

**Proposal to Provide
Professional Engineering Services
for
Brevard County Public Works
2023 Pavement Condition Assessment**

Brevard County (County) is proposing to update its Pavement Management Program (PMP). The following task is proposed to ensure the County's pavement geodatabase includes the most up-to-date information, including maintenance activities completed after the 2019 pavement inventory was collected, as well as the revised PCI score.

SECTION 1 SCOPE OF SERVICES

TASK 1: UPDATE 2019 PAVEMENT GEODATABASE

Update 2019 pavement geodatabase with recent maintenance activities and revised PCI scores. The County will provide Atkins with their pavement geodatabase including updates. Atkins will use the services of DTS to bring updated records into the 2019 pavement geodatabase. See additional details in the DTS scope, included as Attachment A.

SECTION 2: DELIVERABLES

The following deliverables are anticipated:

- Updated 2023 pavement geodatabase including pavement regression by functional class
- See additional deliverables in the DTS scope, included as Attachment A.

SECTION 3: SCHEDULE

The following schedule is anticipated:

- All scope items completed within 5 months of Notice to Proceed.
- Detailed schedule provided in DTS scope, included as Attachment A.

SECTION 4: COMPENSATION

The proposed scope of services will be provided on a lump sum basis administered pursuant to the provisions of our master contract dated February 12, 2019, and invoiced monthly based on the percentage of completion of the overall project.

This Work Order will be an amount not to exceed \$395,600.

If Brevard County desires to change these proposed services or include optional services, an additional fee shall be negotiated. This renegotiation shall be accomplished prior to commencing the additional work.

Attachment A Scope of Services
Pavement Condition Assessment
Brevard County, Florida

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Pavement Condition Assessment Scope of Work

DTS understands that the County's road network is comprised of arterial (approx. 9%), collector (approx. 13%) and local (approx. 78%) roads totaling more than 1,140 centerline miles and, are mostly of asphalt construction. The County received a PCA from Data Transfer Solutions, LLC (DTS), in September, 2019.

The objective of this project is to accurately capture the condition of the pavement using the same or more advanced modern technologies used for the 2019 PCA and this includes an update to the County's Pavement Management Plan (PMP) road segment inventory. The update will include adding new road segments and deleting any overlapping segments or road segments that are no longer under County ownership. The pavement condition assessment will identify pavement distresses and existing road conditions in accord with ASTM D6433-11, and establish a Pavement Condition Index (PCI) value for each segment per ASTM D6433. The County expects fully automated data collection procedures be used coupled with a strict quality control management process. Additionally, DTS will incorporate newly collected data into the County's existing geographic information system (GIS) roadway database. All data collected must integrate with the County's GIS centerline database.

For this project, DTS will collect the County's roadway inventory with one or more Mobile Asset Collection (MAC) vehicles per the ASTM D6433 criteria. DTS employs an approach to mobile data collection and pavement management reporting that is repeatable and defensible across survey years, GIS-centric at its core and a quantitative approach that relies upon standards and procedures that can be applied for pavement management optimization. All data will be formatted to meet the ASTM D6433-11 Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys including International Roughness Index (IRI), rutting, cracking and faulting.

Task 1 – Kickoff Meeting, Centerline File Review & Verification, Route Planning, Calibration Site Survey, and Mobilization

If a Project Kickoff Meeting is desired by the County, DTS will begin the project by meeting with County staff to discuss the overall goals of the pavement evaluation project. During this meeting, DTS will confirm the project requirements and scheduling. The kickoff meeting will include proposed DTS key personnel and the County's project members. DTS will present the proposed Project Approach, which includes project equipment, software, methodology, schedules, and deliverables. The proposed approach will be finalized based on the County's requirements and decisions during the meeting. A key component to this meeting will be a discussion on DTS' lessons learned during the 2019 pavement survey and how DTS can use that experience to leverage even greater value to the County from this 2023 data collection effort. Any maintenance and rehabilitation (M&R) activities since the 2019 pavement survey will be an important component of the overall discussion. Project communication protocol, documentation, accounting methodologies, data format, and standards will be confirmed during the meeting.

