Professional Services For GIS Technical Consulting Services Related to Development of Pavement Assessment Work-limit System (PAWS) 2.0 RFQ016505

Submitted to:
City of Columbus
Department of Technology

Andrew J. Ginther, Mayor
H. Samuel Orth III, Director of Technology

Submitted by:
TP Resources & Cultivate Geospatial Solutions
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TPROhio.com
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CULTIVATE GEOSPATIAL

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1 Cover Letter

Andrew J. Ginther/ H. Samuel Orth III
City of Columbus
Department of Technology

10/20/2020

RE: Cover Letter for PAWS 2.0 – (RFQ016505)

1.1 Executive Summary

Founded in 2010, TP Resources (TPR) is a Columbus, Ohio based technology consulting company with core competencies in Technology, GIS, Data, and Management Services. We are a registered Minority Business Enterprise (MBE) with the City of Columbus (CC003126) and State of Ohio (MBE-220525). We are pleased to submit the attached response for the PAWS 2.0 (RFQ016505) request for proposal. As our response demonstrates, we offer the City of Columbus Department of Technology an experienced & cohesive team who is qualified to perform the required roles and responsibilities set forth in the request for proposal documents. To succeed in this project, we formed a team of industry leading experts in multiple areas of expertise: Leadership, GIS, Data, Analytics, Software, Asset Management and Civil Engineering. Our solution will not only meet your requirements, but allow for scalability for future growth.

Our team has a successful history of delivering quality GIS products and services to governments organizations such as:

- Ohio Department of Transportation – TIMS, TAMDST, ArcGIS Collector, AI/ML Imagine Detection
- City of Columbus – Transportation Asset and Safety Management Tool Prototype
- MORPC – Sidewalk GIS Inventory

1.2 Legal Structure

On June 23rd, 2010, Tran Products, LLC dba TP Resources was formed in the State of Ohio as a single member Limited Liability Company (Entity # 1946069). TP Resource's federal tax identification number is 27-2843241. The principal place of business is 4583 Herb Garden Drive, New Albany, Ohio 43054.

1.3 Preparers

Name	Title	Expertise
Dean Tran	Principal Consultant	Project Management, Data Architecture
Melissa Brenneman, GISP	GIS Solutions Architect	GIS, Data modeling & integration
Jeff Germain	Solution Architect	GIS, Software design & development
Thomas Wesp, AICP	Asset Management SME	GIS, Asset Management

We look forward to discussing this proposal with your team in further detail.

Sincerely,

Dean Tran
dt@tprohio.com
614-620-9343

2 Firm Introduction

Corresponds to RFP section 5.1

2.1 Summary

Founded in 2010, TP Resources (TPR) is a Columbus, Ohio based technology consulting company with core competencies in Technology, GIS, Data, and Management Services. We are a registered Minority Business Enterprise (MBE) with the City of Columbus (CC003126) and State of Ohio (MBE-220525).

In order to provide the City of Columbus successful project delivery, TPR is partnering with Cultivate Geospatial Solutions (CGS). Our resources have a successful history of working together to deliver award winning (URISA ESIG & ESRI SAG) software such as Ohio Department of Transportation's Transportation Information Mapping System (TIMS) and Transportation Asset Management Decision Support Tool (TAMDST).

CGS is a Florida based Geographic Information System (GIS) powerhouse firm that exemplifies GIS expertise and software application development services to local governments. Their team represents decades of GIS industry experience that speaks through the success of our customers and friends. The CGS Team is prepared to support the City of Columbus holistically in all aspects of GIS.

In addition, the regional nature of our team means we are very accustomed to efficient remote team collaboration. Our technical offices are located in Columbus OH, Cincinnati OH, Indianapolis IN, Dallas TX, San Antonio TX, Fort Collins CO, Tampa FL and Bend OR.

2.2 Company Information

Name	Address	Telephone Number	Company Type	Compliance Number	Legal Structure
TP Resources	4583 Herb Garden Drive New Albany, OH 43054	614-620-9343	Primary	CC003126	Ohio LLC
Cultivate Geospatial Solutions	6213 Shadowlake Drive Apollo Beach, FL 33572	407-770-8611	Subconsultant	CC033768	Florida LLC

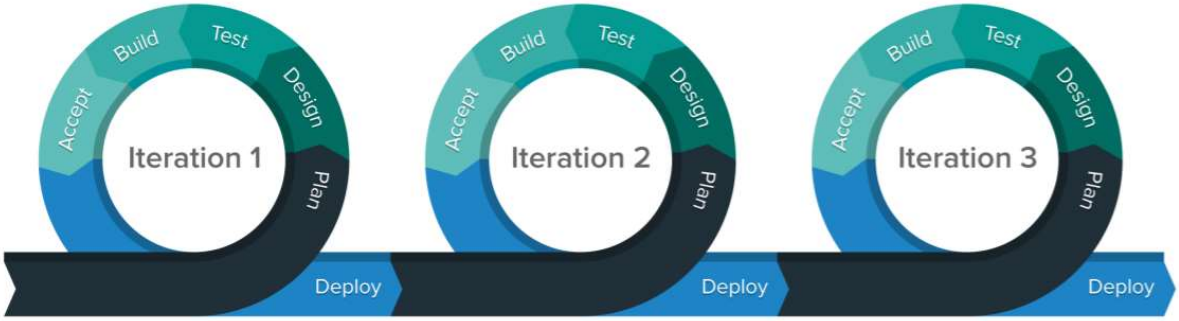
2.3 Project Team Organization

Name	Title	Project Responsibility
Dean Tran	Principal in Charge	Project management, Organizational Change Mgt
Doug Lynch, GISP	Senior Business Analyst	Requirements gathering, workflow management, business process, business analysis and training
Jeff Germain	Solution Architect	System design, technical lead and software development
Melissa Brenneman, GISP	GIS Solutions Architect	GIS, data modeling & integration and training
Bob Binckes	Data Scientist/Developer	Database design, development and administration Software development
Jeremy Folds	Sr. Software Developer	Web & mobile software developer Quality assurance

Name	Title	Project Responsibility
Ethan Christensen	Software Developer	Web & mobile software developer
Dr. Eddie Chou, PhD, PE	Transportation Asset SME	Transportation asset subject matter expert
Anthony Clark	Mobile Data Collection SME	Mobile solutions subject matter expert/ GIS Support
Thomas Wesp, AICP	Asset Management SME	GIS and asset management subject matter expert
Scot Gordon, PE	Pavement Engineer	Pavement management subject matter expert, quality Control

2.4 General Project Approach

Our project approach is tailored based on client factors such as technical environment, capabilities, capacity and characteristics of the project. Every project is unique. Some projects are relatively straightforward and predictable. Others are highly complex and risky. Each requires a different approach when it comes to how the project should be managed. This project flexibility increases client satisfaction and optimizes the use of budget by reducing unnecessary tasks. For software development projects such as PAWS 2.0, we will start with an agile project management (described in detail later in our response) approach and make updates to the methodology (as the project matures) to increase its effectiveness at the City of Columbus.



To optimize team collaboration/coordination, our team proposes the use of several tools:

Tool	Purpose	Audience
Microsoft Project	Maintain the project schedule	Project management teams
Application Lifecycle Management (Asana, Redmine, Git, Clickup)	Task assignment, requirement traceability, tracking defects	Project team members
Dashboarding (Redmine, Word, etc.)	High level project progress	Senior management, project team members

Our team has vast experience with a number of collaboration tools. If the City of Columbus has a tool preference then our team will utilize those tools where possible.

2.5 Quality Assurance

The quality assurance/quality control (QA/QC) process for the PAWS 2.0 project will be a multi-pronged approach and will take place at each phase of the project. Our QA/QC process starts with a Testing & Quality Assurance Plan created in collaboration with key stakeholders including business, technical and management resources. QA/QC is not only for software testing, but will encompass the full project lifecycle through tools such as traceability matrices and peer reviews.

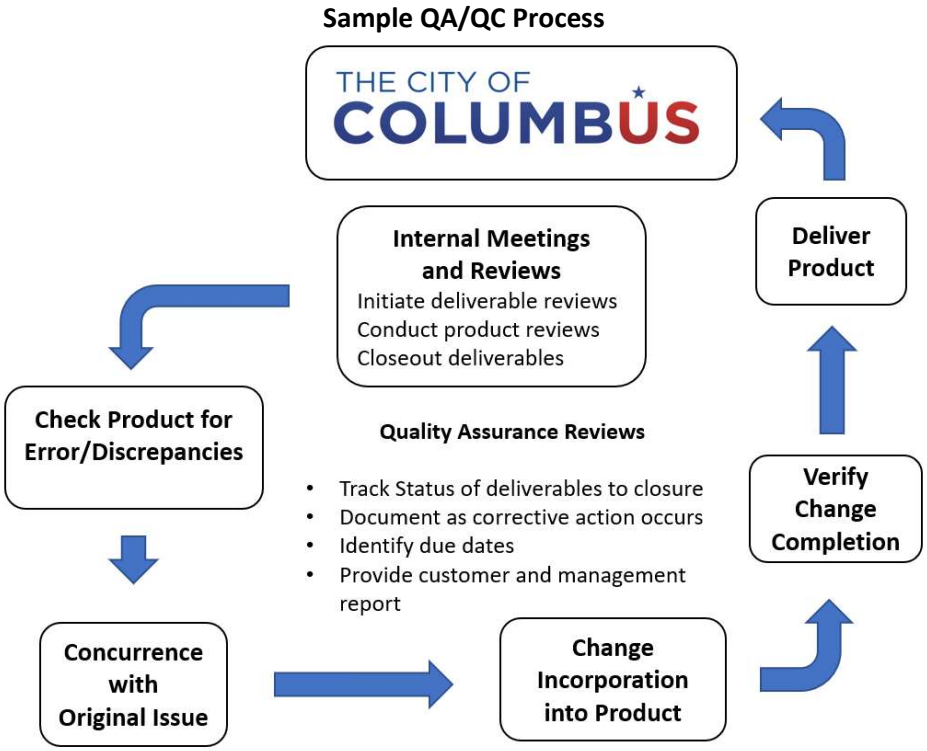
Specifically, for software testing our team will perform QA/QC during each sprint in accordance with the agile methodology. As an example, sprint QA/QC will occur in this manner:

1. After code is developed, QA/QC is performed by the developer.
2. Code is peer reviewed
3. Analyst performs testing to ensure requirements/user stories are met
4. End users will perform testing.

After all sprints are complete, the project team will then conduct the following:

1. Deployment testing
2. Security testing (including tests for penetration & SQL injection)
3. Integrated system test with all technology components
4. Load/Performance testing
5. User Acceptance Testing

All defects will be tracked in the application lifecycle management tool (as mentioned above).



3 Qualified Project Staff

Corresponds to RFP section 5.2

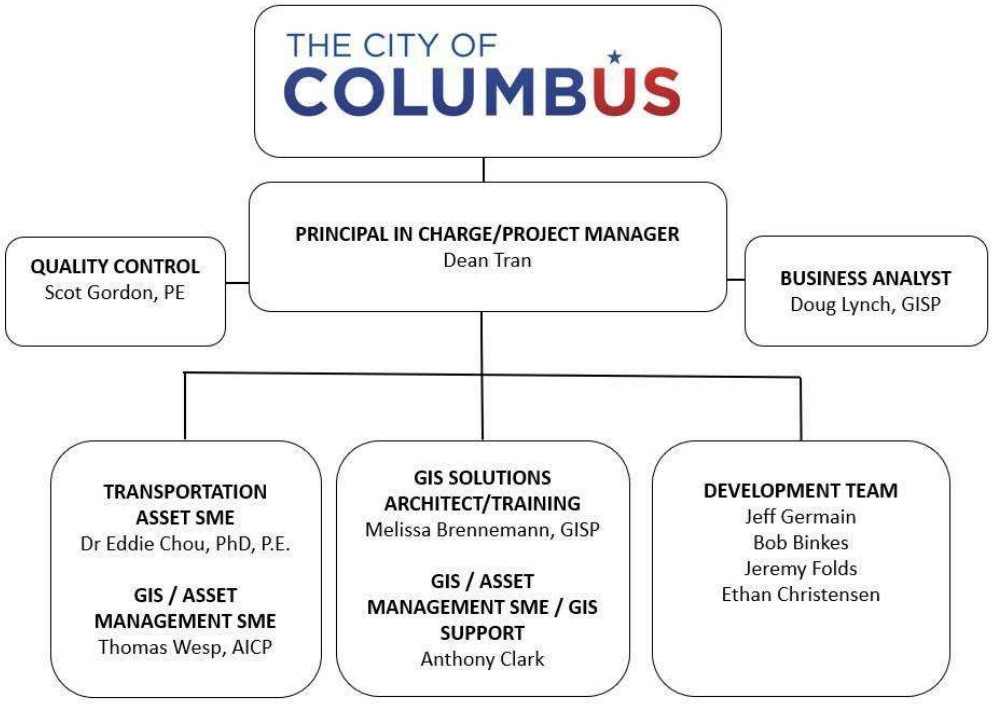
3.1 Summary

The TPR team has a proven record of success providing the very best in knowledge, skills, and abilities for local government challenges. Our team of experts have delivered award winning, state-of-the-art database and software solutions that are making a real difference for our clients. The TPR team strives for best value and quality in every work product. We use the latest in project management strategies as well as have backgrounds that align with client perspectives and know the hardships that we build software to solve.

