

Attachment A – Scope of Work

City of Pflugerville Pavement Condition Survey

Scope of Work Description:

Roadway Asset Services, LLC (working as a subconsultant to H2O Partners, Inc. under HGACBuy Contract #HP08-21), understands that the City of Pflugerville, Texas requests this project consist of providing Data Collection and Reporting services for the City of Pflugerville to assess the existing condition of all existing public roadway pavements within the City of Pflugerville’s boundaries.

The project will be completed by conducting a field survey of the pavement conditions on all the City maintained roads in accordance with the ASTM Standard D6433 “Standard Practice for Roads and parking Lots Pavement Condition Index (PCI) Surveys.” The PCI based pavement condition survey is to be conducted on approximately 245 centerline miles of paved streets within the City limits, on each street segment which is typically a block and tagged with a unique ID (Facility ID) on the feature-class layer in GIS. The Fee Schedule included as Attachment B will include fees for a **Lump Sum**, which is a onetime fee for the task. The Fee Schedule will also include **Test Miles** which are determined from the centerline miles, with the assumption of driving arterial and collector streets in two directions and residential streets in one direction. The test miles are those driven by the collection van and rated for pavement condition. The other term used in the Fee Schedule is **Lane Miles** determined by doubling the centerline mileage. The lane miles represent each side of the roadways that must be reviewed in images to extract and inventory ROW assets.

The CONSULTANT (Roadway Asset Services, LLC.) shall provide the following services to the OWNER (Pflugerville, TX):

Task 1 - Project Initiation and Field Set-Up

Upon notice to proceed the CONSULTANT will arrange a kick-off meeting to confirm the project requirements and schedule. The kick-off meeting (in-person or Teams Meeting) will include proposed key personnel and the OWNER’s project members. During the meeting, CONSULTANT will present the proposed Project Approach, which includes project equipment, software, methodology, schedules, and deliverables. The proposed approach will be finalized based on the OWNER requirements and decisions during the meeting. CONSULTANT will request that the OWNER provide any existing database, previous inventory of street conditions, road centerlines, Geographic Information System (GIS) layers, and aerial imagery for project use. Project communication protocol, documentation, accounting methodologies, data format, and will be confirmed during the meeting.

Task 1 Deliverable:

1. The CONSULTANT will schedule a project kick-off meeting and begin field setup, routing, and GIS integration into the RAC vehicle.

Task 2 – Centerline Identification, Review, and GPS Network Creation

CONSULTANT will use the existing centerline data provided by the OWNER and create a pavement database based on the centerline layer. This centerline layer should contain the Cityworks/GIS linked segments along with any unique ID’s that link each segment to Cityworks. Each road segment record in the centerline layer will have a corresponding record in the pavement database. The OWNER represents that the City maintains approximately 245 centerline miles of roadways. The OWNER supplied the

centerline mileage from the last condition assessment which equaled 233 centerline miles. The CONSULTANT then applied a 5% growth ratio to calculate the new centerline mileage. The CONSULTANT will need to confirm actual mileage by assessing the current GIS centerline mileage.

CONSULTANT will work with the OWNER to maintain the unique identifier of each of the road segments on the OWNER road network so that the pavement database will maintain a link to the GIS data.

CONSULTANT will communicate with the OWNER to gather required information to define all the distress types and treatment selections. Based on this information, the Pavement Condition Index (PCI) rating and treatment selection criteria will be defined to identify each distress type and its severity, extent, and treatment selection (based on the ASTM-D6433 testing methodology for roads and parking lots). Each collected GIS road segment will be populated with its respective PCI as well as any other derivative indices used to make up the OCI, such as roughness in the form of IRI.

CONSULTANT will provide project management for the duration of the project, including coordinating and attending meetings via web meetings or in person with OWNER, data research and collection efforts as required, preparing bi-weekly progress reports, and schedule updates. Bi-weekly progress reports will include the miles collected for the current reporting period as well as cumulative totals. An exhibit displaying the roads collected and not yet collected will also be included.

CONSULTANT will work with the OWNER to review and verify that the data is ready to proceed.

Task 2 Deliverables:

2. The CONSULTANT will provide the OWNER with a centerline assessment document for review and approval.

Task 3 – Collect Street Network

The CONSULTANT will collect roadway data and images for the 307 test miles of streets using a Roadway Asset Collection (RAC) vehicle or identical equipment from a strategic business partner. The CONSULTANT retains a fleet of 4 RAC vehicles and may lease additional equipment if necessary to meet timeline objectives.

The RAS team consists of a driver and operator (CONSULTANT) who will systematically drive the automated data collection vehicle on the road segment listings provided by the OWNER. The CONSULTANT will collect pavement data with two passes on arterial, collector, and divided local roads and one pass collection on residential roadways. Since only total centerline mileage was provided by the OWNER, the CONSULTANT estimated 25% of the network to consist of arterial and collector roadways, resulting in 307 survey miles. CONSULTANT proposes to use its collection vehicle line scan camera with laser illumination and right-of-way cameras to capture pavement and ROW images to be used during the pavement rating process. Unpaved roads will not be surveyed.

