Pavement Management Service Contract  
between  
Champaign County, Illinois  
and  

This Contract is made and entered into on March 4, 2009 by and between Champaign County, Illinois (the Client) and Applied Research Associates, Inc. (ARA).

<table>
<thead>
<tr>
<th>Contract Title:</th>
<th>Multiyear Pavement Management Services for Champaign County, Illinois</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract Type:</td>
<td>Firm Fixed Price</td>
</tr>
<tr>
<td>Contract Value:</td>
<td>$290,000 (USD)</td>
</tr>
<tr>
<td>The Client Contract No.</td>
<td>#05-00401-01-ES</td>
</tr>
<tr>
<td>ARA Contract No.</td>
<td></td>
</tr>
</tbody>
</table>

The parties agree to the following:

**Article 1. Scope of Services and Schedule**

See “Exhibit A - Scope of Services and Schedule” where ARA Proposal dated February 26, 2009 is hereby incorporated in the contract.

**Article 2. Property Rights**

ARA reserves the intellectual property rights to the proprietary software RoadCare PMS which was used in the comprehensive Pavement Management System designed by ARA for the Client in 2007. The technical data collected and used under this contract is the property of the Client with ARA having a royalty free license to use upon notification to the Client.

**Article 3. Supervision**

ARA shall discharge its duties in consultation with and under the supervision of a designated representative of the Client. ARA shall maintain its own office or other required workspace and provide all materials and equipment needed to execute authorized tasks.

**Article 4. Professional Responsibility**

Nothing in this Contract shall be construed to interfere with or otherwise affect the rendering of services by ARA in accordance with its independent and professional judgment. This contract shall be subject to the rules and regulations of any and all professional organizations or associations to which ARA may from time to time belong and the laws and regulations governing said practice.

**Article 5. Compensation**

The Client shall pay ARA on a firm fixed price for the agreed scope of work. The total firm fixed price is $290,000 US dollars as broken down in the below table.
### Table: Annual Pavement Management Cost

<table>
<thead>
<tr>
<th>Date</th>
<th>Annual Pavement Management Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>$80,000</td>
</tr>
<tr>
<td>2010</td>
<td>$25,000</td>
</tr>
<tr>
<td>2011</td>
<td>$80,000</td>
</tr>
<tr>
<td>2012</td>
<td>$25,000</td>
</tr>
<tr>
<td>2013</td>
<td>$80,000</td>
</tr>
<tr>
<td>Totals</td>
<td>$290,000</td>
</tr>
</tbody>
</table>

Payments shall be made to account below via ACH:

| Receiving Bank: | New Mexico Bank & Trust – Albuquerque NM  
7021 Jefferson Street NE Albuquerque, NM 87110 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Routing #</td>
<td>107006541</td>
</tr>
<tr>
<td>For credit to</td>
<td>Applied Research Associates, Inc.</td>
</tr>
<tr>
<td>Account #</td>
<td>611 7469</td>
</tr>
</tbody>
</table>

Notification: Please send an email to imyers@ara.com or call Jamie Myers at (505)816-6372 when the transfer is made or if you encounter any problems with your transfer.

The compensation of $290,000 (USD) shall constitute the compensation for costs incurred by ARA for the entire scope of work, including personnel salary, benefits, company overhead, profit and reimbursable expenses.

**Article 6. Invoice procedure**

ARA will submit monthly invoices for work completed and not previously billed. Payment is due within 30 days of the Client receiving ARA’s invoices.

**Article 7. Insurance**

ARA will procure and maintain throughout the term of this Agreement the following minimum insurance limits and coverage.

Workers’ Compensation, as required by governing law.

**Commercial general liability insurance,** including bodily injury, property damage, personal injury, blanket contractual, and property damage including products and completed operations, with combined single limits of not less than US$ 1,000,000 per occurrence.

**Commercial automobile liability insurance,** including owned, non-owned, leased and hired motor vehicle coverage with limits of not less than US$ 1,000,000 per occurrence.