Prior to the project kickoff meeting, DTS will mobilize a Mobile Asset Collection (MAC) vehicle in order to be present for the kickoff meeting and to provide an equipment demonstration to any interested County staff or elected officials. The following day, the DTS MAC field crews will begin the data collection survey on the County's road network and throughout the course of the project, will provide a "wheels-on-the-ground" verification of the County's current road network. DTS will begin route planning for the data collection efforts as soon as a Notice to Proceed is issued by the County and will utilize the same calibration site survey as the 2019 data collection project.

Task 1 Deliverable:

- DTS will provide the County with a centerline assessment document for review and approval
- DTS will provide an updated project schedule
- DTS will provide kickoff meeting minutes and attendees list

Task 2 – Project Management

DTS has several PMI-certified project management professionals including the proposed Project Manager who oversee and guide our project planning and execution. Our project management plan will adhere to the planning processes as defined by the Project Management Institute and as detailed in the Project Management Body of Knowledge. The plan will encompass all phases of the project including planning and organizing, communication, scheduling and controlling and coordinating.

DTS will provide project management tasks for the duration of the project, including coordinating and attending meetings via web meetings or in person with the County, data research and collection efforts as required, preparing weekly progress reports and schedule updates. Weekly progress reports will include the total days collected and lost due to weather or mechanical issues for the current reporting period as well as cumulative totals. An exhibit displaying the roads collected and not yet collected will also be included.

Task 3 – Quality Assurance and Quality Control

DTS will perform quality assurance and quality control on data collected and analyzed per the Project Quality Assurance Plan. DTS has a proven Quality Assurance/Quality Control (QA/QC) procedure for all MAC image collection projects. DTS' QC procedures begin with the MAC vehicle collection process. The same MAC calibration site that was used in 2019 will be used again for this cycle of pavement data collection and consists of up to ten point-locations nailed, painted and surveyed in a location easily accessible to the vehicle. This calibration site will be recorded in at least two perpendicular directions at the beginning and end of each collection day.

The MAC technician will check each camera's exposure rate, image quality, GPS and IMU to ensure the system is recording the image, GPS, DMI and IMU data and that the GPS location is within the stated project tolerance. Each collection day's calibration collection will be documented in a collection log book. The collection log book also contains information such as date, location,

technician, driver, any issue that developed during the collection day and DMI calibration runs. DTS will maintain a Microsoft Excel database of any collection or other project issues. Issues will be reported in weekly progress reports provided by DTS.

The MAC technician will review the images collected on-screen as they are collected. Any issue with image clarity would require the collection run to end and the image quality issue to be resolved. Once resolved, the collection run can resume from the beginning for the road segment collected. The MAC technician also monitors GPS reception during collection. In any case where the GPS reception is lost (measured using positional dilution of precision [PDOP]), the MAC technician will stop the collection and resolve the GPS reception issue. Collection can resume once the GPS reception issue is resolved. All issues resulting in the collection run being stopped will be recorded in the collection log book along with the resolution.

Completed collection drives will be delivered to DTS' headquarters in Orlando for post-processing. The image QC Officer will perform quality control checks on each delivery provided. The QC Officer will also visually review the collection routes for image quality. Any collection runs that are considered low quality will be marked for recollection before the MAC vehicle is permitted to leave Brevard County. Additionally, DTS will provide independent quality checks via field verification to confirm accuracy of automated data collection. DTS utilizes walk-out maps that display pavement distress data for field confirmation and acceptance.

DTS will provide the County with a breadcrumb file in a GIS database that was developed from the approved centerline data file to illustrate routes that have been collected. The breadcrumb file will be provided for the County's review and concurrence that data collection is complete.

