

Scope of Work

City of Rancho Cucamonga: Pavement & Asset Management Program

Section I: Scope of Work Description

Roadway Asset Services, LLC (CONSULTANT) understands that the City of Rancho Cucamonga (CLIENT) requests the performance of Pavement and Right-of-Way Asset (ROW) Data Collection and Reporting services to assess the existing condition of all existing public roadway pavements within the City's boundaries.

Base Scope of Work: PMP Inventory: The project will be completed by conducting a field survey of the pavement conditions on all CLIENT maintained roads in accordance with a modified version of the ASTM Standard D6433 "Standard Practice for Roads and Parking Lots Pavement Condition Index (PCI) Surveys." The PCI based pavement condition and right-of-way asset image survey is to be conducted on approximately 497 centerline miles (646 survey miles accounting for two-directional testing on arterial, collector, and industrial roads) of roadways within the City limits, on each street segment which is typically block-to-block and tagged with a unique GIS ID on the feature-class layer. The project includes the adoption of the City's existing street centerline layer. CONSULTANT will proceed with driving arterial roads in two directions and local roadways in a single direction. The test miles are driven by the Roadway Asset Collection (RAC) vehicle and rated for pavement condition on CLIENT owned roads. A comprehensive pavement analysis with multi-year maintenance and rehabilitation recommendations and budget scenarios is to be delivered in a Final Report. CONSULTANT is to implement the BOSS™ pavement management system. For the first year (including the initial report is delivered by approximately January 2026) of the agreement, CONSULTANT will provide the Gold level of service and analysis support to the CLIENT. Upon acceptance of the final report and software operating parameters, CLIENT will have access to BOSS™ WEB and the RAS support program package for the software.

Optional Services: CONSULTANT has separated years 3 through 5 of BOSS™ WEB licenses for the CLIENT to elect to continue that service on an annual basis beginning in year 3. There is also an option for a pavement condition assessment in 2027/2028 of the major roadways should the City elect to update the PCI data and update deterioration models.

The CONSULTANT (Roadway Asset Services, LLC) shall provide the following services to the CLIENT (City of Rancho Cucamonga, California):

Task 1: Project Initiation & Project Management

At the outset of the project, CONSULTANT will work in conjunction with CLIENT staff to review the CLIENT's existing GIS centerline files and pavement inventory for use in this project. After an initial review, CONSULTANT will conduct a kickoff meeting with CLIENT to discuss the GIS files, deliverable formats, biweekly progress meetings, and additional data needed by CONSULTANT. During the kickoff meeting, CONSULTANT will also present the methodology for the pavement condition assessment and comprehensive ROW asset survey, review with CLIENT the quality assurance/quality control (QA/QC) plan, introduce key personnel, review equipment, and revise the schedule. Project communication protocol, documentation, accounting methodologies, and data format will be confirmed during the meeting.

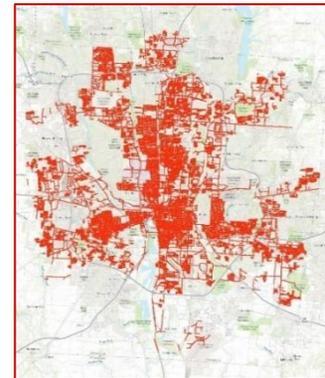
Task 1 Deliverables:

1. CONSULTANT will attend the virtual project kick-off meeting.
2. CONSULTANT will coordinate and management schedule, scope and costs.
3. CONSULTANT to coordinate recurring status meetings on a bi-weekly basis.

Task 2: Field Setup, Centerline Identification & GPS Network Creation

Centerline Identification & Field Setup

CONSULTANT will review the CLIENT's existing GIS centerline and perform an audit of the data to ensure that all roads requiring data collection are surveyed. CONSULTANT will use the existing centerline data and create a pavement database on the centerline layer. Each road segment record in the centerline layer will have a corresponding record in the pavement database. In addition, CONSULTANT will work with the CLIENT to maintain the unique identifier of each road segment in the road network so that the pavement database can maintain a link to the GIS data. The result will be a clean GIS centerline ready for consumption of additional layers and attribution related to the pavement condition surveys and asset inventories.