Cultivate Geospatial Solutions (CGS) is a highly adaptive technology solutions provider focused on software application development, database design, and technology solution implementations. CGS works with state, regional and local governments and has a proven track record of design, redesign, and implementation of information systems. As well as the creation of custom and COTS-enabled interactive websites, web-based applications to meet increasing demands for agency operations, decision makers, and mobile field workers.

3.2 Project Team Organization

Below is the organization structure depicting the members of the combined TPR team:



3.3 Experience Summary

Our team is comprised of people who are experts and leaders in their respective fields. As can be seen below – they bring years of hands-on experience and advanced education.

Name	Project Role	Years of Experience	Education / Certifications
Dean Tran	Principal In Charge / Project Manager	22	BS Management Information Science Series 7
Doug Lynch, GISP	Senior Business Analyst	20	BS Geography AS Cartographic and Mapping Technology GISP
Jeff Germain	Solution Architect	16	BS
Melissa Brenneman, GISP	GIS Solutions Architect	23	MS, Biology/Geography BS, Wildlife Biology
Bob Binckes	Data Scientist/ Developer	23	BS, Electrical Engineering
Jeremy Folds	Software Developer	11	BA Geography GIS Certificate
Ethan Christensen	Software Developer	5	BS, Computer Science
Dr Eddie Chou, PhD, P.E.	Transportation Asset SME	30	Ph.D., Civil Engineering Post-Graduate Study, Civil and Computer Engineering M.S., Civil Engineering B.S., Civil Engineering Registered Professional Engineer (Ohio)
Anthony Clark	GIS/Asset Management SME / GIS Support	16	BS, Geography
Thomas Wesp, AICP	GIS / Asset Management SME	30	MUP Urban Planning BA Geography AICP
Scot Gordon, P.E.	Quality Control /Pavement Management SME	27	M.E, Civil Engineering BS, Civil Engineering Registered Professional Engineer (Texas, Colorado, Florida, Maryland, North Carolina

3.4 Experience Details

Dean Tran – Principal In Charge/Project Manager

Mr. Tran is a highly motivated leader with over 20 years of experience, ranging from global corporations, to government and start-up businesses. Core disciplines include strategic business planning, organizational change management, data governance, business intelligence, program and project management. Mr. Tran led the effort at the Ohio Department of Transportation that resulted in the implementation of Asset Management and Data Governance Another effort led by Mr. Tran was a technology refresh effort which included implementing: Esri Roads & Highways, ESRI Collector, Arc Server upgrades and custom GIS business intelligence web applications including the TIMS and TAMSDST solutions. Mr. Tran has over 10 years of experience with waterfall, agile and agile hybrid methodologies.

Doug Lynch – Senior Business Analyst

Mr. Lynch has been working in the GIS Industry since 2000 specializing in GIS project development and management experience in the areas of local government, transportation, land use, planning real estate and the environment. Mr. Lynch stays current in Esri GIS software and database modeling. He also has extensive experience gathering requirements, documenting as-is business process workflows, financial cost analysis and opportunity assessments. Mr. Lynch is proficient in Esri mobile applications such as ArcGIS Desktop, ArcGIS Server, ModelBuilder, Python, Collector and Survey 123.

Jeff Germain – Solution Architect

Mr. Germain is a leader in programming and application design and development. Focused largely on Esri and Microsoft .NET technologies, Mr. Germain has been developing GIS solutions using ArcGIS Enterprise, ArcGIS Desktop, ArcGIS Runtime SDK for .NET, Leaflet and Google Maps. Lately, Mr. Germain has been building web mapping applications on Microsoft's ASP.NET MVC framework, SQL Server, Esri's ArcGIS API for JavaScript, Esri Leaflet, HTML5 and backbone.js. Mr. Germain is a developer who is known for tackling the most complex tasks on development projects and producing ground-breaking solutions for GIS applications.

Melissa Brenneman, GISP – GIS Solutions Architect/Training

Ms. Brenneman is a seasoned GIS Architect and industry leader in providing innovative GIS consulting services, utilizing state-of-the-art GIS technology by Esri. Ms. Brenneman has extensive experience with legacy applications as well as the ArcGIS framework. Ms. Brenneman is well-versed with ArcGIS Desktop, ArcGIS Server, ModelBuilder, Python, ArcGIS Spatial Analyst, ArcGIS 3D Analyst, ArcGIS for AutoCAD, Survey 123, Visual Basic, ArcObjects, AML, MS Access, and geodatabase design.

Bob Binckes – Data Scientist/Developer

Mr. Binckes has been working in the information technology industry for over 23 years. He has a strong background with Microsoft SQL Server, Transact-SQL Extract, Transform and Load and tabular data modeling. He is also proficient in Microsoft Power BI, SQL Server Reporting Services, SQL Server Integration Services and Microsoft Excel. Additionally, Mr. Binckes leverages his experience with server and network infrastructure to ensure that reporting systems operate efficiently and do not impede the performance of other systems.

Jeremy Folds – Software Developer

Mr. Folds has 11 years of experience working with the ArcGIS platform and developing software applications. With a strong educational background in GIS, GPS, orthoimagery, computer science, cartography, geovisualization and programming, he is able to use his skills for a variety of applications. His technical skills include the Esri ArcGIS software suite and server applications. Mr. Folds has developed applications using HTML, CSS, JavaScript, Python scripting and .NET.

Ethan Christensen – Software Developer

Mr. Christensen has contributed his talents on cutting-edge JavaScript and HTML5 work for local, state and federal governments. Mr. Christensen supports networking, ArcGIS Enterprise configuration, as well as front-end web application development. Mr. Christensen has also contributed significantly to several mobile applications for the iOS, Android and Windows operating systems, developed using Xamarin and the ArcGIS Runtime SDK for .NET. His background in computer science lends an ability to see a path through difficult networking and programming challenges.

Dr. Eddie Chou, PhD, P.E. – Transportation Asset SME

Dr Chou's professional interests include Principles of Transportation Engineering with a focus on systems design, analysis, and modeling; transportation asset management; intelligent transportation systems; geographic information systems; and multi-criteria decision-making and systems optimization. He has served as the Principal Investigator (PI) for 50+ externally funded research projects with a total of ~$7.7 million dollars of funding awarded. In Dr Chou's 30 plus years teaching at the University of Toledo, he has taught 15 different courses including: Transportation Engineering I & II, Civil Engineering Systems Analysis, Intelligent Transportation Systems, Pavement Design & Analysis, Advanced Engineering Systems Modeling. Dr. Chou is the technical lead for the City of Columbus prototype: Transportation Asset and Safety Management Tool.

Anthony Clark – GIS/Mobile Data Collection SME

Mr. Clark is a detail oriented professional with 17 years of experience in the Geospatial and Remote Sensing industry, serving both Private and Public sectors. Customer service oriented professional managing both internal and external customer expectations to deliver on contract requirements on-time and within budget. With a passion for continuous improvement, established lean processes and procedures for various transportation groups, project management, and flight departments. Anthony oversaw the development and use of mobile GIS solutions while at the Ohio Department of Transportation including customization of Esri's Collector solution.

Thomas Wesp, AICP – GIS/Asset Management SME

Mr. Wesp has been working in the GIS industry for over 30 years. Early activities included developing the initial GIS system for the Houston, Texas region. While at Esri for 19 years, he helped the 100's of governmental and private entities across the US integrate GIS capabilities into their organizations. For 7 years, Tom has focused on growing the GIS and lifecycle-based asset management capabilities within the transportation infrastructure industry. He has been a trusted advisor to many State DOTs, local infrastructure management agencies and private transportation corporations. Tom has the ability to quickly assess an organization's "big picture" and interconnected pieces and formulate strategies to achieve desired outcomes. This has resulted in the development of enterprise systems that enable an entities' planning, design/build, and operation/maintenance functions to work together seamlessly to achieve goals and meet mandates.

Scot Gordon, P.E. – Quality Control/Pavement Management SME

Mr. Gordon is a Pavement Engineer with over 27 years of experience in geotechnical engineering and construction materials testing including pavement design and optimization. As a professional engineer, he has managed numerous projects such as design/build highway projects, airfield pavement and other government projects. He is an expert in the design, evaluation and research of pavement as well as pavement rehabilitation and soil stabilization. He has been involved in developing asset management software and resources. He is an expert witness regarding asphalt pavement, concrete pavement and the rehabilitation of pavement structures. Mr. Gordon will serve as the primary quality assurance/quality control for the project.

4 Relevant Project Experience

Corresponds to RFP section 5.3

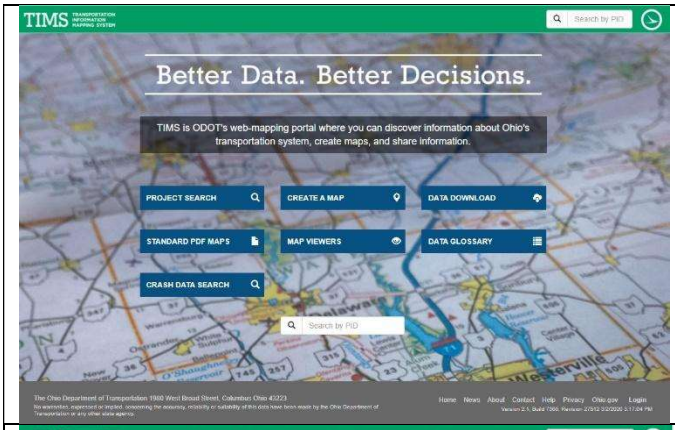
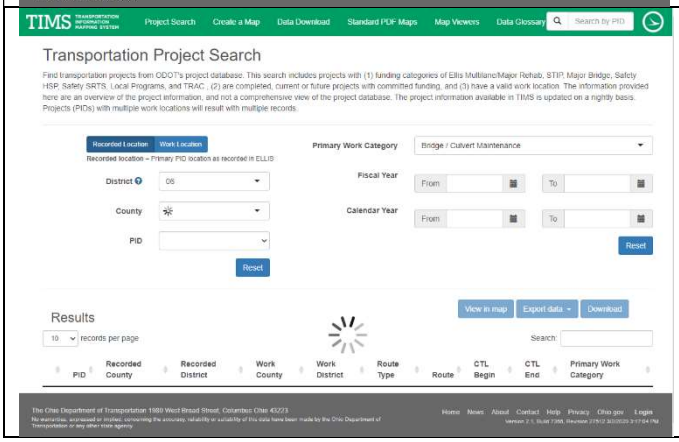
4.1 Summary