**Professional liability insurance,** with limit of not less than US$ 1,000,000 per claim.
Article 8. Indemnification

The Client shall indemnify and save harmless ARA and its agents, representatives, and employees from and against any and all suits, actions, legal proceedings, claims, demands, damages, liabilities, costs, and expenses, including attorney's fees, arising out of or in connection with or claimed to arise out of or in connection with any negligent act, error, omission or wrongful act of The Client, its employees, agents, representatives, or clients.

Article 9. Mediation

If a dispute arises out of or relates to this contract, or the breach thereof, and if the dispute cannot be settled through direct discussion between the parties, then the parties agree to first endeavor to settle the dispute in an amicable manner by mediation before resorting to arbitration or a judicial forum.

Article 10. Governing law

This contract shall be governed by and construed according to the laws of Illinois.

Article 11. Termination of Agreement

This contract may be terminated by either party for cause, including failure to perform the work and/or failure to make payment. Termination shall be effective 10 working days following notice of termination.

In the event of termination by either party, the Client and ARA shall work cooperatively to a speedy conclusion of the work. Work conclusion will include the completion of the scope of services for the year in which termination occurs. Payment will be prorated to the work completed at the time of conclusion of the work.

Article 12. Procurement Ethics

ARA warrants that it has not employed or retained any company or person, other than a bona fide employee working solely for ARA, to solicit or secure this contract and that ARA has not paid or agreed to pay any company or person, other than a bona fide employee working solely for ARA, any fee, commission, percentage, brokerage fee, gifts or any other consideration contingent upon or resulting from the award or making of this contract. For breach or violation of this warranty the Client shall have the right to annual this contract without liability.

Article 13. Contact Information

All notices required or permitted to be given under this Agreement shall be given to the parties at the following address or to such other addresses as either may designate in writing to the other party:

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doug Steele (technical matters)</td>
<td><a href="mailto:dsteele@ara.com">dsteele@ara.com</a></td>
<td>217-356-4500</td>
</tr>
<tr>
<td>Yan Liu (contractual matters)</td>
<td><a href="mailto:yliu@ara.com">yliu@ara.com</a></td>
<td>217-384-3800</td>
</tr>
<tr>
<td>100 Trade Centre, Suite 200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Champaign, IL 61820</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>217-356-4500</td>
</tr>
<tr>
<td>Jeff Blue, P.E.</td>
<td><a href="mailto:jblue@co.champaign.il.us">jblue@co.champaign.il.us</a></td>
<td>217-384-3800</td>
</tr>
<tr>
<td>County Engineer</td>
<td>Champaign County Highway Dept.</td>
<td></td>
</tr>
<tr>
<td>1605 E. Main Street</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Champaign, IL 61802</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>217-384-3800</td>
</tr>
</tbody>
</table>
| Article 14. Entire Contract

This contract constitutes the entire understanding and agreement between the Client and ARA with regard to all matters herein. There is no other agreement, condition, or representation, oral or written, express or
implied, with regard to this Agreement. This Agreement may be amended only in writing, signed by both parties hereto.

**Article 15. Approval of Contract**

In witness whereof, the Client has by its appropriate officer, signed and ARA has counter signed this Agreement.

**Champaign County, State of Illinois, acting by and through its County Board Chairman**

C. Pius Weibel  
Champaign County Board Chairman  
March 20, 2009  
Date

Mark V. Shelden  
Champaign County Clerk  
3/23/09  
Date

**Applied Research Associates, Inc.**

William R. Vavrik, Ph.D., P.E.  
Vice President, Transportation  
March 4, 2009  
Date

Curt A. Beckmeyer  
Senior Vice President  
March 4, 2009  
Date
Exhibit A - Scope of Services and Schedule

BACKGROUND

In response to the Champaign County Highway Department’s request for an objective tool to manage their highway network, Applied Research Associates (ARA), Inc. implemented a comprehensive Pavement Management System (PMS) in 2007. This system consisted of ARA’s RoadCare PMS software and condition assessment data collected by ARA over the entire 400 lane-mile Champaign County highway network, including video, Rolling Wheel Deflectometer (RWD), and roughness data. The results of this implementation provided the County with software, data, and the means to generate long-term pavement maintenance and rehabilitation plans, as well as the evaluation of multiple funding scenarios. ARA is proposing to perform regular updates to the County’s PMS, including annual regeneration of maintenance and rehabilitation plans, as well as biannual assessment of pavement conditions.