The results of the data collection shall be quality checked for rating consistency by DTS to ensure the accuracy and quality of deliverables. Additionally, deliverables will be checked for missing and/or duplicate assets. A 97% accuracy rate is expected. QC checks will be based on the batch/sample size of the delivery (see Table A below to determine sample size for the appropriate accuracy rate).

For any measurement that is needed, it must be accurate to the nearest foot. If the data has more errors than allowable, the set of data will be corrected. This process will be repeated until each set of data is within the allowable limits.

Each attribute captured for an asset counts as one unit of measure. Each physical measurement required for an asset location counts as one attribute or unit of measure. The following location information also counts as an attribute or unit of measure for each asset: Physical presence (when captured as per source = correct, not captured or missed = incorrect). In the event of a duplicate capture of an asset, the total number of attributes or units of measure for the duplicate asset(s) will be deducted from the total units of the sample set, and one error or unit of measure (incorrect physical presence) is charged. For example, a delivery results in 100 assets. Each asset has been determined to have ten attributes to be captured (including the physical presence attribute for each asset). Thus, the total units of measure for the batch size = $100 \times 10 = 1,000$. Based on the table above, to attain an expected accuracy of 97.5%, the allowable number of errors

for a sample size of 80 units is ≤ 5 .

Batch size			Sample Size (Normal)	Acceptance Rate (%)				
				99.0	98.5	97.5	96.0	93.5
2	to	8	2	= 0	= 0	= 0	= 0	= 0
9	to	15	3	= 0	= 0	= 0	= 0	= 0
16	to	25	5	= 0	= 0	= 0	= 0	= 1
26	to	50	8	= 0	= 0	= 0	= 1	= 1
51	to	90	13	= 0	= 0	= 1	= 1	= 2
91	to	150	20	= 0	= 1	= 1	= 2	= 3
151	to	280	32	= 1	= 1	= 2	= 3	= 5
281	to	500	50	= 1	= 2	= 3	= 5	= 7
501	to	1,200	80	= 2	= 3	= 5	= 7	= 10
1,201	to	3,200	125	= 3	= 5	= 7	= 10	= 14
3,201	to	10,000	200	= 5	= 7	= 10	= 14	= 21
10,001	to	35,000	315	= 7	= 10	= 14	= 21	= 21
35,001	to	150,000	500	= 10	= 14	= 21	= 21	= 21
150,001	to	500,000	800	= 14	= 21	= 21	= 21	= 21
500,001 +			1250	= 21	= 21	= 21	= 21	= 21

Task 3 Deliverable:

- DTS will provide the County with a copy of the Quality Assurance Plan
- DTS will provide staff profiles of the team working on the PCA including a summary of experience, professional licenses, training and certifications showing the staff members, their roles and anticipated time allocated as it relates to the PCA. Additionally, DTS will provide an organizational chart of staff members assigned to the PCA.
- Upon completion of the data collection efforts, DTS will provide the County with the GPS breadcrumb van tracks of all locations collected by the MAC Van and an updated centerline file via the MAC Van's "wheels-on-the-ground" verification of the provided road centerline file

Task 4 – Data Collection

DTS will collect roadway data and images for the County's 1,140 paved centerline miles of roadway using a MAC data collection vehicle.

4.1 System Setup, Mobilization and Pilot Project

DTS will set up the data collection system and pavement management system so that all GIS and database system data are integrated and properly configured. DTS will mobilize one or more MAC vehicles to the County's site.

The County will provide the pilot project area to DTS so initial sample data can be collected and verified. DTS will collect data on the pilot project area and review the result with the County and acquire approval for full size project implementation.

4.2 Field Data and Image Capture

The DTS team includes a driver and operator who will systematically drive the MAC vehicle on the road segment listings provided by the County. DTS will collect pavement data with two-way roads receiving two passes and one-way roads receiving a single pass per lane. DTS will collect the outside lane in each direction in four-lane roads, and the outside and inside lanes in each direction in six-lane roads. DTS proposes to use its MAC vehicle line scan camera with laser illumination and four right-of-way cameras to capture pavement and ROW images to be used during the pavement rating process. Unpaved roads will not be surveyed.