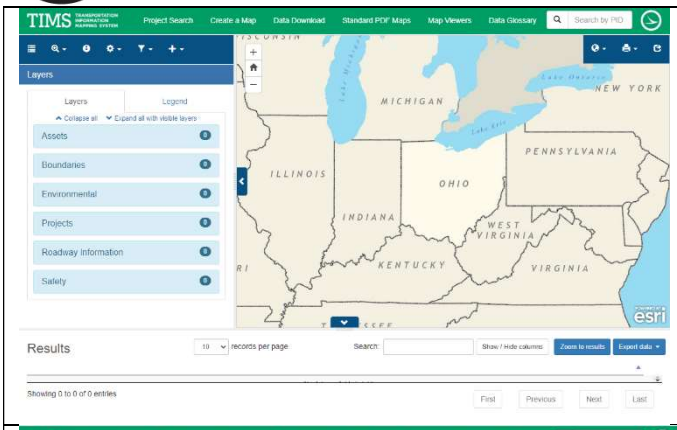
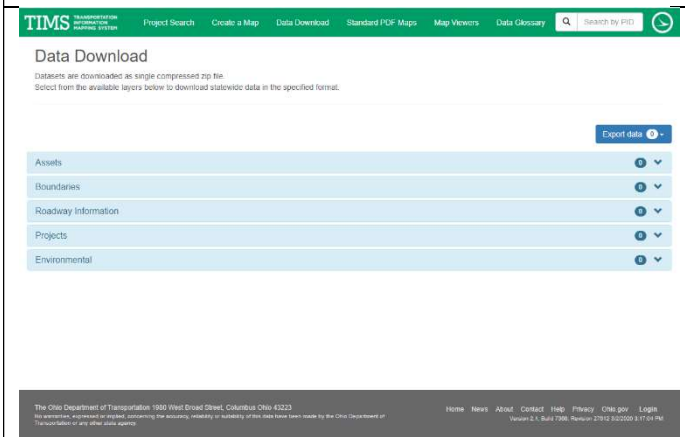
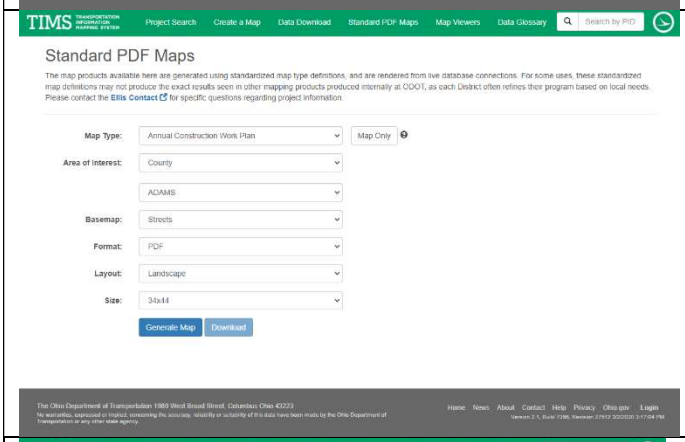
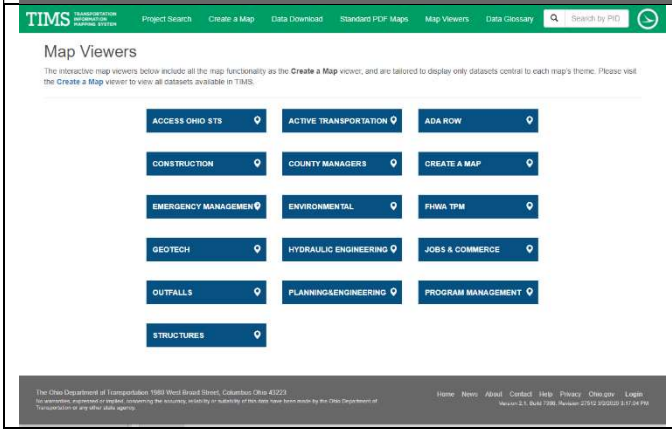
The TPR team has delivered state of the art web and mobile based enterprise solutions that have allowed our customers to manage their complex organizations and diverse assets more effectively and efficiently. These solutions are always GIS-based and usually include three intertwined parts – web-based applications, enterprise datasets, and field-focused mobile applications.

Some notable projects that incorporated the skill sets needed to ensure the PAWS 2.0 project is successful include the following:

4.1.1 TIMS – Ohio Department of Transportation

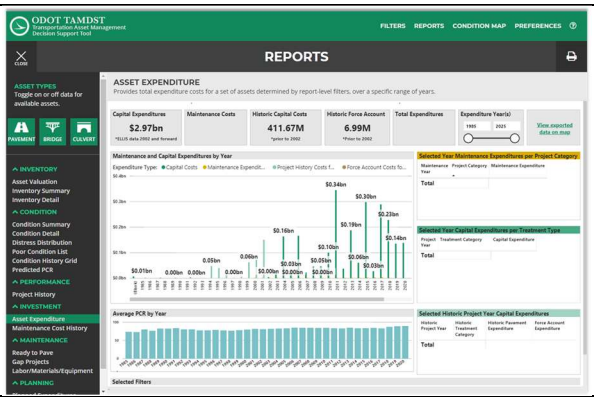
The Transportation Information Mapping System (TIMS) is a custom built mapping system which allows ODOT to visualize and analyze over 100 disparate datasets. The following tables highlights key functionalities of the solution:

	Ohio Department of Transportation's Transportation Information Mapping System (TIMS) is an interactive web-based portal to authoritative information from the Ohio Department of Transportation.
	In depth slice and dice searching tools allow for complex queries and filters for finding specific data.

	Map creation allows users to select what layers of information to display and print. Further filtering and attribute review is possible from the map viewer.
	Data downloading is done through a catalog of layers and downloading data can be done in multiple formats right through the browser.
	Standard PDF Maps capability allows users to define standard map product generation to make a PDF map on the fly that leverages map services on the backend. Basemaps, content, and size are specified by the user and output is generated in a PDF for download.
	Map viewers with pre-selected content are set to make it easy for specific users to jump right in with map use already packaged for analysis.

4.1.2 TAMDST– Ohio Department of Transportation

Transportation Asset Management Decision Support Tool

	The Transportation Asset Management Decision Support Tool is a custom interface for Microsoft Power BI integrated with Esri technologies. The application allowed for deep forensic analyses of asset management data to decision making.

4.1.3 Kansas Statewide 511 Solution

	The KanDrive web application served the Kansas Department of Transportation for traveler's information. The application was optimized for mobile, tablet, and computer users. The application was officially stress-tested to support over 10,000 simultaneous users. Personas were set to specifically target the following personas; daily commuters, bad weather enthusiasts, long haul truckers, and out-of-towners.

4.2 Esri Platform

The TPR team has deep and close relationships with Esri. These relationships have been built over 35 years of direct employment with Esri, partnering with Esri, and using Esri's solutions. We are GIS people; it's how we see the world; all of our projects have GIS as a core. We monitor Esri's platform development and look for ways to incorporate the latest advances into our solutions. We are well versed in incorporating Esri technology into enterprise web and mobile technologies. The close relationship with Esri allows for speedy resolution of questions/concerns/technical issues with the Esri platform. This is a huge benefit in the planning/development/implementation of any Esri-based solution.

4.3 Development of SQL Server Datasets and Web-based User Interfaces

The following projects included development of web-based user interfaces and SQL Server Datasets - Ohio Department of Transportation – TIMS and TAMDST; Kansas DOT – Statewide 511, City of Fishers, Indiana, City of Westfield, Indiana, and Hamilton County, Indiana. More project info can be found in the following table.

4.4 Esri GIS and Integration with Third Party Asset Management Systems

All of the projects in the table below involved integration with another system. Our team is well versed in building solutions that bring together the disparate and disjointed systems that end up populating most large entities. The following projects specifically included Esri GIS and integration with third party asset management systems – City of Fishers, Indiana, City of Virginia Beach, Virginia, City of Houston, Texas. More project info can be found in the table below.

4.5 Esri Enterprise Data Integration with SQL Server Datasets

All of the projects in the table below included the integration of Esri Enterprise datasets with a third-party database. Bringing together the many databases within a large entity is a main function of any enterprise GIS system. The following projects specifically involved integration of Esri Enterprise datasets with SQL Server datasets – Ohio Department of Transportation TIMS and TAMSDST, Kansas Statewide 511 solution, City of Fishers, Indiana, City of Westfield, Indiana, and Hamilton County, Indiana. More project info can be found in the table below.

4.6 Development of Mobile GIS and Integration with Electronic Inspection Form for Municipal Assets.

The following projects involved development of mobile GIS capabilities including the use of forms - Ohio DOT – TIMS and TAMDST; Kansas DOT – Statewide 511, City of Fishers, Indiana, MORPC Sidewalk GIS Inventory. More project info can be found in the table below.

Client Name	Project Description	Team Member(s) and Role(s)
Ohio Department of Transportation **2013 – 2020** **Stephen Hale** GIS Manager 1980 West Broad Street Columbus, Ohio 43223 Stephen.Hale@dot.ohio.gov (614)752-6921	**Transportation Information Mapping System (TIMS)** TIMS is a browser-based application that serves as ODOT's web mapping portal where users can discover information about Ohio's transportation system, create maps and share information. TIMS is a public facing enterprise web mapping portal for accessing ODOT's geospatial information, and it publishes data from 11 ODOT offices and 1 external agency. The application includes functions for delivering dynamic readouts of ODOT's linear referencing system within the application GUI and for dynamically linking to external systems. The project included a	**Dean Tran** – Project Manager **Jeff Germain** – Solution Architect **Bob Binckes** – Data Developer **Jeremy Folds** – Developer **Ethan Christensen** – Developer

Client Name	Project Description	Team Member(s) and Role(s)
	framework redesign to effectively improve the end user experience.	
Ohio Department of Transportation **2016 – 2020** **Garrison Gawel** Product Owner 1980 West Broad Street Columbus, Ohio 43223 Garrison.Gawel@dot.ohio.gov (614)466-7170	**Transportation Asset Management Decision Support Tool (TAMDST)** The TAMDST exploits vast amounts of asset and maintenance data and gives ODOT staff and decision makers information to help with planning, programming, and maintaining infrastructure. The objective of the implemented system will be to provide ODOT internal users with a one-stop, web-based solution that organizes data to meet stakeholders' business needs.	**Dean Tran** – Project Manager, **Anthony Clark** – Product Owner, **Jeff Germain** – Solution Architect **Bob Binckes** – Data Developer (Power BI) **Jeremy Folds** – Developer **Ethan Christensen** – Developer **Dr. Eddie Chou** - Developed the original prototype
Kansas Department of Transportation **2013 – 2019** **Kevin Hennes** GIS Applications 700 SW Harrison Street, 2nd Floor Topeka, KS 66603 Kevin.Hennes@ks.gov (785) 368-7344	**Statewide 511** The Kansas Department of Transportation needed to update the technology stack for KanRoad and six other traveler websites throughout the state. This project simplified the user interface and made navigation and site use more intuitive. The redesign was based upon the .NET framework, developing applications using ASP.NET MVC and leveraging HTML5 and JavaScript. The geoprocessing services were converted to Server Object Extensions to improve performance of the website. Data aggregations are provided via MIST, XML and map services. RESTful architecture was used to enhance information access. The delivered website was friendly on any device (desktop, tablet and smartphone).	**Jeff Germain** – Solution Architect, **Bob Binckes** – Data/Web Developer **Jeremy Folds** – Developer **Ethan Christensen** – Developer
City of Fishers, Indiana **2015- Present** **Tracy Gaynor** Director, Information Technology 3 Municipal Drive, Suite 210 Fishers, IN 46038 gaynort@fishers.in.us 317-595-3114	Supported all day-to-day GIS needs for the City including Esri software lifecycle planning and management, GIS data layer planning and editing, training and knowledge transfer to staff as well as website application and ArcGIS Online and Portal management. Included working with Esri Enterprise Geodatabases using Microsoft SQL Server, publishing web services with ArcGIS Server and Portal, developing mobile GIS Collection systems using Collector, Geoforms, Survey123 and QuickCapture, and integrating GIS with other applications such as Infor EAM (asset management), ViewPoint Cloud (permitting), and ITPipes (video pipe inspections and assessments).	**Melissa Brenneman -** Project Manager and GIS Architect
City of Westfield, Indiana **2018 – Present** **Leane Hieber** GIS Manager, Informatics	Supported City Informatics Department with upgrade and migration to ArcGIS Enterprise, including ArcGIS Portal, ArcGIS Server, ArcGIS Data Store and an enterprise	**Melissa Brenneman -** Project Manager and GIS Technical Lead

Client Name	Project Description	Team Member(s) and Role(s)
2728 East 171st Street Westfield, IN 46074 lhieber@westfield.in.gov 317-379-117	geodatabase housed in Microsoft SQL Server. Provided general support as needed including automating tasks with Python, general troubleshooting, and assisting with web GIS applications.	
Hamilton County, Indiana **2018** **Joan Keene** GIS Director, ISS Department 1 Hamilton County Square Noblesville, IN 46060 Joan.Keene@hamiltoncounty.in.gov 317-776-8254	Supported Hamilton County with a variety of Python scripting, Microsoft SQL Server geodatabase troubleshooting, web application trouble-shooting and design of a distributed multi-user editing system for county-wide collaboration on the county's E911 address dataset.	**Melissa Brenneman** - Project Manager and Technical Lead
Mid-Ohio Regional Planning Commission, Columbus, Ohio **2015** **Cheri Mansperger** GIS Manager 111 Liberty Street Columbus, Ohio 43215 cmansperger@morpc.org 614-233-4158	**MORPC Sidewalk GIS Inventory** The project involved developing a GIS-based region-wide continuous sidewalk transportation network for the MORPC region including Franklin County, Delaware County, and portions of Fairfield and Licking Counties in Ohio. Using the latest Esri ArcGIS software, a GIS sidewalk inventory with over 220,000 sidewalk and crosswalk features was created via digitizing using recent high-resolution true color orthophotography. The sidewalk inventory followed Ohio's Location Based Response System (LBRS) topology cardinality rules including full attribution of features.	**Doug Lynch** – Business Analyst and GIS Lead
City of Virginia Beach, Virginia **2017** **James R. Evans, Jr.** 3500 Dam Neck Road Virginia Beach, VA 23453 JREvans@vbgov.com 757-385-1505	Pavement Condition Survey, ROW Asset Inventory and Asset Management Software Project included software implementation, network database development, automated data collection for pavement condition surveys, budget analysis and maintenance optimization for the City's approximately 1,760-mile pavement network. Several ROW assets were extracted including guardrail, pavement markings and striping, curbing and ADA ramps. The scope of services included complete roadway pavement data collection with images and video, performing pavement condition rating and assessment, developing pavement management repair recommendations and reports, VUEWorks® Pavement Management System and training for data analysis and pavement management planning and collection of assets within the right-of-way. Project included working with the City in the conversion of data from the	**Scot Gordon** – Pavement Engineer and QA/QC Manager