The following sections describe ARA’s proposed scope of work for the above activities.

Project Approaches

ARA plans to meet the project objectives with the following tasks:

Pavement Management System

- Task 1. Kickoff meeting and records gathering
- Task 2. Video data collection and condition rating (biannual)
- Task 3. Rolling Weight Deflectometer (RWD) testing and data analysis (biannual)
- Task 4. Profile data collection and roughness measurement (biannual)
- Task 5. PMS data upload and data quality check
- Task 6. Performance model update (biannual)
- Task 7. Five-year maintenance and rehabilitation plan and budget analysis
- Task 8. Report, software update, and presentation

The following sections describe the detailed project scope.

Pavement Management System

Task 1. Kickoff Meeting and Records Gathering
ARA will kickoff the project by meeting with County personnel to discuss the project goals, coordinate schedules (including field work, if applicable), and to gather updated information on any construction history, cost, or traffic data that may have changed from the initial implementation year.

Task 2. Video Data Collection and Condition Rating (Biannual)
Similar to the 2007 study, ARA will use an automated digital camera to collect high-resolution images of Champaign County’s highways. Figure 1 shows a sample image taken from County Road 1 in 2007. The digital camera is mounted on a survey vehicle and collects JPG images of pavement condition at 20-ft intervals while being driven at normal highway speeds. In addition, the GPS coordinates of each image are stored on the system’s laptop computer, making for easy integration with Geographical Information Systems (GIS) following data collection. ARA will collect images in both traffic lanes for the entire 400-lane-mile network.
Following data collection, ARA will determine a condition rating of each county road using a modified version of the Pavement Condition Index (PCI). The PCI method identifies the type, severity, and extent of key pavement distresses, such as fatigue of asphalt concrete (AC) pavements and reflective cracking of AC-overlaid concrete pavements. The distress data for each sample unit are summarized to determine the PCI rating of each road on a scale of 0 to 100 (100=excellent, 0=very poor). ARA engineers and technicians perform PCI rating using specialized software that shows the condition and location of each roadway.

The newly-collected digital images will be uploaded to the RoadCare Image Viewer software, along with the 2007 images, to allow the County to perform a virtual drive of the network from their office.

Task 3. Rolling Wheel Deflectometer (RWD) Data Collection and Analysis (Biannual)
The RWD is an innovative testing device developed jointly by ARA under funding from the Federal Highway Administration (FHWA). Its purpose is to measure the pavement's structural response due to an 18-kip single axle truck load; thereby, providing a measure of overall pavement structural capacity. It consists of four displacement lasers mounted on a reference beam placed beneath the bed of a custom-built semi-trailer. One laser is placed between the dual tires of the rear trailer axle to measure the vertical deflection of the pavement surface. Benefits of the RWD include that it makes continuous measurements while operating at normal highway speeds, does not interrupt traffic flow, and does not require lane closures or traffic control.

ARA will perform RWD testing over the entire 400-lane-mile network in both traffic directions. Testing is expected to be completed in a 2-day period. Raw laser readings will be post-processed to determine pavement deflections in mils (1 mil = 0.001 in) and results will be averaged and output at 0.1-mi (528-ft) intervals. Anomalous data, such as bridges and railroad crossings, will be eliminated. All data will be referenced using the linear reference system established in the 2007 study, as well as GPS coordinates for each 0.1-mi average.
Task 4. Profile Data Collection Roughness Measurement (Biannual)
ARA measures pavement roughness using a van-mounted laser profiler and analysis software to calculate the International Roughness Index (IRI) of each roadway. Our profiler is a two-laser system (one laser in each vehicle wheel path) that meets Class I profile measurement criteria, as defined by ASTM standard E-950. It can collect data at normal highway speeds at 25-mm intervals, and provide IRI values at 100-ft intervals. ARA will test both lanes of each roadway, removing non-representative data, such as that at bridges and railroad crossings. Roughness testing provides a quantitative method for determining the ride quality observed by the traveling public.