DTS MAC Vehicle

The DTS' MAC vehicles are equipped with the following equipment that meets the requirements to provide PCI and IRI data:

- **High-resolution right-of-way digital cameras** – Allied Vision Prosilica GX1920C GigE, frame rate of 15 images per second and 1936 x 1456 color resolution
- **Laser Road Imaging System (LRIS) pavement imaging system** – collects high-definition pavement images used to extract distress type severity and extent measurements. 4096 pixel/line, 28,000 lines/sec, 1mm resolution
- **ApplanixPOS220V inertial measuring unit (IMU)** – centimeter-level positioning of MAC van during collection
- **DMI equipment** – distance measuring instrument used for system integration
- **GPS equipment** – used for mapping level positioning of the vehicle, heading information and positional tagging of images (2 positional units, 1 differential unit)
- **Servers** – on board servers for storing data, processing images and storing profiler, GPS, DMI and IMU data
- **Surface (road) profiler** – used for precise pavement ride and rut measurement

The MAC system collects all pavement and right-of-way images, IMU, DMI and profiler data concurrently as well as imagery for roadway assets including signs, sidewalks, ramps, pavement marking, pavement striping, street lights, curb and gutter, signals, fire hydrants, inlets and manholes.

Task 4 Deliverables:

- DTS will provide right-of-way imagery for all segments collected in a JPEG format.
- DTS will provide downward-facing pavement imagery in a georeferenced JPEG format for all segments collected.

Task 5 – Pavement Data Analysis

5.1 Pavement Surface Imaging Rating

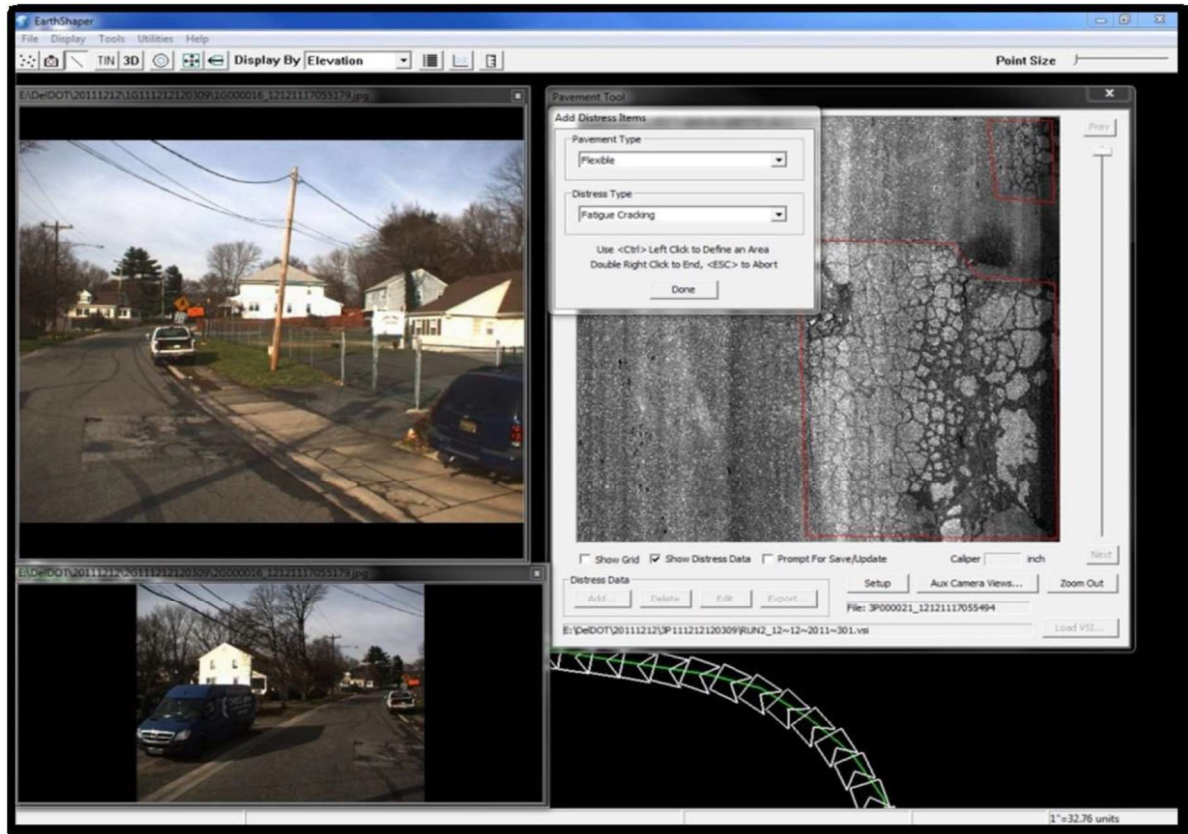
The DTS' MAC vehicles' pavement imaging sensors are oriented from nadir (straight- down) to achieve the best perspective, laser-illuminated to ensure uniform image contrast and GIS-integrated to provide geospatial distress vectors (points, lines and polygons) that can be loaded and verified using GIS.