Client Name	Project Description	Team Member(s) and Role(s)
	Stantec rating system to the ASTM 6433 PCI rating system to understand the differences in distress identification and evaluation of rutting and IRI data to determine appropriate maintenance strategies.	
City of Houston **2015 - 2020** **Raj Shah, PE** System Consultant and IT Projects 611 Walker Street Houston, TX 77002 Raj.Shah@houstontx.gov 832-395-2026	Pavement Management Information System This project shows our experience with exposure to provided pavement professional services and the collection of street assets including curb and gutter, sidewalks, sidewalk ramps and sidewalk obstructions. The pavement survey and rating were performed for 1,231 centerline miles of major streets and 4,918 centerline miles of local streets. The resulting condition rating information was imported into StreetSaver Plus.	**Scot Gordon –** Pavement Engineer and QA/QC Manager
Ohio Turnpike and Infrastructure Commission **2016** **Andy Cooksey, PE** Environmental Engineer 682 Prospect St. Berea, OH 44017 440-971-2024 Andrew.Cooksey@ohioturnpike.org	The Enterprise GIS Implementation Services project is a two-phased project that follows core needs and GIS web mapping tools as identified as high priorities as part of OTICs 2014 GIS Strategic Plan. The first phase of the project involves establishing and working with the OTIC GIS steering committee to identify all OTIC department's data user geospatial needs as they pertain to the development of a web-based interactive Strip Map Tool. Extensive GIS database modeling, database schema design, and event building are major data development tasks as part of the project to support the Strip Map Tool.	**Doug Lynch –** Business Analyst

5 Proposed Rates

Corresponds to RFP section 5.4

5.1 Summary

Listed in the table below is the proposed rates by labor classification:

Classification	Description	Education/Experience	2020 Hourly	2021 Hourly	2022 Hourly
Principal Consultant	The Principal Consultant serves as the overall lead consultant and client liaison. Works closely with senior leadership to ensure program/project directives are met.	Bachelor's degree in related field 10 years of related experience	$300	$300	$300
Senior Project Manager	The Senior Project Manager is responsible for leading teams to deliver complex project(s) that span across one or more business units. Manage resources, schedules, financials and adhere to SDLC control guidelines throughout the full systems development life cycle. This also includes management of issues, risks and project change requests to ensure successful and on-time project delivery. The Senior Project Manager has the responsibility of running the project on a day-to-day basis.	Bachelor's degree in related field 10 years of project management experience	$200	$200	$210
Project Manager	The Project Manager is responsible for leading teams to deliver complex project(s) that span across one or more business units. Manage resources, schedules, financials and adhere to SDLC control guidelines throughout the full systems development life cycle. This also includes management of issues, risks and project change requests to ensure successful and on-time project delivery. The Project Manager has the responsibility of running the project on a day-to-day basis.	Bachelor's degree in related field 5 years of project management experience	$175	$175	$185
Senior Business Analyst	The Senior Business Analyst documents business workflows,	Bachelor's degree in related field	$150	$150	$160

Classification	Description	Education/Experience	2020 Hourly	2021 Hourly	2022 Hourly
	identifies requirements, analyzes data and develops strategies to maximize opportunities. The Senior Business Analyst creates various documentation such as requirements, user stories, as-is and to-be workflow, manuals and training materials.	10 years of analyst experience			
Business Analyst	The Business Analyst documents business workflows, identifies requirements, analyzes data and develops strategies to maximize opportunities. The Senior Business Analyst creates various documentation such as requirements, user stories, as-is and to-be workflow, manuals and training materials.	Bachelor's degree in related field 5 years of analyst experience	$120	$120	$125
Asset Management SME	The Asset Management Subject Matter Expert responsibilities are to ensure the facts and details are correct so that the project's/program's deliverable(s) will meet the needs of the stakeholders, legislation, policies, standards, and best practices. Support the definition of processes and policies, supply business rules and procedures, and communicate the contexts in which the rules, processes and polices are applied.	Bachelor's degree in related field 10 years of related experience	$175	$175	$185
Mobile Data Collection Subject Matter Expert	The Mobile Data Collection Subject Matter Expert responsibilities are to ensure the facts and details are correct so that the project's/program's deliverable(s) will meet the needs of the stakeholders, legislation, policies, standards, and best practices. Support the definition of processes and policies, supply business rules and procedures, and communicate the contexts in which the rules, processes and polices are applied.	Bachelor's degree in related field 5 years of related experience	$105	$105	$110
Transportation Asset Subject Matter Expert	The Transportation Subject Matter Expert responsibilities are to ensure the facts and details are correct so that the project's/program's deliverable(s) will meet the needs of the	Bachelor's degree in related field, Professional Engineer (PE) 10 years of related experience	$150	$150	$160

Classification	Description	Education/Experience	2020 Hourly	2021 Hourly	2022 Hourly
	stakeholders, legislation, policies, standards, and best practices. Support the definition of processes and policies, supply business rules and procedures, and communicate the contexts in which the rules, processes and polices are applied.				
Pavement Management Subject Matter Expert	The Pavement Subject Matter Expert responsibilities are to ensure the facts and details are correct so that the project's/program's deliverable(s) will meet the needs of the stakeholders, legislation, policies, standards, and best practices. Support the definition of processes and policies, supply business rules and procedures, and communicate the contexts in which the rules, processes and polices are applied.	Bachelor's degree in related field, Professional Engineer (PE) 10 years of related experience	$175	$175	$185
Senior Solutions Architect	The Solution Architect designs or modifies systems architecture to meet business needs. Provides supervision and guidance to development teams and resolves technical problems as they arise.	Bachelor's degree in related field 10 years of related experience	$175	$175	$185
GIS Solutions Architect	The GIS Architect designs or modifies systems architecture to meet GIS needs. Provides supervision and guidance to development teams and resolves technical problems as they arise.	Bachelor's degree in related field, Geographic Information Systems Professional (GISP) 10 years of related experience	$150	$150	$160
Data Scientist/Developer	The Database Administrator is responsible for the designing, testing, planning, implementing, protecting, operating, managing and maintaining our databases.	Bachelor's degree in related field 10 years of related experience	$150	$150	$160
Business Intelligence Developer	The Business Intelligence Developer produces analytics to aid in business decision making through the development of reporting systems. The BI Developer uses and maintains warehouse data to solve organizational problems.	Bachelor's degree in related field 5 years of related experience	$175	$175	$185
Senior Application Developer	The Senior Application Developer creates and modify general computer applications software (desktop, web and mobile) or	Bachelor's degree in related field 10 years of related experience	$140	$140	$150

Classification	Description	Education/Experience	2020 Hourly	2021 Hourly	2022 Hourly
	specialized utility programs. Analyze user needs and develop software solutions. Design software or customize software for client use with the aim of optimizing operational efficiency.				
Application Developer	The Application Developer creates and modifies general computer applications software (desktop, web and mobile) or specialized utility programs. Analyze user needs and develop software solutions. Design software or customize software for client use with the aim of optimizing operational efficiency.	Bachelor's degree in related field 5 years of related experience	$115	$115	$125
Quality Assurance Analyst	The Quality Assurance Analyst evaluates products, systems, and software to ensure they are free of defects and meet the quality standards of the organization.	Bachelor's degree in related field 5 years of related experience	$100	$100	$105
UX/UI Designer	UI/UX Designer responsibilities include gathering user requirements, designing graphic elements and building navigation components. The designer will create wireframes and design web/mobile applications.	Bachelor's degree in related field 5 years of related experience	$100	$100	$105
Technical Trainer	The Technical Trainer conducts classes to educate users on the workflows and use of specific software applications. In addition, Technical Trainers will assist in the development of training materials.	Bachelor's degree in related field 5 years of related experience	$100	$100	$105
Clerical Administrator	The Clerical Administrator provides the project staff clerical support with billing, invoicing and organization.	5 years of related experience	$40	$40	$42

6 Cost Schedule

Corresponds to RFP section 5.5

6.1 Summary

Based on the TPR team's understanding of the project, the assumptions detailed in the Project Approach (see section 7.2) and the interruption of the Needs Assessment, we developed the following cost schedule. The table below represents the labor costs to complete the PAWS 2.0 project. We have not accounted for, nor do we anticipate any travel or material costs.

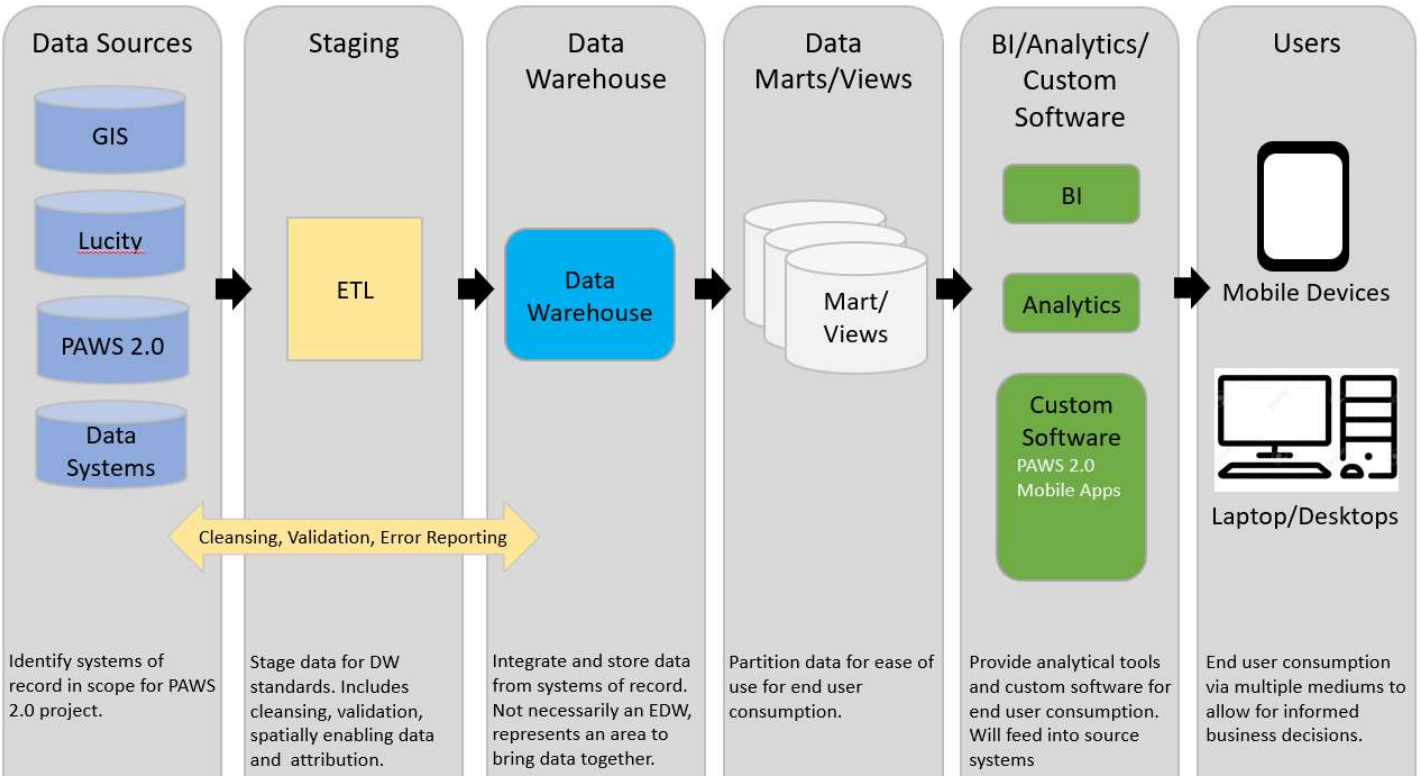
PAWS 2.0 Cost Schedule	Total Hours	Total Amount
Phase 1 - Dataset and Application Discovery Phase		
1.1 Project Kick-off Meeting	17	$2,255.00
1.2 Project Management Documentation	26	$4,450.00
1.3 Project Scope Document	4	$700.00
1.4 Workflow Documentation	11	$1,700.00
1.5 System Architecture	48	$7,510.00
1.6 Defined personas, user access controls, associated classifications and permissions	14	$2,250.00
1.7 Detailed Project Approach	3	$550.00
1.8 Opportunities for Improvement Documentation	23	$3,485.00
1.9 Technical Requirements, Functional Requirements Traceability Matrix	29	$4,605.00
Total Phase 1	***175***	***$27,505.00***
Phase 2 - Prototype Mobile Design Application		
2.1 Wireframes	52	$8,130.00
2.2 PAWS 2.0 Database	136	$20,450.00
2.3 Mobile Field Design Application prototype	138	$20,450.00
2.4 Deployment of the mobile application	61	$8,260.00
Total Phase 2	**387**	***$57,290.00***
Phase 3 - Database Development and Implementation for Testing		
3.1 PAWS 2.0 Management Application Minimum Viable Product	593	$77,760.00
3.2 Migrate Database	131	$20,370.00
3.3 Migrate current non database data	138	$20,900.00
3.4 GIS Integration	211	$30,760.00
Total Phase 3	**1073**	***$149,790.00***
Phase 4 - Final Mobile App Design & Development		
4.1 Final Mobile Design application	101	$14,390.00
4.2 Final PAWS 2.0 Management Application Design & Development	527	$69,490.00
4.3 Integration	117	$17,590.00
4.4 Implementation Plan	87	$12,800.00
4.5 Integrated System Test	7	$1,060.00
4.6 Security Test	15	$2,140.00
4.7 Load/Performance Test	15	$2,140.00
Total Phase 4	***839***	***$119,610.00***
Phase 5 - UAT and Production Deployment		
5.1 Training for user acceptance testing	19	$2,440.00
5.2 Testing (Deployment and UAT)	25	$3,610.00
5.3 Installation and configuration instructions	21	$2,985.00
5.4 Assistance to COC for Migration of system from test environment to production environment	26	$3,870.00
5.5 Documentation of support services and integrations/dependencies	16	$2,320.00
5.6 PAWS 2.0 Management Application - production deployment	32	$4,860.00
5.7 Mobile Field Design Application - production deployment	18	$2,760.00
5.8 Final integration with COC GIS repository data and ArcGIS Online - production deployment	36	$5,190.00
5.9 Final Integration with COC Asset Management Solution, Lucity - production deployment	50	$7,290.00
5.10 Production validation	18	$2,760.00
5.11 Training for end users and system administrators.	23	$3,130.00
5.12 Final documentation delivery	30	$4,520.00
5.13 Maintenance requirements	13	$2,030.00
5.14 Parallel Production Support - Included	22	$3,130.00
Total Phase 5	***349***	***$45,645.00***
Project Total	**2823**	**$399,840.00**

