operate at speeds up to 60 mph.

- **Dynatest Model RSP-5051 Mark III High-Speed Laser Profiler**: The Dynatest Road Surface Profiler (RSP) is equipped with 7 lasers and 2 accelerometers and is a Class I (highest standard) profiler. In addition to pavement profile measurements, the RSP is capable of calculating IRI and rutting in real time.

- **High-definition Right of Way (ROW) cameras**: The system includes two UniBrain cameras capable of capturing color images in 1920x1080 format or higher. Images are acquired and stored every 20 ft. and all images are geotagged.

- **Inertial Measurement Unit (IMU) and GPS**: The PCSS is equipped with an Applanix POS LV V5 inertial navigation system for recording sub-meter accuracy GPS coordinates. In addition, our system also captures pavement geometry including cross slope, radius of curvature and longitudinal grade.

The Laser Imaging system allows automated detection of pavement distresses including various types of cracks, raveling, edge drop-offs, potholes, macrotexture, and rutting. The system also automatically determines the presence of paint stripes which help in identifying the pavement lane.

Data acquired with the Laser Imaging system allows the automated detection/identification of various types of distresses including all types of cracking, rutting, raveling, potholes, edge drop-off, sealed cracks, lane markings, and macrotexture. However, it should be noted that for PCI calculation purposes, the ASTM D 6433 standard includes 20 distress types for both asphalt and concrete surface types. Due to the complexity of separating all distresses into the 20 distress types, we believe it is prudent to follow a two-step approach for distress rating, where a combination of fully automated computer-based crack type determination and a semi-automated rating process performed by an experienced pavement inspector. Dynatest will determine the most suitable approach to ensure quality results for the City.

Quality control and quality assurance are an integral part of our methodology. We incorporate QC/QA measures in all aspects of data collection, verification, analyses and reporting. During data collection, all data streams are verified on a daily basis as part of a comprehensive QC/QA program to ensure that all
required data elements are being collected. It also serves to ensure that no segment is left untested, unless for a reason beyond Dynatest's control at the time of data collection (ex. road closures or construction activity). The Transtec Group, Inc will serve in this project as a 3rd party for QC/QA of the data. The following section describes our proposed analysis approach.

For the first step of the analysis process, all acquired data will be analyzed through Dynatest’s proprietary software, Dynatest Explorer/Dynatest Rating Module (DE/DRM). The DE/DRM software automatically classifies detected distresses, categorizes them by severity, and quantifies the results including location and extent. Distresses which can be automatically identified and classified are:

- Alligator cracking
- Block cracking
- Longitudinal cracks
- Transverse cracks
- Sealed cracks
- Edge cracks
- Potholes
- Curbs or edge drop-off
- Rutting
- Raveling
- Concrete joints

An example of the automated distress identification and classification process is shown in the figure below. This figure shows alligator cracking classified by our software.

![Automated Distress Analysis Process in Dynatest Explorer/Dynatest Rating Module.](image)

All collected data will be analyzed through our software using automated analysis tools to identify the locations of the above-mentioned distress types.

In the second step for the analysis process, experienced pavement inspectors will review the results of the fully automated process and make changes or edits to the analyzed data. An example of this process is shown in the figure below; (a) the results of the automated analysis. (b) manual revisions to the auto-classified alligator cracking area made by Dynatest staff. In this case, the area of alligator cracking was increased slightly to capture the full extent of the cracking.
(a) Alligator Cracking Identified by Automated Process.

(b) Alligator Cracking Area Modified by Dynatest Pavement Inspectors.

Tasks 4: Software Deployment & Integration

After all pavement distress records have been analyzed, reviewed and passed our QC/QA measures, Dynatest will compile the data standard summary tables that can be formatted for any pavement management software. PAVER has several distinct advantages:

- PAVER is widely used across the USA, and the databases/files can be easily shared.
- PCI scores are calculated in PAVER and conform to the guidelines described in ASTM D6433.
- We can generate user-defined reports which include individual segment PCI values, distress quantities, and deduct scores for each distress.
- The resulting report/data can be easily exported to Excel files.

With the PAVER databases in hand, the City can use PAVER’s built-in analysis tools to perform several types of analyses including:
- Reports, statistics, and graphs showing distribution of surface types and areas.
- Reports, statistics, and graphs showing distribution of PCI values analyzed by surface type.
- Develop pavement performance models.
- Develop GIS based reports.

Dynatest will coordinate with City IT personnel to facilitate installation and deployment of the software. Additionally, Dynatest will advise the City on data storage requirements for the pavement imagery that will be provided along with the PAVER database upload.