At the completion of the GIS audit, CONSULTANT will deliver a .pdf and ArcGIS file geodatabase collection map that ensures arterial and collector roadways are two pass tested and that local roads are single pass tested.

GPS Network Creation

CONSULTANT will consume the final GIS centerline's to be adopted for the pavement condition surveys as it will serve as the foundation for routing and CLIENT road ownership. The centerline data will be loaded to the RAC van field routing application in preparation of the surveys. The mobile mapping application will be utilized to track the centerline segments surveyed and eventually link the XY coordinates of each automated sample collected.

Task 2 Deliverables:

1. CONSULTANT will develop the road centerline file and GIS data to finalize the extent of the survey.
2. CONSULTANT will initiate field setup, routing, and GIS integration into the RAC vehicle.

Task 3: Collect Roadway Network

The CONSULTANT will collect roadway data and images on 680 survey miles 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 CONSULTANT team consists of a driver and operator who will systematically drive the automated data collection vehicle on the road segment listings provided by the CLIENT. The CONSULTANT will collect pavement data with two passes on arterial, collector, and industrial roadways while single pass testing the local roadways. 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 imagery for deliverables and identify all requested right-of-way (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-2) for automated pavement data acquisition, panoramic 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. CONSULTANT will perform data field collection on paved roads using a state-of-the-art Roadway Asset Collection (RAC) vehicle with the following systems mounted:

- Right-of-way georeferenced images with: Forward, Left, Right, and 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 RAC vehicle collects pavement and ROW 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. The road surface profiler meets all ASTM E-950 standards for evaluating the smoothness of pavement.

CONSULTANT will process the LCMS-2 and panoramic imagery to deliver to the CLIENT via an external hard drive with image hyperlinks included in the pavement database (.csv).



Example imagery from RAC camera system

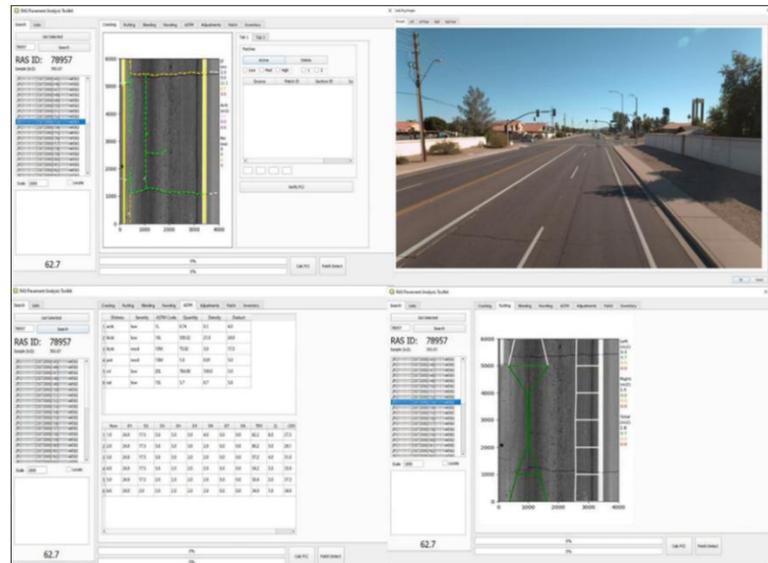
Task 3 Deliverable:

1. CONSULTANT will complete field testing on all paved roadways.

Task 4: Pavement Condition Index (PCI): ASTM D6433 Distress Processing

ASTM D6433 Distress Processing

CONSULTANT will evaluate the PCI survey results in accordance with ASTM D6433. CONSULTANT will conduct a 100% linear survey on all CLIENT maintained roadways driven and evaluate those sample images using an analysis program called **RoadTRIP™** (Technical Rating Intelligence Program). The program was designed around automated inspection techniques utilizing a modified ASTM D6433 pavement distress rating protocol that includes 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 QA.



Quality Assurance and Quality Control

The CONSULTANT will perform quality assurance and quality control on all data collected.