7 Project Approach

Corresponds to RFP section 5.6

7.1 Customized Out of the Box vs. Completely Custom Solution Components

The TPR team is eminently qualified to pursue advanced application development, modifications, and upgrades to the existing Pavement Assessment Work-Limit System (PAWS) and ADA MS Access database system or to pursue a strategy of constructing a replacement system that exceeds the expectations of the City of Columbus (COC) and its stakeholder groups. As part of our work breakdown structure, we have proposed that the existing PAWS and ADA MS Access database system serve as the starting point along with appendices and supporting materials provided in the request for proposal for evolving the documentation of all system workflows that will be integral for the successful outcome of this PAWS 2.0 project. Beyond a highly effective PAWS 2.0 solution outcome, we envision this project as a foundation for other business functions to leverage the newly created GIS enabled platform. The TPR team understands that a project of this magnitude should maximize the technology stack for many applications beyond PAWS 2.0. The diagram below demonstrates a future state that is possible after our implementation of PAWS 2.0 project.

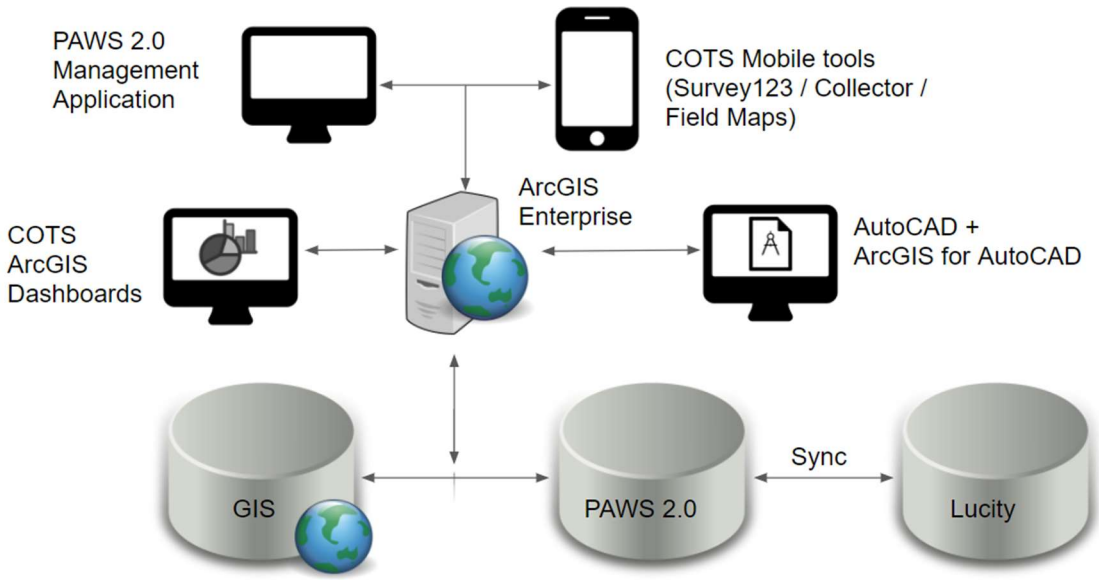


We understand that the proposed system will be hosted from an enterprise SQL Server database with the user interface developed as a web application using JavaScript 4.X, HTML5, and/or .NET 4.0 and higher. Additionally, the project will incorporate the development of a GIS based field data collection and design application to utilize and/or integrate with the COC's current Esri GIS and other platforms within the COC's Data and Analytics Services (DAS) division and will

integrate with asset information from the COC's asset management system (Lucity). For further specificity, the TPR team is proposing an approach that takes the maximum advantage of COTS tools and augmenting those tools with custom solutions where needed. The solution contains the following components:

- The PAWS 2.0 database in SQL Server will store all of the PAWS 2.0 and ADA data in one centralized schema. Data can be linked directly to applicable GIS features in the COC's enterprise GIS. Synchronization tools will keep PAWS 2.0 and ADA data updated with the latest information in the Lucity database, as appropriate.
- ArcGIS Enterprise exposes GIS data and PAWS 2.0 and ADA data as web map services that can be consumed by commercial off the shelf (COTS) Esri apps and custom apps. ArcGIS Enterprise provides the authentication and authorization mechanism for all the applications.
- The IHD Field team and ADA team would have configurations of Esri mobile applications to support digital collection of all form-based data and asset inventory. This would include the Mobile Design Application (MDA) that will be configured using Esri's latest field tools. At the writing of this response the capabilities of Survey123 and the soon to be released Field Maps represent the best fit for the needs of the MDA. The implementation team will work with the COC to apply the best Esri field tool based on availability at the time of the implementation. Leveraging COTS tools for the field data collection represents the most cost-effective solution for the first implementation of this solution. Any functional gaps between Esri field apps and the needs of the field teams will be reevaluated and scoped for custom development.
- AutoCAD with ArcGIS for AutoCAD can work directly with the field crews through feature services from ArcGIS Enterprise. This will remove the need for file sharing and conversions.
- The PAWS 2.0 Management Application will be a custom application using JavaScript, HTML5, and/or .NET. The application allows for project definition, scoping, and estimating. This web application provides modules for the In-House Design Pavement Team and ADA Team that offers a simple user interface for office-based tasks.
- ArcGIS Dashboards will provide specific dashboards to communicate status and progress of the pavement work to executives and the rest of the COC team. These COTS tools would provide a flexible way to communicate PAWS information to the rest of the organization.

The diagram below is a high-level architecture of the system that will support PAWS 2.0 and ADA application needs:



7.2 Assumptions

The TPR team will deliver based on the current state of knowledge and information shared via the RFP and the following assumptions.

- All infrastructure will be hosted by the City of Columbus.
- This quotation does not include any software licensing costs. Where possible, current software licensing will be leveraged. In the event new/additional licensing is required, CGS will seek approval before any development is started.
- ArcGIS Enterprise 10.8.1 will be deployed by the start of this project.
- The design team is willing to work with ArcGIS for AutoCAD through feature services to seamlessly work with the rest of the team. This is not required for success but we believe it would have a significant impact on improving the existing workflow.
- Full access to the Lucity database and APIs.
- Full access to the GIS database.
- Web server environment for deploying applications.

7.3 Management Methodology

To maximize value and deliver the highest quality software to the COC, the TPR team will employ an agile project management strategy and software development approach for this project regardless of COTS or custom initiatives. Our agile approach is an iterative approach that emphasizes a collaborative relationship between TPR's development staff and the COC's project staff. Our agile practices will revolve around two-week sprints in which our development team will work closely with the COC stakeholders to plan, define requirements, design, build, test and document the software developed. In addition, the TPR team approach will follow best practice industry guidelines for Project Management principles under the Project Management Institute (PMI) protocols. As mentioned in the General Project Approach, our team will modify the agile methodology as needed to optimize the effectiveness for the City of Columbus and its stakeholders. The overall project will start with a kickoff meeting and the development of a Project Plan.

The following work breakdown structure has been developed for this project and will be refined based on the project kickoff meeting and finalization of the Project Plan:

PHASE 1: Dataset and Application Discovery Phase
- Sprint 0

PHASE 2: Prototype Mobile Design Application and Supporting Database for Testing and Evaluation
- Sprint 1
- Sprint 2
- Sprint 3
- Sprint 4
- Sprint 5

PHASE 3: Database Development and Implementation for Testing
- Sprint 6
- Sprint 7
- Sprint 8
- Sprint 9

PHASE 4: Final Mobile Application Design and Development and User Interface Design and Implementation/Enhancements
- Sprint 10
- Sprint 11

	Sprint 12
	Sprint 13
PHASE 5:	System Final Testing and Production Deployment
	Sprint 14
	Sprint 15
	Sprint 16

How Agile is Different: Agile is different from many other project management and software development methodologies. It is based on continuous inspection and adaptation of both the process and the product being produced. In an agile approach to software development, the emphasis is placed on value. We do this by time-boxing our development efforts into short increments of time known as sprints. In this approach, we develop an initial list of high-level requirements to start the project. We call this a backlog. We then prioritize the backlog with the project stakeholders. We then kick off a two-week sprint in which the development team selects the highest priority backlog items to develop during the two-week sprint. At the conclusion of the sprint, the development team conducts a live demonstration of the functionality that was developed during the sprint. The functionality is fully complete, including design, coding, testing, and documentation. It is live, end-user ready functionality. The stakeholders can provide feedback and comments on the functionality directly to the development team at the review meeting. After the sprint is completed, the stakeholders have the opportunity to revisit the prioritized backlog of requirements. They can add requirements, remove requirements, change requirements and re-prioritize requirements based on their current business needs and on the knowledge gained by viewing the live functionality. This enables the stakeholders to maximize their return on investment by guaranteeing that the most valuable work will be completed and waste will be minimized.

Therefore, in agile approaches, budget and time select the requirements that can be delivered. Stakeholders have the ultimate project control in agile approaches and may declare their satisfaction with application as a whole at any time in the development process.

7.4 The Agile Process

The agile process is based on collaboration and the ability of the development team and the stakeholder organization to work together openly and collaboratively. It relies on the constant inspection and adaptation of the process itself and the backlog of requirements. As such, it is a communications-intensive approach to software development. The collective group of agile practices our team actively employs on software development projects is known as Scrum. It is a set of guidelines and practices that encourages frequent communication and collaboration and intensely focused developed effort throughout the life of a project. It is an iterative approach and is described in detail below.