CONSULTANT will record all ROW assets by collecting images at 20-ft maximum intervals with an automated data collection survey vehicle equipped with a Laser Crack Measurement System (LCMS) for automated pavement data acquisition, Ladybug 360 camera system for capturing right-of-way imagery and a laser profiler which includes at minimum two-line lasers for capturing roughness and ride data.

Roadway Asset Services (RAS) will perform data field collection on paved roads using a state-of-the-art Roadway Asset Collection (RAC) vehicle with following systems mounted:

- Right-of-way georeferenced images with Ladybug 5+ camera: Forward, Left, Right, and 360-degree spherical images.
- LCMS-2 pavement 2D/3D imaging.
- Longitudinal profile with 2-line lasers (left and right wheel paths) Distance measuring instrument

(DMI) with an accuracy of +/- 0.1%.

- Differentially corrected GPS (DGPS) with an accuracy of +/- 2 feet.
- Applanix POS/LV 220 to compensate for difficult GPS conditions in urban environments.

The RAS system collects all pavement and right-of-way images, IMU, DMI and profiler data concurrently.



A RAS automated data collection vehicle

The International Roughness Index (IRI) will be collected using a class 1 road surface profiler manufactured by International Cybernetics Corporation (ICC). The road surface profiler meets all ASTM E-950 standards for evaluating the smoothness of pavement.



Example imagery from Ladybug 360 camera

Task 3 Deliverables:

1. CONSULTANT will complete field testing on all roadways tagged for survey.

Task 4 Onsite RAS Data Review of Pilot

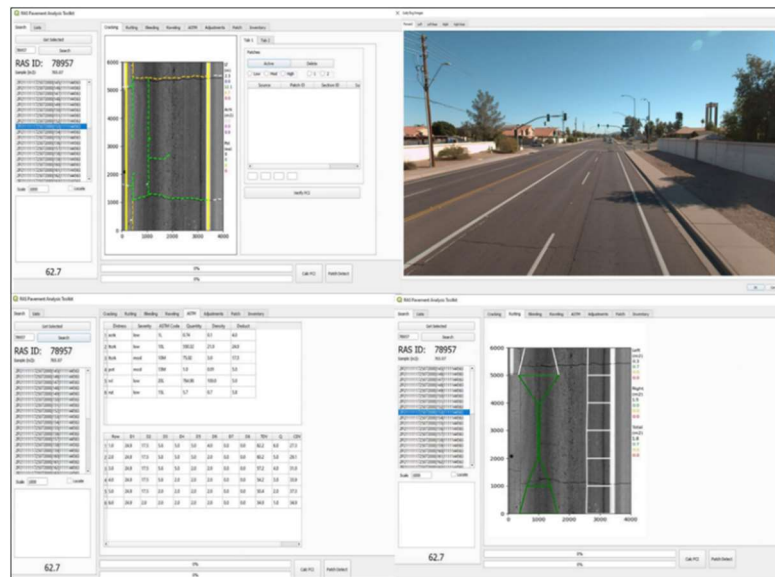
CONSULTANT will work with the OWNER to setup a field validation pilot area that is approximately 10 miles in length. Upon completion of the network level testing, the field pilot data will be linked and processed first so that the field pilot can be scheduled prior to the full network data being processed. If any corrective action is identified during the field pilot, such corrections will be applied to the data processing algorithms prior to final PCI calculations.

Task 4 Deliverables:

1. CONSULTANT will process 10-miles of data for field pilot.
2. CONSULTANT will schedule and conduct a field pilot with City staff.
3. CONSULTANT will make any necessary modifications to processing algorithms.

Task 5 – Pavement Condition Index (PCI) and IRI - Artificial Intelligence Tools

CONSULTANT will evaluate the PCI survey results in accordance with ASTM D6433. CONSULTANT will provide 100% survey of all lanes driven using RAS’ pavement analysis tool, Technical Rating Intelligence Program (**Road TRIP™**) to evaluate the pavement condition using automated techniques per the ASTM D6433 pavement distress rating process including the following distresses: alligator cracking, longitudinal cracking, transverse cracking, block cracking, rutting, weathering, raveling, potholes, and patching. Experienced pavement engineers will review the resultant output for accuracy and make any corrections that may be needed. The **Road TRIP™** software allows the pavement and right of way imagery to be synchronized and the distress data to be displayed geospatially to provide another layer of quality assurance.



*Pavement Condition Evaluation within **Road TRIP™***

Task 5 Deliverables:

1. CONSULTANT will deliver a final GIS file geodatabase containing collected pavement data (containing the Type, Severity and Extent of distresses along the road segment as defined by the ASTM D6433 methodology), distresses, and PCI value.