- DTS will utilize a downward-facing, progressive line scan camera that provides high-resolution images (1mm pixel, 4,000 pixels wide, and ~12 feet width) of the pavement surface to clearly detect and quantify distresses.
- Pavement surface imaging (JPEG format) will span, at a minimum, the data collection lane from left lane stripe to right lane stripe and will provide 100% continuous pavement coverage.
- Image resolution will be such that all visual cracking distresses can be accurately identified and quantified.
- Images will have a minimum horizontal resolution of 4,000 pixels or better.
- Images will be synchronized with the County's centerline file.
- DTS will collect the longitudinal profile and IRI to provide a ride condition index for each segment.

5.2 Pavement Condition Evaluation

With the pavement image collection started, DTS will begin processing pavement images. This allows DTS to begin the pavement distress rating process concurrent with the image collection.

Once pavement images and distress mapping processing are complete for each collection day, DTS' experienced pavement evaluators will review each road segment's images for a complete and thorough evaluation of the existing pavement condition per the ASTM D6433 pavement distress rating process which includes 19 distress factors. The EarthShaper™ software allows distress vectors to be viewed and edited through this workflow. DTS has designed the EarthShaper asset data extraction software by optimizing the performance of visualization/QC of the roadway condition and inventory data.



Pavement condition evaluation within the EarthShaper™ software

The IRI will be collected using profiler equipment that meets ASTM E950 standards. DTS utilizes a surface profiling system manufactured by International Cybernetics Corporation (ICC) for evaluating the smoothness of pavement.

DTS will provide the pavement condition assessment data to the County in an industry-standard format (Esri file geodatabase, Access database, SQL database) for upload into the County's pavement management system.

Task 5 Deliverables:

- DTS will provide a geodatabase of distresses containing the type, severity and extent of distresses along the road segment as defined by the ASTM D6433 sampling methodology along with sample locations.
- DTS will provide a report including PCI values and IRI values in an Excel spreadsheet.
- DTS will provide an industry-standard format database (Esri file geodatabase, Access database, SQL database) to the County containing collected pavement data including PCI values and IRI values.
- DTS will perform field verification of pavement condition scores with County staff.

Task 6 – Comparison Analysis between 2019 and 2023 Datasets

Once the PCI has been calculated, DTS and County staff will confer on the specific elements and content of the comparison analysis between the 2019 and 2023 datasets.

Task 6 Deliverable:

- DTS will deliver a report to the County in an electronic format (PDF) detailing the comparison analysis between the 2019 and 2023 as agreed upon by DTS and County staff.

Task 7 – Pavement Report with Maintenance and Repair (M&R) Strategies

DTS will provide a draft and final report of the PCA including the PCI rating for every road segment, an Executive Summary of the PCA detailing the overall health of the County's road network, countywide and by district, including visual graphs/charts, recommendations for maintenance & repair (M&R) strategies, data analysis results from comparison with 2019 dataset.