CONSULTANT has a proven Quality Assurance (QA)/Quality Control (QC) procedure for all mobile data collection projects. CONSULTANT QC procedures begin with the RAC vehicles' collection process.

The technician will check each camera's exposure rate, image quality, GPS, and IMU operation to ensure the data collection system is recording the image and that the GPS location is within the stated project tolerance. Each collection day's calibration collection will be documented in the collection logbook. The collection logbook also contains information such as date, location, technician and drivers name, any issue that developed during the collection day and DMI calibration runs.

During image collection, the technician reviews the images collected on-screen as they are collected and any issue with image clarity requires the collection run to end and the image quality issue to be resolved. Once resolved, the collection run begins from the beginning for the road segment collected. The technician also monitors GPS reception during collection. If GPS reception is lost (measured using PDOP – positional dilution of precision), the technician stops the collection and resolves the GPS reception issue. Collection begins again once the GPS reception issue is resolved. All issues resulting in the collection run being stopped will be recorded in the collection logbook along with the resolution.

With a completed collection drive delivered to CONSULTANT offices, images are post processed and provided to the image QC Officer who will perform quality control checks on each delivery provided. The QC Officer will visually review the collection routes for image quality. All collection runs that are considered of low quality will be marked for recollection before the data collection vehicle(s) is allowed to leave the project site. Additionally, CONSULTANT will provide independent quality checks via field verification to confirm accuracy of automated data collection.

Task 4 Deliverables:

1. CONSULTANT will deliver all views camera system and a single view of the LCMS-2 downward pavement imagery.

Task 5: RAS Verification & Pilot Review

CONSULTANT will work with the CLIENT to identify and setup a pilot of approximately 10 miles of roadway so that initial sample data can be collected, processed, and verified. CONSULTANT will collect data within pilot project area, process the data and review the result with the CLIENT. If any corrective action is identified during the data validation, such corrections will be applied to the data processing algorithms prior to final PCI calculations. CONSULTANT will work with the CLIENT to review and verify that the data is ready to proceed. This task is to be completed on-site or virtually depending upon the availability of key staff.

Task 5 Deliverables:

1. CONSULTANT will schedule and conduct virtual/on-site field validation with CLIENT staff.
2. CONSULTANT will process data for the pilot area (approx. 10-miles) and data validation meeting.
3. CONSULTANT will make any necessary modifications to processing algorithms.

Task 6: Pavement Widths Verifications

The CONSULTANT will use aerial imagery and the images from the RAC camera system to capture the width of pavement for each street segment to compare with any existing database information. CONSULTANT will capture multiple widths for each pavement segment, including noticeable width changes (including turn lanes) to ensure an acceptable average width per segment is acquired for budgetary modeling purposes.

Task 6 Deliverables:

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

Task 7: Delivery of Inventory Data and PowerBI Portal

The CONSULTANT will package all of the pavement management data into an updated File Geodatabase, a MS PowerBI QC portal, and ArcGIS Online (AGOL) PCI maps for the CLIENT to access. The data included in the deliverable will include; individual pavement distress quantities, densities and deduct values for each segment, PCI for each segment, linked forward-view imagery in the PowerBI portal, and all imagery delivered via a portable hard drive.

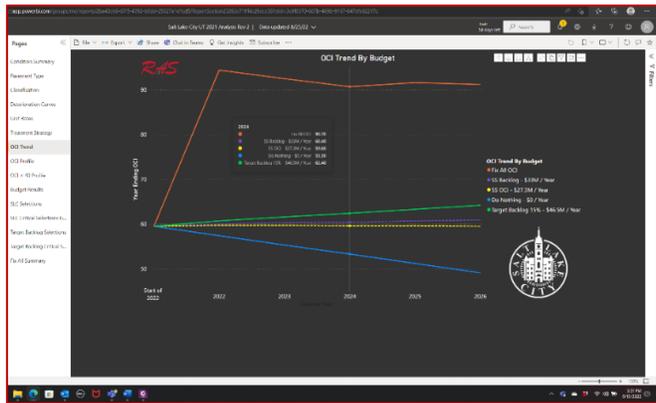
Task 7 Deliverables:

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 for each roadway segment.
2. CONSULTANT to host a PowerBI portal as a QC tool with access to segment-level data and forward-view imagery.
 - a. The QC portal will be hosted by RAS and the term of the license to this portal will last through the duration of the contract. This data is static and will not change with any updates to the BOSS WEB™ system.