Task 5. PMS Data Upload and Quality Check
Following the completion of all data collection and analysis, ARA will format all collected data into the appropriate tables for upload to the County’s database for viewing and use with ARA’s web-based RoadCare PMS software. This will include PCI, RWD, and IRI data, as well as updated construction history, cost, and traffic information. Once uploaded, ARA will run a series of quality checks to ensure data completeness and validity.

Since the 2007 project, ARA has migrated their RoadCare software to a web-based application, where the County’s database can now be stored on a web-server at ARA’s office, with data and images accessible to the County via any internet-connected computer. This eliminates the complications of installing database software and large files on the County’s computers, while maintaining the same accessibility and function as the previous RoadCare version.

Task 6. Performance Model Update (Biannual)
Performance modeling involves studying the relationship between pavement age and condition for various pavements of similar construction type. In the case of Champaign County, all pavements are of either AC or AC-overlaid concrete construction. The data from our condition survey are plotted versus pavement age (defined as age since last rehabilitation) and a curved trend is fitted through the data. Figure 3 shows the performance model developed in 2007. It shows that AC overlays typically last 14 years before requiring rehabilitation in Champaign County. Using the newly collected PCI values, this curve will be updated and revised for use in RoadCare, as necessary.

![Figure 3](image)

Figure 3. ARA will update the County’s deterioration curve to confirm the typical service life of AC overlays in Champaign County.

Task 7. Five-Year Maintenance and Rehabilitation Plan and Budget Analysis
The main output from the RoadCare PMS software is a 5-year maintenance and rehabilitation plan for the County’s network based on the collected data, a treatment matrix that selects the appropriate maintenance or rehabilitation strategy (e.g., crack sealing, chip sealing, or AC overlay) for each road segment based on its condition, and the available construction budget. This plan is generated by performing a simulation of in RoadCare that selects a list of candidate projects each year based on the highest benefit-to-cost ratio and the amount of funding available for construction. This 5-year plan was
generated in 2007 and can be updated on an annual basis as actual construction takes place on given roads and the updated information is entered in RoadCare. Figure 4 shows the treatment matrix customized for Champaign County that incorporates RWD data, as well as visual condition criteria.

**Figure 4.** Champaign County’s customized treatment matrix incorporates RWD deflection to make the optimal treatment selection.

ARA can also perform “what if” scenarios with varying budget amounts and rehabilitation strategies. This shows the consequences on overall network condition as measured by the network PCI value for multiple funding strategies. Currently, the County has approximately $2 million available annually for road maintenance and construction. The 2007 analysis showed that with this funding level the overall network condition will deteriorate slightly over the next 5 years. By varying the funding amount, the resulting effect on pavement condition for both higher and lower funding amounts can be quantified. The 2007 budget analysis results are shown in figure 5 and ARA will update this analysis on an annual basis.

**Figure 5.** ARA is able to evaluate the consequences of multiple “what-if” funding scenarios on overall pavement network condition, as shown in the 2007 study.

**Task 8. Report, Software Update, and Presentation**
The final step in the project is to provide Champaign County with a written report of findings from the annually-updated PMS system. The updated database and images will be stored on a web-server at ARA’s office, accessible to the County via any internet-connected computer. Each year ARA will be available to make a summary presentation to County personnel, including the board if desired.
Five-Year Pavement Management Program
ARA proposes a 5-year pavement management program for Champaign County that includes the following:

- Years 1, 3, and 5: Full study including data collection, as described in the above sections. This will include complete PMS analysis and update of the maintenance and rehabilitation plan, as well as uploading of the latest round of pavement images to the Champaign County database in ARA's web-based RoadCare software.
- Years 2 and 4: Updates to the RoadCare database, such as changes in construction history, and regeneration of the maintenance and rehabilitation plan.

Project Schedule

Work can begin within one month of receipt of a signed contract. Given a start date of no later than April 1st, all work will be completed by July 31 of the same year, such that results are available for the County's use in planning construction projects for the following calendar year.

SUPPORT REQUESTED of CHAMPAIGN COUNTY

Support requested of Champaign County as part of this project is minimal and consists primarily of providing annually updated pavement maintenance and construction information, including:

- Changes to pavement construction history (i.e., recently completed construction and maintenance projects), updated construction unit cost data, any significant changes in traffic loadings, and updated budget data.