Task 7 Deliverable:

- The deliverable of the final Pavement Management Program Report will be signed and sealed by a DTS P.E.

Task 8 – Guardrail Inventory and Assessment

DTS' MAC vehicle will collect right-of-way asset inventories at the same time as data is collected for the pavement management system. The vehicles will capture images at an interval of approximately 10 to 15 feet for both forward and side-facing directions and geo-referenced to the pavement inventory by segment. DTS proposes populating the following attributes for the guardrail inventory:

Guardrail Attributes (Linear Feature)

- AssetID
- Location (Line representing guardrail location)
- Location (Street Name asset located on)
- Length
- Photo Image link
- Physical Condition Rating
 - Good – no visible damage
 - Fair – visible minor damage such as small piece dented
 - Poor – visible damage caused by vehicle impact, section twisted/bent/down
- Comments



Sample image of guardrail collected with MAC LRIS system

Task 8 Deliverable:

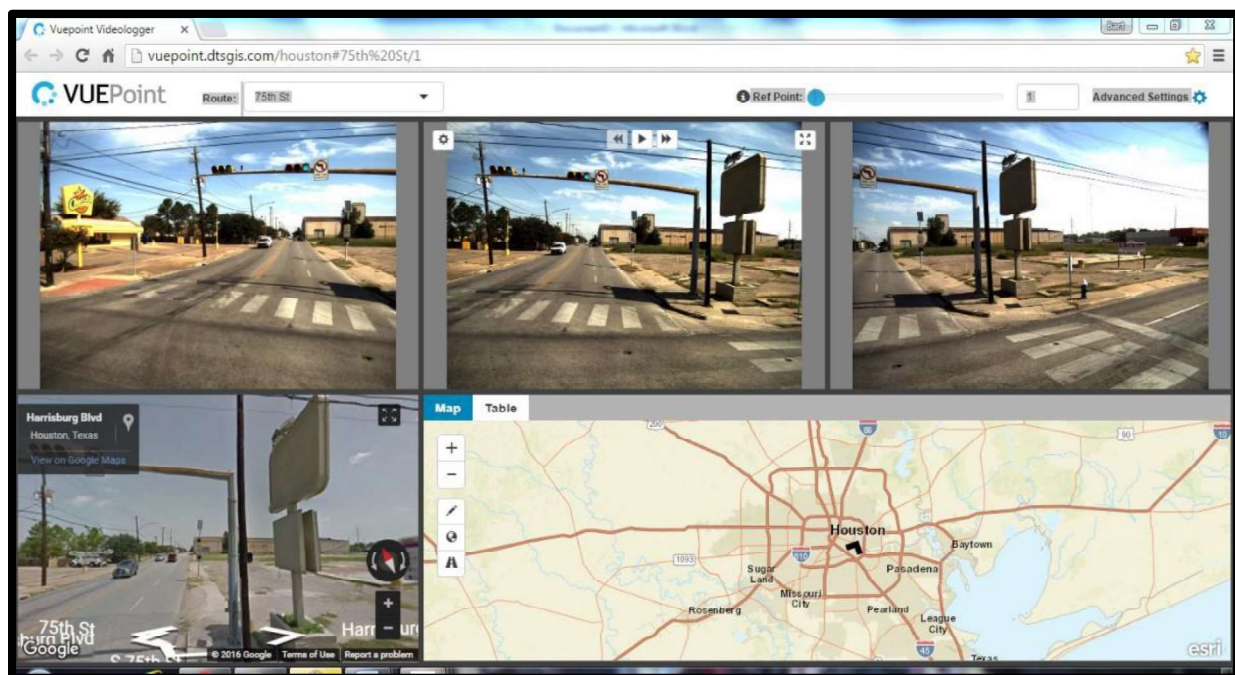
- DTS will deliver a guardrail inventory with attributes identified above in a GIS file geodatabase along with corresponding extracted asset image.