Task 8: Pavement Analysis, Budget Scenarios & Report

CONSULTANT will develop, configure and set up the pavement analysis operating parameters within our Budget Optimization Street Selector (**BOSS™**) application. CONSULTANT will configure the software with 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 CLIENT with determining the right treatment (prescription) at the right time by reviewing the CLIENT’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.

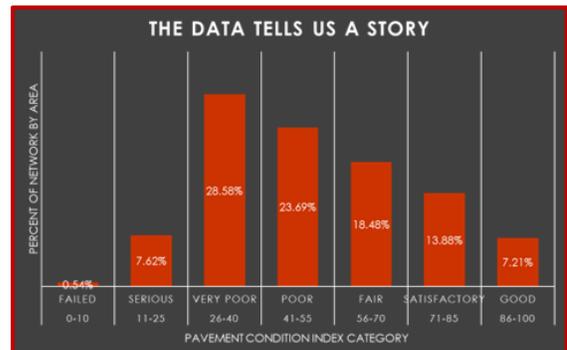
We propose to provide these services to develop a 5-year maintenance plan that is financially optimized and prioritized to meet the needs of the CLIENT. **BOSS™** is a cloud based application with powerful pavement management algorithms behind it that export the results of the pavement analysis to a user friendly interface such as **Microsoft Power BI** (single user log-in supplied and hosted by RAS for the duration of the license of **BOSS WEB™**), **Excel Spreadsheets**, and **PowerPoint files**. All of the results are integrated with the CLIENT’s existing GIS and supplied to the CLIENT as a **File Geodatabase for consumption and storage**.



While the CONSULTANT will define the scenarios to be run with the CLIENT, at a minimum the following questions should be answered with the budgetary scenarios:

- What is the resultant network PCI at my current funding level?
- What budget is required to maintain my existing network PCI?
- What budget is required to achieve a desired network PCI?
- What budget is required to control the growth in backlog?

COSULTANT will provide the CLIENT a final executive report including study objectives, background information, methodology, work history of completed maintenance and rehabilitation, inventory of all roads, current pavement conditions for each street function classification, and network PCI and IRI. In addition, the CLIENT will receive statistical charts, graphs, and area maps illustrating all PCI results, pavement type, the overall road quality, and findings from the pavement evaluation.

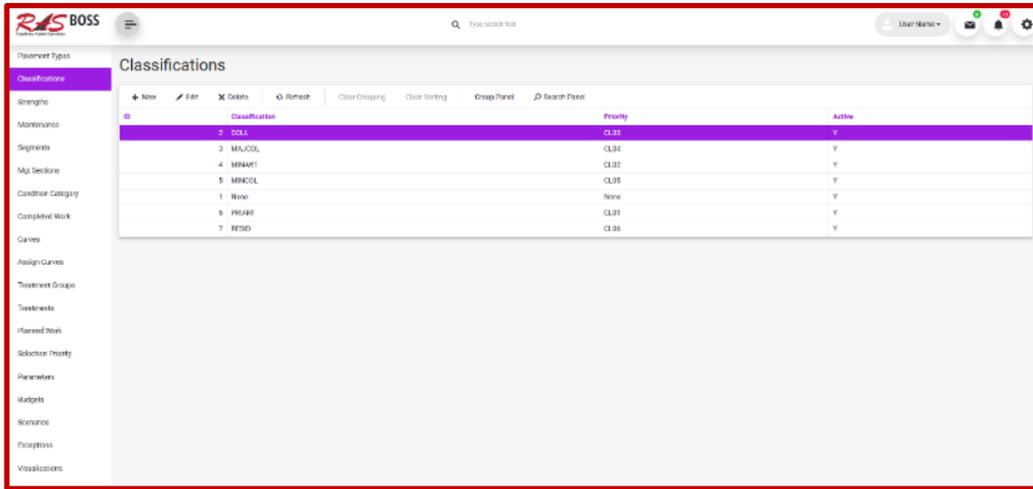


Task 8 Deliverables:

1. The final pavement and analysis results will be delivered as a File Geodatabase that is ready to be consumed within the CLIENT’s GIS environment.
2. A final report will be drafted that summarizes the results of the data collection survey and budetary models performed as a part of the pavement analysis.
3. Initial analysis parameters will be imported to the CLIENT’s **BOSS WEB™** system.

Task 9: BOSS WEB™ Configuration, Deployment & Training

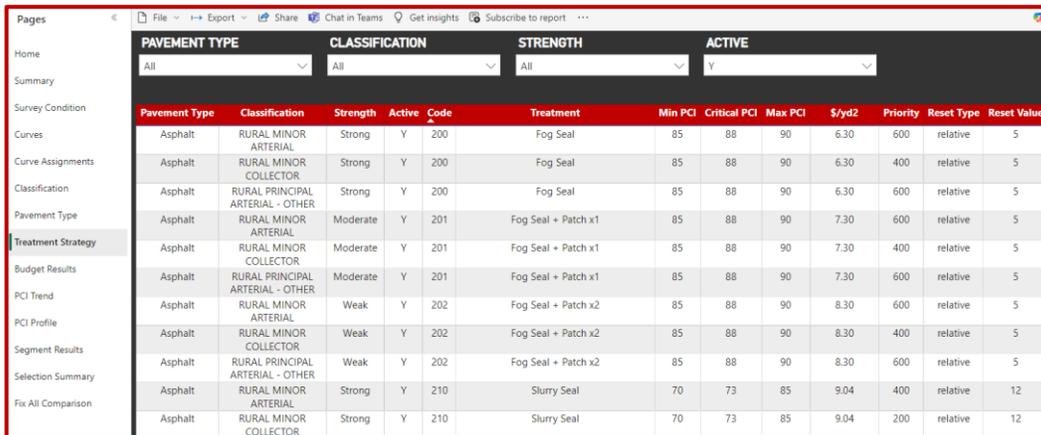
Access to the software grants the CLIENT the ability to add segments to the inventory, edit attributes, modify management section sizes (projects), program completed work, program planned work, modify the customized deterioration curves, re-assign appropriate curves, modify an unlimited number of maintenance and rehabilitation activities, modify priority parameters, run customized budgetary models, and view scenario results. In addition, the BOSS WEB™ software can be linked to update the CLIENT’s GIS via an ArcGIS Online End Point.



Configuration of BOSS WEB™

The CONSULTANT’S approach to the implementation, hosting, and training for the software includes the following CLIENT engagements during the configuration process.

- **Deterioration Curves** – forecasting pavement conditions requires a detailed set of pavement deterioration curves for each roadway traffic classification and pavement material type, as designated by the pavement management system. The CONSULTANT will develop the deterioration curves to ensure they reflect realistic degradation rates for the CLIENT.
- **Maintenance & Rehabilitation Setup** – to ensure the results of the budget model runs meet the CLIENT’S expectations, the CONSULTANT will discuss the CLIENT’S current Maintenance and Rehabilitation setup within the pavement analysis setup. This will include activity set up, PCI trigger points, and PCI reset scores.