Task 5: Five-Year Maintenance Plan Development

Task Description

This task involves gathering data on the City of Leander’s roadway network to develop Pavement Condition Indices (PCI) and develop a 5-year Street Maintenance Plan (SMP) for roadway maintenance and preservation. The deliverables will include a 5-year SMP, associated opinion of probable costs (OPC’s), and associated technical specifications for each recommended street maintenance process.

Scope of Services:

The scope of services for this project includes developing the 5 Year Street Maintenance Program (SMP) for the roadways within the City of Leander network. The project team will develop a rehabilitation and remediation program for the City’s roadway networks. Different rehabilitation methods will be developed during the review of the streets in the field. These will include, but not be limited to sub-grade stabilization and overlay, drainage enhancement and pavement rehabilitation, hot-in-place asphalt recycling, surface treatments, asphalt rejuvenation, asphalt overlays, cape seals, micro-surfacing, etc. Visual collection of data will include reviewing the street to determine if the data collection is accurate and looking at contributing issues, such as drainage, that are creating poor PCI numbers.

A final meeting with City Staff will be scheduled to review the final document, reports and illustrations. After final comments the final report, illustrations and cost estimates will be delivered (PDF and Hard Copies).
Development of 5-year SMP

A. Organize deficient streets into geographical areas
B. Develop options for rehabilitation
C. Develop projects for sustainability in bidding and construction
D. Organize project and develop graphical representation
E. Prepare cost estimates for all projects in all rehabilitation methods
F. Review projects and rehabilitation methods with City Staff
G. Develop 5-year SMP projects with graphical representation and cost estimates
H. Review documents with City Staff
I. Produce preliminary draft for 5-year SMP
J. Review preliminary draft with City Staff
K. Develop final 5-year SMP, graphical representation, cost estimates, maps, etc.
L. Deliver up to 10 copies of the report, maps, graphical representations and cost estimates to City Staff

These are a FINAL deliverable, not due until the 5-year SMP has been approved. Due to the time constraints of this project, the major focus will be on producing the SMP so that City personnel can plan maintenance for this year. Once the plan is done and accepted by the City, only then will work commence on the final reports.

Task 6: Final Pavement Management Report

This involves preparing a final report that will document all fieldwork, ride statistics, distress information, and the maintenance and rehabilitation recommendations. This report will include the following:

- Summary of fieldwork
- Summary of network condition
  - Will include summary based on City’s master thoroughfare network
- Summary of network-level repair recommendations for full network
- Summary of network-level 5-year work plan and recommendations and listing of candidate roads for project cost estimating purposes
- Recommended project groupings and with recommendation repair activities with estimated costs for City approved projects only
- GIS maps summarizing roadway condition scores
  - GIS layer for average PCI
  - GIS layer for weighted condition index
  - GIS layer of 5-year plan
- Spreadsheet and/or database summaries of network condition and recommended maintenance/repair activities

A draft of the report will be prepared and provided to the City for review. Upon inclusion of City comments and acceptance of the report by the City, Dynatest will finalize the report. The purpose of this report will
be to serve as initial strategies in support of the City’s 5-year maintenance and rehabilitation plan. Should more detailed project level plans need to be created, additional fees may be applicable and will be addressed with the City at that time. It should also be noted, that due to future circumstances, the plan presented to the City in this report is subject to change at the City’s discretion. Additional revisions of the plan provided or report will entail additional fees.

**Task 7: Training**

This task involves training the City personnel on the PAVER software and pavement management concepts. It is anticipated that one day of on-site training will be required. A specific training agenda will be developed throughout the project.

**Task 8: Viewing Solution**

Dynatest will train-on and provide the City a Google Earth based viewing tool that will allow for reviewing video and condition scores of the roadways. No special software installation is required to utilize this tool, only server space to save the images collected with the data collection vehicle. A description of this tool is described in another section of this proposal. Dynatest will work with the City to define which elements to include and the graphical layout of the tool to be provided. The Google Earth based solution is extremely intuitive to use and requires minimal training and resources on the City’s end to use.
Dynatest’s pricing for this proposal to perform an automated pavement condition survey, update the City’s PMS, and provide pavement management services are shown in the table, below. The table below provides a summary of the prices by task for the proposed effort.

<table>
<thead>
<tr>
<th>Task</th>
<th>Price</th>
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<tr>
<td>Task 1 - Project Management</td>
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<td>Task 2 - GIS &amp; Inventory Review &amp; Routing</td>
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<td>Task 3 - Pavement Condition Survey</td>
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<td>Task 4 - Software Deployment &amp; Integration</td>
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<td>Task 5 - Five-Year Maintenance Plan Development</td>
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<td>Task 7 - Training</td>
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<td>Task 8 - Viewing Software</td>
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