Required geographic information system (GIS) formats are the same coordinate and projection systems as the provided roadway database by the County. The details are as followed:

- Geographic Coordinate System: GCS North American 1983 HARN
- Projected Coordinate System: NAD 1983 HARN StatePlane Florida East FIPS 0901 Feet
 - Projection: Transverse Mercator
 - False Easting: 656166.66666667
 - False Northing: 0.0
 - Central Meridian: -81.0
 - Scale Factor: 0.99994118
 - Latitude of Origin: 24.33333333
 - Linear Unit: Foot US

Task 9 – Optional Service: VUEPoint™ Videolog Viewer

DTS will develop an Esri web-based and GIS-centric viewer, the VUEPoint™ videolog viewer, from collected imagery from the MAC vehicles. DTS will provide the County a GIS-integrated video viewing application that can be used to view all the collected data, including ROW images and tabular data. The County will store the images and be able to query by road name, direction, year and other attributes. The software is hosted on premise with the client unless arrangements have been made for DTS to host at an additional fee. DTS estimates the County needs 15-20 TB of internal data storage capacity. Recurring fees for hosting would only be applicable if DTS is hosting.



Sample VUEPoint Videologger Built for City of Houston

Task 10 Deliverable:

- DTS will deliver a web-based and GIS-centric viewer that allows users to view DTS' MAC-collected right-of-way images of asset data and review pavement images.

Schedule (Note: DTS to provide updated project schedule in Gantt Chart format upon NTP):

Proposed Schedule (Brevard County) – complete in 5 months from Notice to Proceed	
Task	Timeline
Centerline identification and mobile asset collection pre-planning	1 Day
Project kickoff meeting	1 Day
Mobile data collection (Pavement and ROW imagery)	90 Days
Pavement condition rating per the ASTM D6433 (concurrent with collection)	90 Days
Draft Pavement Report (March/April 2023)	5 Days
Pavement Final Report (May 2023)	3 Days

Cost Estimate:

Brevard County, FL				
Task	Description	Units	Unit Cost	Fee
1	Centerline Review & Verification, Route Planning, Calibration Site Survey and Mobilization ¹	1	\$ 5,700.00	\$ 5,700.00
2	Project Management	1	\$ 20,000.00	\$ 20,000.00
3	Quality Assurance and Quality Control	1	\$ 20,000.00	\$ 20,000.00
4	Mobile Image Data Collection of Pavement and ROW Imaging (Units = Centerline Miles)	1,140	\$ 125.00	\$ 142,500.00
5	Pavement Analysis with IRI and QA/QC (Units = Centerline Miles)	1,140	\$ 120.00	\$ 136,800.00
6	Comparison Analysis between 2019 and 2022 Datasets	1	\$ 10,000.00	\$ 10,000.00
7	Pavement Report with Maintenance and Repair (M&R) Strategies	1	\$ 15,000.00	\$ 15,000.00
8	Guardrail Inventory (centerline miles)	1,140	\$ 40.00	\$ 45,600.00
	Based on 1140 centerline Miles ²			
	Total Fee³			\$ 395,600.00
	Optional Services			
9	VUEPoint Videolog Viewer(County hosted) ⁴	1	\$ 30,000.00	\$ 30,000.00
	Optional Cloud Hosting for VUEPoint Videolog Viewer			
	Environment Setup ⁵	1	\$ 5,000.00	\$ 5,000.00
	Annual Hosting (recurring) ⁶	1	\$ 12,000.00	\$ 12,000.00
1. Assumes centerline file will be provided in GIS and require no edits. 2. Cost estimate is subject to change if units change. 3. DTS will bill lump sum based on percent complete for each task item. 4. County will be hosting all the data 5.Setup includes 15 TBs of Storage. Additional storage is available. Setup fee is a one-time fee 6. Hosting is due at Go-Live and renews annually thereafter on the Go-Live anniversary				