Pavement Type	Classification	Strength	Active	Code	Treatment	Min PCI	Critical PCI	Max PCI	\$/yd2	Priority	Reset Type	Reset Value
Asphalt	RURAL MINOR ARTERIAL	Strong	Y	200	Fog Seal	85	88	90	6.30	600	relative	5
Asphalt	RURAL MINOR COLLECTOR	Strong	Y	200	Fog Seal	85	88	90	6.30	400	relative	5
Asphalt	RURAL PRINCIPAL ARTERIAL - OTHER	Strong	Y	200	Fog Seal	85	88	90	6.30	600	relative	5
Asphalt	RURAL MINOR ARTERIAL	Moderate	Y	201	Fog Seal + Patch x1	85	88	90	7.30	600	relative	5
Asphalt	RURAL MINOR COLLECTOR	Moderate	Y	201	Fog Seal + Patch x1	85	88	90	7.30	400	relative	5
Asphalt	RURAL PRINCIPAL ARTERIAL - OTHER	Moderate	Y	201	Fog Seal + Patch x1	85	88	90	7.30	600	relative	5
Asphalt	RURAL MINOR ARTERIAL	Weak	Y	202	Fog Seal + Patch x2	85	88	90	8.30	600	relative	5
Asphalt	RURAL MINOR COLLECTOR	Weak	Y	202	Fog Seal + Patch x2	85	88	90	8.30	400	relative	5
Asphalt	RURAL PRINCIPAL ARTERIAL - OTHER	Weak	Y	202	Fog Seal + Patch x2	85	88	90	8.30	600	relative	5
Asphalt	RURAL MINOR ARTERIAL	Strong	Y	210	Slurry Seal	70	73	85	9.04	400	relative	12
Asphalt	RURAL MINOR COLLECTOR	Strong	Y	210	Slurry Seal	70	73	85	9.04	200	relative	12

BOSS WEB™ Training Program

Functional Training

RAS will conduct BOSS WEB™ training through a series of remote sessions for users of the pavement management application. Software training will be deliberately executed in shorter web sessions that cover a specific area of study within the software. While the training agenda will be developed and approved by City staff toward the end of the project, topics such as the following can be expected:

1. Software overview, user interface, and administration constraints
2. Principles of pavement management
 - a. How to modify deterioration curves, pavement types, functional classifications, deterioration curves, management sections, treatment groups, selection priorities, visualizations, and inventory attributes.
3. Understanding the pavement condition indices and how BOSS uses them (PCI, RI, SI, and OCI)
4. Network inventory database management such as adding new streets and modifying management sections.
5. How to update the system with the work the City has completed and check to ensure the City is getting the PCI impact that was programmed
6. How to generate custom budget scenario reports and export the data from BOSS
7. How to maintain the database and what to look for within the BOSS system
8. Other topics and more detail will be added to this agenda when developed by RAS and reviewed by City staff.

Tasks 9a-9e: BOSS WEB™ Hosting & Annual Support

Structure

The BOSS WEB™ application leverages an Azure hosted application.

Authentication

User Authentication shall be username / password and include self-service reset options such as email reset and / or one time passcode.

Authorization

The application shall include a user, user group and module security model to manage user access to the features of the application.

Standard Map Functionality

- All maps in the application shall have the option of adding ESRI base maps. Examples include, but are not limited to:
 - Imagery
 - Streets
 - Light gray canvas
 - Dark gray canvas
- All maps in the application shall have the option of adding ESRI AGOL reference layers outside of the CLIENT AGOL environment.
- Zoom, Pan, Select, Information Window
- Table of Contents, Customizable symbology.
- Hyperlinks to images hosted at a url.

Annual Support Program

The BOSS WEB™ license includes a supplemental support package. The included Client Success Package includes access to one of the CONSULTANT's analysis mentors whom the CLIENT can call when they forget how to access and perform tasks within the system. The CONSULTANT's mentor provides further guidance, feedback, and training to ensure the ultimate success of the CLIENT's staff who is operating the BOSS WEB™ software. As a part of the BOSS WEB™ license subscription, CLIENT staff automatically receive a Client Success Package with up to 20 hours of support supplied on a use it or lose it basis. Additional Support Packages can be provided to the CLIENT on an annual basis if additional support or consulting services are required.

Task 9 Deliverables:

1. BOSS WEB™ – Full configuration conducted in Year 1 at the conclusion of the CONSULTANT's pavement management report process.
2. BOSS WEB™ – Go-Live
3. Training to be conducted over a series of web meetings to configure the system.
4. Support to be provided to the CLIENT with an annual maximum of 20 hours through the duration of the software license agreement.

Section II – Scope of Services Budget

The CONSULTANT fee structure for this assignment can be found below with the compiled tasks to illustrate the full scope of this project. The CONSULTANT fees are based on the proposed scope of work.