7.5 Backlog Development

The TPR team will work closely with the COC to develop a backlog of requirements for the application development. The backlog will initially be developed at a high level. After creating the backlog, our team will work with the COC to prioritize the user stories (i.e. requirements) within the backlog to ensure that the most valuable functionality to the COC is developed first. An example of backlog itemization could be as follows:

Example Item	Requirement Details	Project and Sprint Objective
Example Item 1	Elimination of manual data entry from paper field inspection forms and field drawings through refined data entry interfaces (GIS application,	Sprints 2, 3

	tables and forms in a uniform, systematic and integrated manner).	
Example Item 2	Centralization of project notes, tables and graphics and integration with the proposed enterprise project management and design solution.	Sprint 4
Example Item 3	Routing and status of field work assigned to staff	Sprint 2

A true result and deliverable of requirements will be established in Phase 1 of the project and will require formal signoff to begin Sprint 0 with design, mock-ups and development.

7.6 Sprint Planning

As discussed previously, the TPR team development teams work in two-week sprints. At the start of each sprint the development team and the COC will conduct a sprint planning meeting.

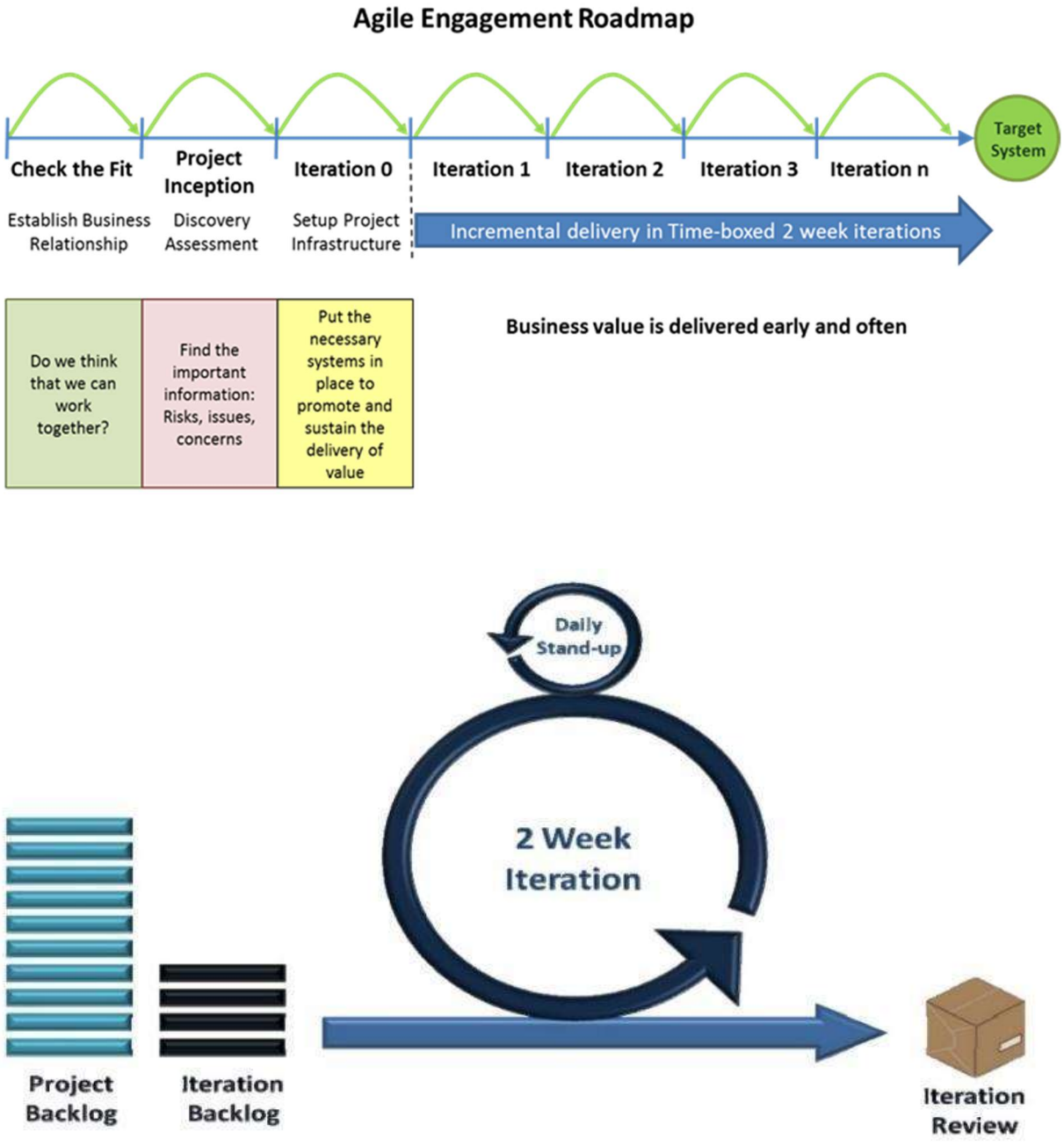
Upon selection of the backlog items to be developed during the sprint, the COC and the TPR team will collaboratively discuss the user stories selected in detail. This discussion will allow the developer team and the COC to adequately define the requirements so that our team can provide high quality functionality at the conclusion of the sprint. Following this discussion, the TPR team will internally decompose the user stories into detailed tasks to be accomplished during the upcoming sprint. Time estimates are placed against the tasks and TPR team members select the tasks they will work on during the sprint.

7.7 The Sprint

Following the Sprint Planning Meeting, the development team will immediately begin working on the functionality to be developed during the Sprint. Our development team is completely dedicated to the user stories in the Sprint without disturbance from external influences or other project work. They will work closely with the COC during the Sprint to ensure that what is being developed is precisely what the COC requires. The work of the sprint will include designing, coding, testing, peer review and documenting the functionality developed during the Sprint. The project teams including TPR and COC will use a current web-based solution to track details and assignments.

7.8 Sprint/Release Review

At the conclusion of each sprint, the TPR development team will conduct a review meeting in which the functionality developed during the previous sprint will be demonstrated live. The TPR team will review the user stories that were included in the sprint and demonstrate the functionality developed that correlates to each user story for the application. There will be no presentations (i.e., PowerPoints) of “prototyped” functionality. The COC will see real live demonstrations of actual functionality. In addition to the demonstration, the TPR team will solicit feedback from the COC on the functionality developed. These review meetings provide a very high level of visibility into TPR teams’ application development process and allows for an effective feedback mechanism for the development team. Where possible, COC users will be able to test functionality in a given sprint.



TPR TEAM 2-Week Sprint Process

7.9 Overarching Approach and Technical Guidelines

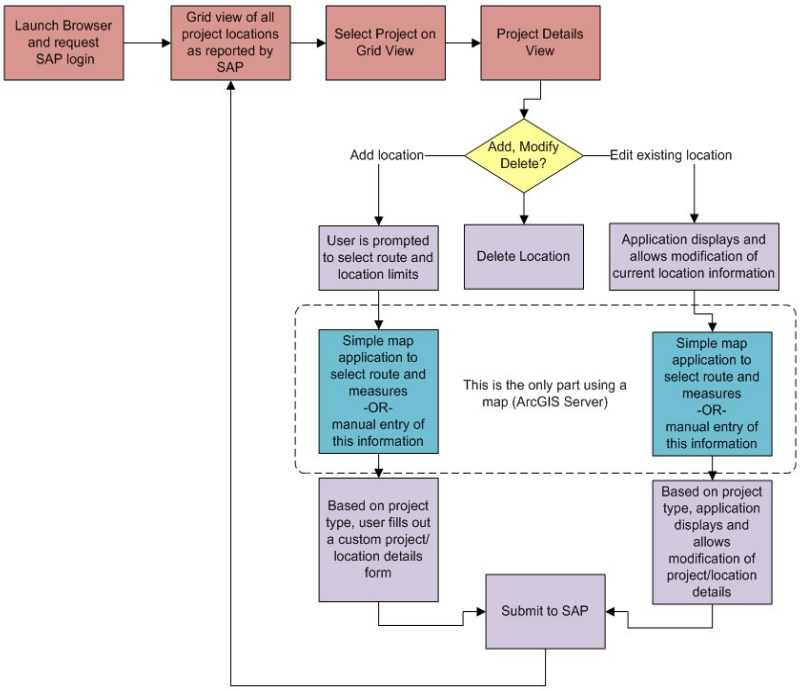
Within the bounds of our iterative Agile Project Management methodology, the TPR team follows the same generalized approach for all successful projects that we execute. Our team has continually refined and validated this software development process on projects ranging from lite applications to multi-million dollar Federal and State enterprise systems.

1. Documentation and validation of user and system workflows
2. Preparation and validation of user interface mockups
3. Approval of workflows and mockups commencing in iterative software development and delivery

4. Iterative testing, QA/QC and generation of documentation

In the past, the TPR team has successfully followed this general approach by mocking up entire software systems prior to development, testing and delivery and has also pursued design and implementation of large software systems in stepwise fashion guided by logical divisions of software functionality (e.g., designing and initial implementation of data entry and viewing prior to reporting workflows, mockups, and implementation).

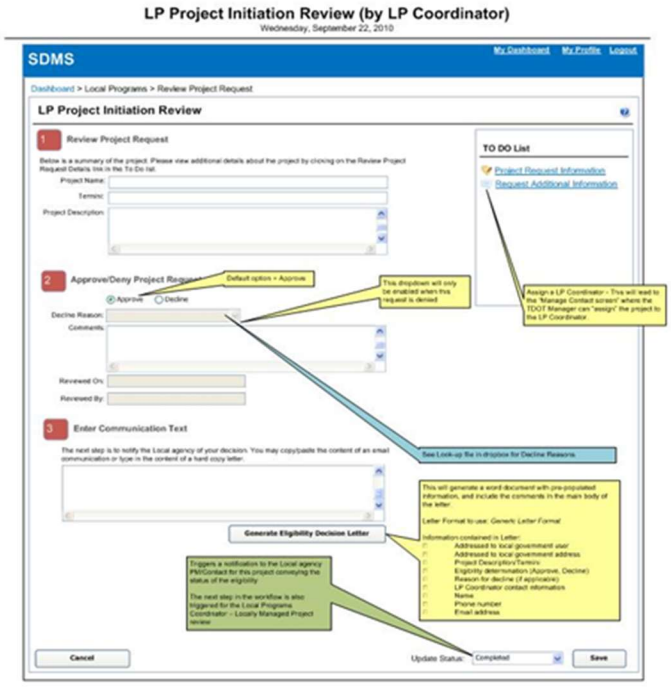
Soon after receiving a notice to proceed (NTP) and negotiating contract details, the TPR team will work with the COC staff and relevant stakeholders to document primary workflows for the planned system as part of the phase 1 discovery process (see Phase 1: Dataset and Application Discovery Phase). This may include but is not limited to data entry tasks, data analysis and project tracking mechanisms, public access paradigms, reporting mechanics and formats and data I/O requirements as well as internal system functions not visible to the user such as auditing and logging of user activities. The goal of this step in the process is to prove the critical path through the software on paper or soft-copy medium and identify all major functions and user roles that interact with the system.



TPR TEAM sample workflow diagram

Following approval of software system workflows, the TPR team will develop an application sitemap identifying major software components and proceed with highly detailed application UI wireframes describing how each user group will interact with the software.

The goal is to provide the COC with an understanding of exactly what is being built through each Sprint of the project development lifecycle. It is much more economical to debug and fine tune user interfaces and software features on paper than it is to undertake constant revisions once system components have been implemented.



TPR team interface mockup example

Once application workflows and user interface mockups have been approved by the COC (in an iterative fashion), the TPR development team will utilize the Agile Project Management process to produce working, tested, documented software in two-week sprints. This method of software development allows COC to be constantly involved in the implementation and testing process and establishes a feedback loop between developers and consumers of the software. Since testing and documentation are integrated into the software development sprints, quality control and assurance mechanisms, automated unit and functional testing and the documentation process are never relegated to the end of the contract period.

7.10 Project Phasing

TPR is in general agreement with the recommended project phasing as outlined in section 4.3 of the RFP. Additional details are included for added specificity.

7.10.1 Phase 1: Dataset and Application Discovery Phase

Phase 1, as a prerequisite for the following phases, includes a discovery, technology review/confirmation, dissection and review of all the datasets needed and the application functionality that will be ported into the new application. Through this discovery phase, TPR will gain a mastery of the current technology stack, required datasets and desired workflow in order to flowchart and outline the proposed enterprise and mobile design application.

For efficiency, the TPR team is prepared to conduct a document review as well as in-depth meetings (virtual or face-to-face) to fully understand and document source data and desired functionality as part of the discovery process. This decoding exercise will then be reinforced with a presentation of the material back to the COC for assurance that the details have been understood and incorporated for future phases. A key output in addition to noted deliverables includes a formal Requirements Traceability Matrix following a Business Requirements analysis.