2. CONSULTANT will deliver all 5 views from the Ladybug imagery and a single view of the LCMS downward pavement imagery.

Task 6 - Pavement Width

The CONSULTANT will use the images from the Ladybug 360 camera system to capture the width of asphalt or concrete pavement for each street segment, recorded from face-of-curb to face-of-curb, to compare with the existing database information. CONSULTANT will provide the widths for roads with width changes by noting locations of changes by stations and measuring each section of change, and the addition of lanes or turn lanes.

Task 6 Deliverables:

1. CONSULTANT will deliver the width measurements as an attribute of the final dataset.

Task 7 - BOSS™ Data Load & Analysis Parameter Definitions

CONSULTANT will format the pavement inventory, attributes, supersegments (project limits), PCI data, and analysis parameters for import into the Budget Optimization Street Selector (**BOSS™**) software. The CONSULTANT will schedule a meeting with OWNER to discuss and develop the analysis parameter setup completed in Task 6.

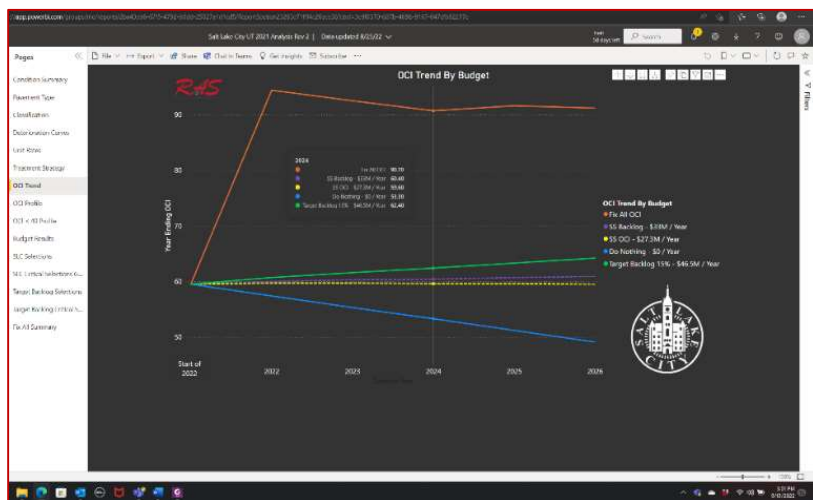
Task 7 Deliverables:

1. CONSULTANT will load the condition data to BOSS and provide consultation to develop the analysis parameters for the pavement analysis.

Task 8 – Pavement Analysis Configuration, Budgetary Models, & Final Report

CONSULTANT will configure and set up the pavement analysis operating parameters (developed in Task 5) within our Budget Optimization Street Selector (**BOSS™**) software. CONSULTANT will configure the maintenance and rehabilitation activities, PCI trigger points, costs, reset PCI values, completed rehabilitation work since the survey, planned work, existing budgets, pavement deterioration curve development/assignment, and inflation priorities. CONSULTANT will assist the OWNER with determining the right treatment (prescription) at the right time by reviewing the City’s existing maintenance and rehabilitation strategies and recommending others that may be a good fit. The scope will include running at least 10 profile budget runs to establish the budget model trend and showcasing at least 5 budget scenarios for the 5-year pavement analysis. We propose to provide these services to develop a 5-year

maintenance plan that is financially optimized and prioritized to meet the needs of the OWNER. **BOSS™** is a cloud based application with powerful pavement management algorithms behind it that export the results of the pavement analysis to a user friendly interface such as **Microsoft PowerBI** or even a simple **Excel spreadsheet** if desired. All of the results are integrated with the City’s existing GIS and supplied to the City as a **Personal/File Geodatabase** for consumption and storage.



2. The final pavement and analysis results will be delivered as a Personal Geodatabase that is ready to be consumed within the City's GIS environment.
3. CONSULTANT will deliver a Final Pavement Condition Survey Report for the project including:
 - Executive Summary.
 - Project methodology and pavement data.
 - Current street segment PCI
 - Budget models and predicted outcome of PCI
 - Deferred maintenance backlog
 - Exhibits showing PCI and street segment length and pavement type.
 - Optimized 5-year maintenance and rehabilitation plan

Task 9 – Supplemental Staff Support to Complete Pavement Condition Survey: Senior GIS Analyst

The CONSULTANT can provide a Senior GIS Analyst for supplemental support services on an as-needed basis up to the maximum hours set in the project budget. The Senior GIS Analyst would be responsible GIS centerline edits, linkage, and analysis results mapping.

Task 10 – Supplemental Staff Support to Complete Pavement Condition Survey: Senior Pavement Consultant

The CONSULTANT can provide a Senior Pavement Consultant for supplemental support services on an as-needed basis up to the maximum hours set in the project budget. The Senior Pavement Consultant will conduct field verification of the pilot area, provide quality assurance checks, and pavement modeling development within the **BOSS™** software.