Rancho Cucamonga RFP #24/25-006 Pavement and Asset Management Program				
Task	Description	Units	Unit Cost	Fee
Item 1: PMP Inventory, Reporting, 1st Year BOSS™ Software				
1	Project Initiation and Project Management [Lump Sum]	1	\$6,320.00	\$6,320.00
2	Field Setup, Centerline Identification & GPS Network Creation [Lump Sum]	1	\$5,000.00	\$5,000.00
3	Collect Roadway Network [Test-Miles]	646	\$100.00	\$64,600.00
4	Pavement Condition Index (PCI): ASTM D6433 Distress Processing [T-Miles]	646	\$40.00	\$25,840.00
5	RAS Verification & Pilot Review [Lump Sum]	1	\$3,500.00	\$3,500.00
6	Pavement Widths Verification [Lane-Mi]	993	\$10.00	\$9,930.00
7	Delivery of Inventory Data and PowerBI Portal [Lump Sum]	1	\$5,000.00	\$5,000.00
8	Pavement Analysis, Budget Scenarios & Report [Lump Sum]	1	\$15,000.00	\$15,000.00
9	BOSS™ WEB Configuration, Deployment, & Training (Year 1 Only) [Lump Sum]	1	\$25,000.00	\$25,000.00
Annual BOSS License Fees				
9-a	BOSS™ WEB: Year 1 (2026 Annual Support, Maintenance & License)	1	\$17,500.00	\$17,500.00
9-b	BOSS™ WEB: Year 2 (2027 Annual Support, Maintenance & License)	1	\$17,500.00	\$17,500.00
Item 1 - PMP Inventory and Software Sub-Total:				\$195,190.00

Assumptions:

- CONSULTANT to consume CLIENT GIS centerline for developing survey mileage.
- Arterial, Collector & Industrial roadways will be surveyed once in each direction and the local roadways will be surveyed in a single direction.
- Roads are to be surveyed when free of debris and standing water at temperatures between 40 and 90 degrees Fahrenheit.
- Bill monthly, lump sum based on percent complete for each task item. Fees are inclusive of labor and expenses.

Optional: BOSS WEB™ Annual License for Years 3-5

The following table includes the annual license fees for years 3 through 5 for BOSS™ WEB.

Optional: BOSS™ WEB Years 3-5				
Task	Description	Units	Unit Cost	Fee
10	BOSS™ WEB: Year 3 (2028 Annual Support, Maintenance & License)	1	\$20,000.00	\$20,000.00
11	BOSS™ WEB: Year 4 (2029 Annual Support, Maintenance & License)	1	\$20,000.00	\$20,000.00
12	BOSS™ WEB: Year 5 (2030 Annual Support, Maintenance & License)	1	\$20,000.00	\$20,000.00
Optional: BOSS™ WEB Years 3-5 Sub-Total:				\$60,000.00

Optional: 2027/2028 Re-survey of Major Roads

The following table includes the tasks and fee associated with a partial network survey to update the PCI data and import the data to the City’s BOSS WEB™ software mid-cycle. This set of tasks also includes staff time to update the deterioration curves and import the updated PCI data.

This partial network PCI update and import to BOSS WEB™ would require approximately 4 to 5 months to complete from issuance of NTP.

Optional 2027/2028 PCI Update of Major Roads				
Task	Description	Units	Unit Cost	Fee
13	Setup and Mobilization	1	\$5,500.00	\$5,500.00
14	Collect Roadway Network [Test-Miles]	364	\$112.00	\$40,768.00
15	Pavement Condition Index (PCI): ASTM D6433 Distress Processing [T-Miles]	364	\$45.00	\$16,380.00
16	Staff Consulting Hours: Sr. Pavement Consultant (Hours)	16	\$275.00	\$4,400.00
17	PCI Data Import to BOSS™ WEB	1	\$5,000.00	\$5,000.00
2027/2028 PCI Update of Major Roads Sub-Total:				\$72,048.00