In addition, this initial task will include the Project Management organization for the project. This includes the development of a Project Work Plan, Project Risk Matrix, Project Communication Plan, Project Responsibilities (modified RACI) and a Stakeholder Register as well as a presentation of other Project Management templates and reporting forms such as biweekly status reports and invoice forms and procedures throughout all phases. The TPR team will coordinate with the COC to identify an appropriate data sharing platform such as Dropbox or other similar data collaboration platforms for the project.

This task will also include a meeting with the COC key stakeholders and Project Management team. This meeting will be conducted within two weeks of contract execution. This initial meeting will allow for team members to open a discussion of expectations beyond the procurement process. A review of the project schedule and any changes to Business Requirements will also be included on the agenda. The information gathered in Phase 1 will drive Phase 2, and similar to past experience, a series of directed questions will be used to expand the general functional requirement specifications or backlog presented in the RFP. Through a project scope document, our team will confirm our project understanding and key areas in the Needs Assessment.

7.10.1.1 Phase 1 Deliverables (Sprint Zero):

1. Project Kickoff Meeting
2. Project Management Documentation - Overall project Gantt chart included in the Project Management Plan Documentation. Project Management Plan contents will include, but are not limited to: Communication Plan, Project Responsibilities, Stakeholder Register, Risk Management Plan and Risk Register, Change Management Plan, Testing and Quality Assurance Plan, and detailed project schedule.
3. Project Scope document. Confirmation of project understanding and key areas of Needs Assessment.
4. Workflow Documentation - Detailed flow chart of COC's desired workflow and relation to proposed system integrations.
5. System Architecture - Preliminary schematic of system layout and integration with COC GIS and Lucity systems along with Risk Assessment.
6. Defined personas, user access controls, associated classifications and permissions.
7. Detailed Project Approach - Documentation of existing systems and approach to develop the new solution
8. Opportunities for Improvement Documentation - Details of required functions that require process changes or workarounds, providing the options available for COC to make any necessary choices.
9. Technical Requirements, Business Requirements Traceability matrix.
10. Sprint 0 session.

7.10.2 Phase 2: Prototype Mobile Design Application and Supporting Database for Testing and Evaluation

Phase 2 will commence once the COC has officially signed off on Phase 1. At this point, the wireframe designs and workflows will be used to configure the Prototype Mobile Design Application (MDA) from the best available Esri field tool. Additionally, the PAWS 2.0 and MDA database design will be linked back to data needs and workflows. These will once again be reviewed with the COC stakeholder team to ensure they are on target with the envisioned features and capabilities.

It is at this stage that systems and data review will take place. The advised deployment environment, software, hardware and level of effort required for data management will be conducted. As a prototype, it is understood that full functionality will be limited in the spirit of review to make advantageous recommendations for final development. All documentation developed for Phase 2 will include a thorough review by our quality control resource as part of the TPR QA/QC process.

Phase 2 will be complete once there is a COC agreement on the prototype PAWS 2.0 Mobile Field Design solution. A review of the Requirements Traceability Matrix will define the path for moving into Phase 3.

The TPR team will further develop end-user personas or target profiles based on the review of the Business Requirements analysis and from discussions carried out in Phase 1. These personas will be leveraged to develop meaningful wireframes and workflows that demonstrate the understanding of the system and to allow for collaboration between the COC stakeholders and the TPR team. It is anticipated that this will involve multiple sprints to establish the envisioned workflows and specified features of the ultimate solution. During this process, TPR will leverage previously built systems and functionality from other systems to demonstrate envisioned capabilities and features. These will be presented as storyboards where the workflows and wireframes will be presented.

7.10.2.1 Phase 2 Deliverables (Sprint 1-5):

1. Wireframes
2. PAWS 2.0 Database - Centralized database to support prototype Mobile Field Design Application including authentication mechanism(s).
3. Mobile Field Design Application prototype configured from the best available Esri field tool utilizing COC enterprise GIS datasets. (System architectural overview). Any functional gaps between Esri field apps and the needs of the field teams will be reevaluated and scoped for custom development.
4. Deployment of the mobile application in a COC enterprise test environment to allow for testing of COC design and data collection process.
5. Sprints 1 – 5 sessions.

7.10.3 Phase 3: Database Development and Implementation for Testing

Continuing with 2-week sprints, the TPR team will focus on SQL Server database design and implementation. This includes the primary SQL Server database that will host project management and design functions gathered in Phase 1. Data existing in both the PAWS and ADA database will be migrated into the SQL Server enterprise database along with the additional functionality and data fields requested. Data will be migrated using Safe Software's FME. With FME a workbench will be created to make the data migration repeatable and transparent. This process will make the final migration seamless when the PAWS 2.0 Management Application moves into production. ArcGIS Enterprise Bulk Publishing will be used to expose the PAWS 2.0 data directly to the rest of the ArcGIS Enterprise Portal. Data integration with the GIS will happen through web services within the portal. This approach provides the same authentication and authorization environment for both the GIS data and the PAWS 2.0 data and allows Esri applications to be configured leveraging all the data.

It is noted, programming shall contain clear notes within the program script(s) to describe the code section's purpose and other relevant information for future reference. The TPR team will leverage user acceptance test plans and end user help document for all components that are developed.

7.10.3.1 Phase 3 Deliverables (Sprint 6-9):

1. PAWS 2.0 Management Application Minimum Viable Product - Preliminary web-based user access system to evaluate the project management, design, ADA and GIS integration functions
2. Migrate Database - Migrate existing PAWS and ADA Access database information into the new system (System architectural overview)
3. Migrate current non-database ADA information into the new system
4. GIS Integration - Integration with COC on premise GIS repository data

7.10.4 Phase 4: Final Mobile Application Design and Development and User Interface Design and Implementation/Enhancements

Phase 4 includes the final mobile application design, configuration and development. This phase also includes the implementation/enhancements for the User Interface. Where applicable, TPR will leverage existing capabilities, features and tools developed to bring the user stories (based on the functional requirements) to life in two-week sprint cycles presented as functional software demonstrations. Within this phase, our team will have a fully working version of the whole solution deployed to an environment identified by the COC. Once fully deployed, we will complete an integrated system test, security testing, and performance testing. After testing is complete, the TPR team will document the final implementation plan which will include detailed environment promotions tasks.

7.10.4.1 Phase 4 Deliverables (Sprint 10-13):

1. Final Mobile Design Application - Final Mobile Design application and integration with the enterprise database, COC GIS and Lucity.
2. Final PAWS 2.0 Management Application Design & Development - Final system design of the web-based user interface for the PAWS 2.0 Management Application
3. Integration - Integration of systems with associated programs and resources such as ArcGIS Workforce and Navigation.
4. Implementation plan - Finalize implementation plan for solution promotion to multiple environments (Dev, Test, UAT, Training, Production) – as examples
5. Integrated System Test
6. Security Test (Penetration and SQL injection)
7. Performance Test

7.10.5 Phase 5: System Final Testing and Production Deployment

Final delivery and system implementation will include the full engagement of the TPR team with support that includes deployment testing, user acceptance testing), a virtual implementation session, and bug fixes if necessary. This phase also includes updates to any documentation provided as deliverables through the entire project as a final check for final delivery and project close out.

To ensure quality leading up to and through implementation, our process involves routine audits of the deliverables to ensure they comply with quality requirements. In a broad context our process includes the collection of quality metrics throughout the execution of the project. When issues are encountered, we utilize a variety of diagnostic and corrective techniques. The benefit to our process and ultimately our client is the learning gained from this analysis. More specifically, when we encounter an issue, we do not just address the issue, we address the root-cause ensuring that issue no longer is a factor. Additionally, through our own Organization Process Assets (OPAs), we maintain a record of all our lessons learned so future clients also benefit from our past experiences. The TPR team is committed to providing our clients with quality

products and professional services. No deliverable shall leave the TPR team without having first undergone the QA/QC process. At the end of this task, our combined teams will execute a project closeout which will include items such as helpdesk transition, lessons learned and final project reporting.

7.10.5.1 Phase 5 Deliverables (Sprint 14-16):

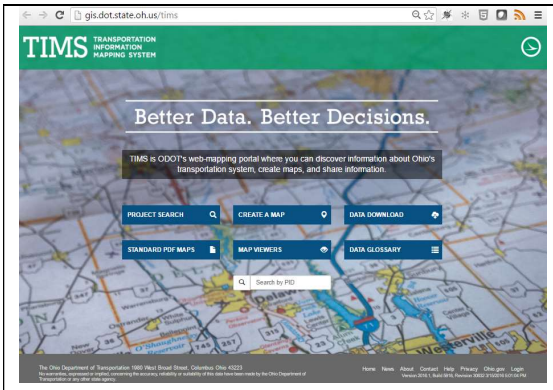
1. Training for user acceptance testing
2. Testing (Deployment, UAT)
3. Installation and configuration instructions
4. Assistance to COC for Migration of system from test environment to production environment
5. Documentation of support services and integrations/dependencies
6. PAWS 2.0 Management Application - production deployment
7. Mobile Field Design Application - production deployment
8. Final integration with COC GIS repository data and ArcGIS Online - production deployment
9. Final Integration with COC Asset Management Solution, Lucity - production deployment
10. Production validation
11. Training for end users and system administrators
12. Final documentation
13. Maintenance requirements
14. Project Closeout

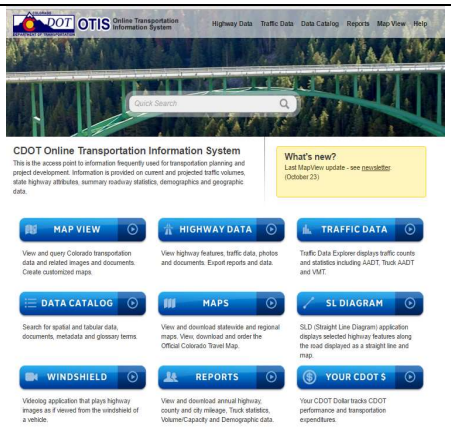
7.10.6 After the Official Project Closeout

Beyond the initial scope of work, the TPR team is open to ongoing maintenance and support as well as warranty as part of our proposal. Our maintenance and support agreement provides the protocol for communication and approval for action regarding the carrying out of support and maintenance requests. Some examples of specific items that may be incorporated into a support and maintenance agreement based on City of Columbus's requirements are as follows:

- Technical support and troubleshooting of the application and GIS databases including maintenance of the SDE database instances.
- Response to support issues on production servers initiated by COC within 3 hours of requested support.
- Provide software upgrades, code modifications, and database updates to accommodate COC network, hardware and software changes.
- At the request of the City of Columbus, the TPR team will provide an informal quote before specific tasks or services are agreed to be completed.