Project Total for All Services

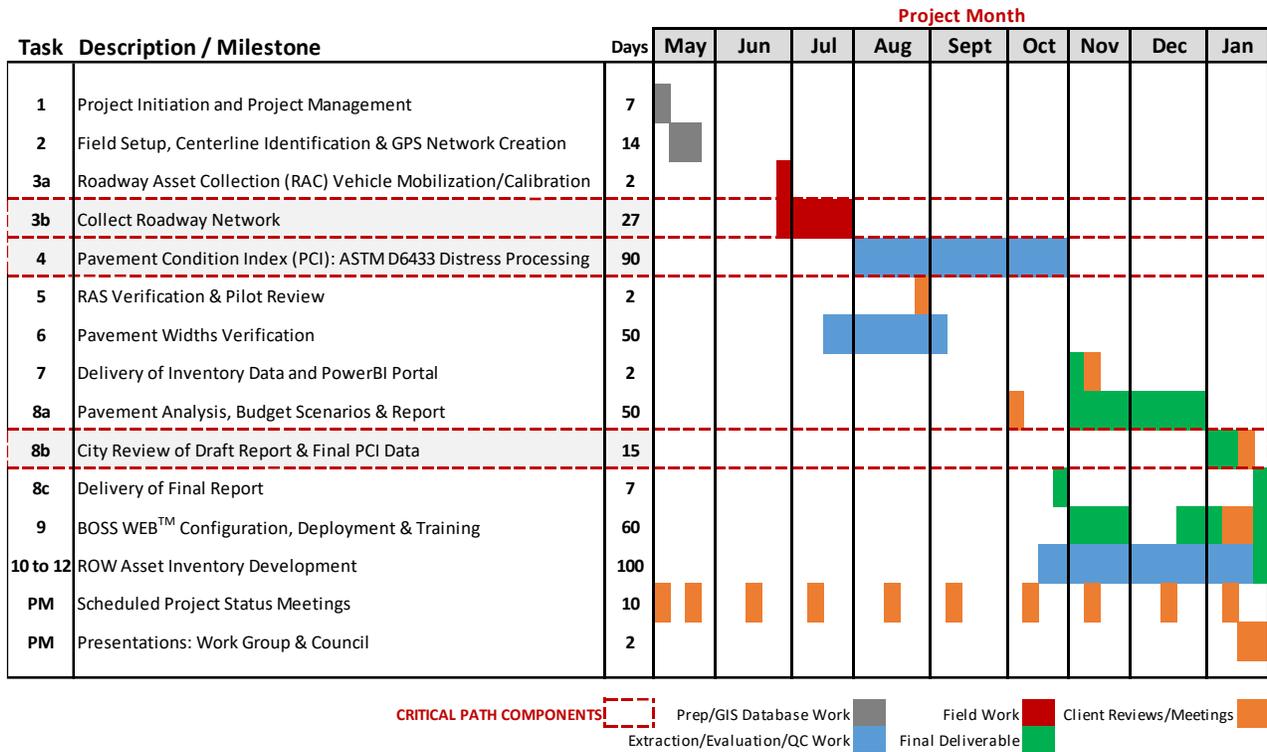
Should the City elect to conduct the base scope of work and all optional services, the total 5-year project fee is reflected below.

5- Year Project (Base SOW & Options) Total: \$327,238.00



Section III – Scope of Services Schedule & Timeline

CONSULTANT to assign staff and resources to perform the tasks associated with this scope of work to meet the timeline presented below.



Annual Service Milestones

From the projected timeline above, the recurring annual license will be schedule for renewal at the approximate dates.

Milestone	Time from NTP	Estimated Milestone
Final Report & BOSS WEB™ Go-Live	Approx. 9-Months	January 2026
Year 1 License BOSS WEB™	Approx. 9-Months	January 2026
Year 2 Renewal BOSS WEB™	Approx. 21-Months	January 2027
Year 3 Renewal BOSS WEB™	Approx. 33-Months	January 2028
Year 4 Renewal BOSS WEB™	Approx. 45-Months	January 2029
Year 5 Renewal BOSS WEB™	Approx. 57-Months	January 2030