The TPR team has provided similar support and maintenance agreements in the past. These arrangements each contain a number of hours set aside for assistance as needed and they also establish an hourly rate for issues that may go above the day-to-day support requests. The agreement therefore ensures that the COC has the TPR team resources for emergencies and support. Often, clients that do not run into emergencies use support and maintenance dollars to make minor enhancements to their systems. This ensures that resource dollars are in place as a contingency for when issues arise and can be leveraged in the event no issues arise. Below are some examples where maintenance and support services have been provided:



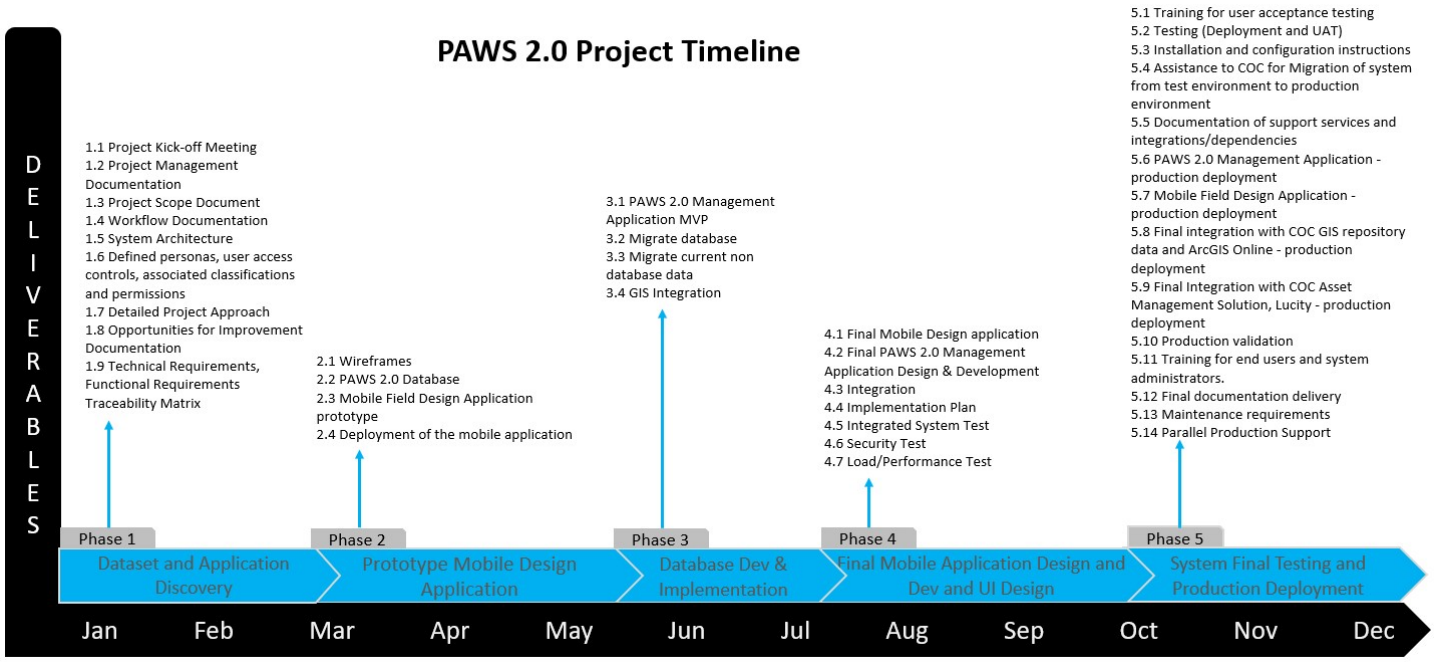


Maintenance and Support examples for Ohio Department of Transportation and Colorado Department of Transportation in support of the Transportation Information Mapping System (TIMS) and Online Transportation Information System (OTIS) respectively.

7.11 Overall Project Timeline

The following schedule is based on a start date of January 4, 2021 and we understand this may need to be adjusted to align with the final notice to proceed. TPR anticipates 12 months maximum to complete the project. The schedule has been developed on a standard working week of 40 hours and incorporates standard U.S. holidays. This schedule also includes respectful time allowances for stakeholder reviews and iterative sign-offs from the COC project team members.

7.11.1 Timeline Summary of Deliverables



7.11.2 Timeline Summary by Sprint

PHASE	START DATE	END DATE
Phase 1: Dataset and Application Discovery Phase Sprint 0	January 4, 2021	February 26, 2021
Phase 2: Prototype Mobile Design Application and Supporting Database for Testing and Evaluation Sprint 1-5	March 1, 2021	May 21, 2021
Phase 3: Database Development and Implementation for Testing Sprint 6-9	May 24, 2021	July 16, 2021
Phase 4: Final Mobile Application Design and Development and User Interface Design and Implementation/Enhancements Sprint 10-14	July 19, 2021	October 1, 2021
Phase 5: System Final Testing and Production Deployment Sprint 14-16	October 4, 2021	December 10, 2021

Shoreh Elhami
Citywide GIS Manager
Data & Analytics Services

11/5/2020

RE: Response to Shortlist Questions (PAWS 2.0 – RFQ016505)

Dear Shoreh,

Thank you again for the opportunity to discuss our potential PAWS 2.0 solution with your team. I am writing this letter as TPR's response to the Shortlist questions sent on 11/4/2020.

Question 1:

Regarding the Mobile Design Application (MDA), we believe this component to be the most challenging part of this project and wanted a better understanding on the development process for that. The necessary features that we were not able to achieve utilizing Esri Collector are best described in pages 71-73 of the RFP scope Appendix.

Can you elaborate further on the process from the development of the prototype (phase 2) to the final MDA creation (phase 3)?

Answer:

The TPR Team is committed to the success of this project for the City of Columbus (COC). Our intent is to execute Phase 1 with our team's focus and diligence to understand and document the business case for each of the requirements and to prioritize those through collaboration in rolling out the prototype solution. Note that we see this as a requirements validation exercise (i.e. many times 1 sentence requirements can be interpreted multiple ways) and not a recreation of "as is" and "to be" processes as COC has provided significant detail already.

Our team's approach will be to provide for flexibility to make adjustments in order to best align required capabilities with the elected technology. This means the needs of system end users drive the technology and development. COTS is the cost-effective approach that we typically start with and augment with "build to suit" where gaps drive the custom development. Below is a representation for our standard process for the development of the prototype (phase 2) thru to the final MDA creation (phase 5). That said, our team is flexible and adaptable and will work with the COC to make modification to this process as needed:

Phase 1 Dataset and Application Discovery Phase

- Validation of MDA Functional Requirements
    - Review of existing COTS systems
    - Review of custom enhancements
- Population of Requirements Traceability Matrix
- Sprint Plan for MDA Prototype

Phase 2 Prototype Mobile Design Application and Supporting Database for Testing and Evaluation

- Delivery of wireframe prototype application
- Review of wireframes and acceptance
- Development of prototype (one or more sprints)
- Delivery of prototype for testing
- Delivery of test cases

- User Acceptance Testing
- Incorporate any changes for following sprint
- Delivery of updated prototype (includes documentation, code, and configuration)

Phase 4: Final Mobile Application Design and Development and User Interface Design and Implementation/Enhancements

- Replicate Phase 2 process but include
    - Full featured MDA database, and application
    - Integration with associated programs and resources
- Integrated System Test, Security Test and Performance Test
- Finalized Implementation Plan

Phase 5: System Final Testing and Production Deployment

- UAT testing training and deployment/UAT testing
- Deliver training guides with classroom and field instruction for administrative and end users
- Deliver deployment guide
- Staff support of deployment and go live

Question 2:

Regarding the Mobile Design Application (MDA), we believe this component to be the most challenging part of this project and wanted a better understanding on the development process for that. The necessary features that we were not able to achieve utilizing Esri Collector are best described in pages 71-73 of the RFP scope Appendix.

Is the effort to create an MDA that achieves all of the detailed goals accounted for in the currently proposed budget and schedule detailed in the proposal. If not, please elaborate on the impact.

Answer:

We anticipate meeting the goals and objectives of the MDA utilizing a COTS first approach (detailed below) within budget and schedule. We are proposing that the MDA be implemented, primarily, as a configuration of Esri's mobile tools, where feasible. At this time, we believe that a combination of ArcGIS Workforce, and ArcGIS Survey123 can be configured to accomplish most of the requirements documented in the scope Appendix. Our intention is to configure these tools as a first step of the prototype development process and document any gaps in functional requirements. We will supplement the COTS configuration with custom mobile application development where a particular COTS product cannot meet the functional requirement.

The following list references the desired features from pages 71-73 of the scope appendix as well as our current approach for satisfying these requirements with COTS tools.

- **1.1 - The MDA shall directly integrate with the centralized SQL Server database such that information entered through the mobile application is directly routed to the respective data tables in the database.**
  Survey123 will be configured to update data in SQL Server through ArcGIS Enterprise feature services.
- **1.2 - The mobile application is to be primarily map based for designing and collecting information related to spatial assets and design features.**
  Both ArcGIS Workforce and ArcGIS Survey123 provide map based interfaces.
- **1.3 - The MDA should allow users to enter relevant asset and design data and view available asset related data within the newly structured enterprise database.**

ArcGIS Workforce will be configured to include all relevant asset and design data so that it can be easily viewed in the field.

- **1.4 - The MDA shall include tabular or form-based data entry for non-spatial design information.**
  ArcGIS Survey123 is particularly suited for form entry that supports the form shown in Attachment F.
- **1.5 - The MDA shall have the ability to collect and detail multiple spatial field data design features related to one MLID or related unique asset identifier. The features will denote specific construction work limits that relate to specific work items or groups of work items.**
  The field users work list in ArcGIS Workforce will include the MLID. This will be generated from the PAWS 2.0 Management Application. Field collection in ArcGIS Survey123 will be initiated from the work list which allows the MLID to be automatically populated in the form. In this way multiple features can be collected and associated with the same MLID without the user having to re-enter the MLID in each form.
- **1.5.1 - Inspection notes and design features shall be automatically associated with the primary asset work limits (MLID / Intersection ID)**
  By tying data collection together using MLID and Asset IDs automatically passed into the ArcGIS Survey123 forms we are able to create the one to many relationships you are asking for.
- **1.7 - The MDA system requires the ability to create new features (design elements that relate to work items or groups of work items) not only edit existing design features.**
  ArcGIS Survey123 can collect new data as well as edit existing data.
- **1.9 - The MDA must incorporate the ability to create customized work item groups (features) for user selection.**
  At this time this item could be partially satisfied with cascading selects in Survey123. The one aspect that could be challenging is custom favorite lists for each user. This could be accomplished using the search capability that is coming in version 3.12. We believe this search capability will be available in time for this project however even with just the cascading selects the COC would realize significant productivity savings.
- **1.10 - The MDA must incorporate the ability to add notes to graphics on the map related to a location to capture related design and inspection notes. This includes the ability to add notes for reference that are not related directly to work items and will be separate feature types (field design notes).**
  Using Survey123 a field notes configuration would accomplish this item. Users would also have the ability to sketch on the map with markup and save it to a specific location. This was shown on slide 24 of our shortlist presentation.
- **1.11 The MDA must include the ability to retain data locally if live data connection is interrupted and update data to server upon reestablishing the data connection. and 1.11.1 - The system must incorporate a process or utility to allow saving and updating data collected when data connection is interrupted.**
  Offline editing is built into ArcGIS Survey123 and ArcGIS Workforce.
- **1.12 - Provide replacement for the field worksheet. Design and implement a customized electronic form to collect data currently represented in the field worksheet.**
  This form entry is supported in ArcGIS Survey123. The layout of the form might need to change a little to accommodate the form function of the device but the Field design worksheet is well suited to an ArcGIS Survey123 form.
- **1.13 - The MDA shall integrate with the solution for assigned work and reporting current status of work for field staff.**
  ArcGIS Workforce will supply the functionality for managing assigned work and reporting current status of field work. An ArcGIS Dashboard could be configured to provide a real time executive view of the status of the work.
- **1.14 - Ability to show the users location within the map on the mobile design application using the device's GPS and cellular information.**

ArcGIS Workforce and ArcGIS Survey123 have functionality built in for showing your current location from the GPS.

- **1.15 - All quantities related to features entered in the GIS data solution will be referenced to specific streets and further referenced to an intersection ID and a ramp number for ADA items.**
  When field work is assigned in ArcGIS Workforce the street and intersection references will be embedded in the assignment. When the field users get to the site and launch ArcGIS Survey123 from their assignment the street or intersection information is automatically populated. This allows all the field data to be associated with the appropriate asset and project.
- **1.16 - Direct integration of GIS enterprise spatial asset and design feature data and related attributes with AutoCAD for creating construction drawings.**
  ArcGIS Workforce and ArcGIS Survey123 directly leverage ArcGIS Enterprise services which can serve GIS assets and AutoCAD data.

There are two items listed in the requirements that have less of a direct match with functionality available in COTS Esri products. However, the needs for these functions could possibly be satisfied with a different approach with the COTS features or additional custom development.

- **1.6 The MDA must incorporate the ability to draw features with intended dimensions and the ability to edit the features dimensions (lines and polygons).**
  The ability to draw and edit feature dimensions. The need behind this could potentially be accomplished with form based entry for the dimension as an attribute of the feature in ArcGIS Survey123.
- **1.8 The MDA must incorporate the ability to create polygon areas using right angles or defined angles and orienting them in the correct direction.**
  The ability to create polygons with right angles. If the need behind this function is to calculate quantities based on an area this could potentially be satisfied by form based entry for the dimensions with calculated fields for the quantities.

We will also research other mobile COTS solutions and tools from Esri, Autodesk and others to determine if they can provide the capabilities needed.

We believe that most of the requirements listed can be accomplished directly with a combination of ArcGIS Workforce and ArcGIS Survey123. Since the majority of the requirements are satisfied with COTS capabilities, we believe it is in the best interest of COC to initially implement a COTS solution. The thoughts here are only our initial solution based on the documentation provided in the RFP. As already discussed, software at COC is constantly evolving (e.g. the migration of the Enterprise Geodatabase from Oracle to SQL Server) and we want to make sure that we have interpreted the requirements correctly as well as accounted for the intentions of COC's future IT and business application infrastructure. Our project management approach will flesh out all the details of your needs and apply the best technology (custom or COTS) to provide the best overall solution. Our team has extensive experience enhancing COTS solutions and building native applications with custom capabilities.