



DATE: March 13, 2018

TO: C.H. Huckelberry, County Administrator

FROM: 
Ana M. Olivares, P.E.
Director


Yves Khawam, Ph.D.
Chief Deputy Director

SUBJECT: Pima County Transportation Department Improvement Plan Update

Your January 8, 2018 memorandum approves the December 28, 2017 Transportation Department Improvement Plan with the exception of technology systems investment for which you requested additional clarification.

The department has requested \$1.7M placeholder in the 2018/2019 budget to purchase and implement the system(s) which will include consolidation of the more than thirty currently deployed traffic, asset management and workflow department databases. However, no detail was provided in the plan as to what these systems comprised due to the preliminary nature of the analysis. While an annual plan update will be provided, this memorandum will serve as an intermediate update focusing solely on the technology systems component.

A core team dedicated to this effort has been assembled to include Transportation, Information Technology and Finance staff. This team has analyzed needs, evaluated these against existing systems and has identified gaps and technology solutions. The primary priority within the analysis was to utilize systems already owned by the County, to procure gap systems, to limit customized configuration overhead to maximum 10% of the deployed solution and to have the full implementation completed by July 2019.

Basic system needs are outlined in our original plan to include tracking, routing and managing all Transportation assets, work, customer requests and analytics. Our initial thought was to purchase Esri Roads and Highways along with Maximo as the primary platforms for these functions. However, since the County's currently deployed implementation of Maximo is multiple versions old, Roads and Highways cannot connect to it and so we will instead utilize our existing Maximo installation linked to our existing ArcGIS environment for management of assets, analytics and work.

Use of Maximo will be expanded within the existing platform to enable advanced functionality of the Asset Management, Scheduler and Field application modules. The existing ArcGIS environment will be expanded by building on the already developed Linear Referencing System, and Transportation assets to be extracted from LiDAR data by a contractor will be incorporated into that environment along with traffic analytics and system performance data. Off the shelf analysis tools, such as Esri Insights, will be integrated without need for customization.

The only elements which Maximo and ArcGIS cannot support are a robust pavement management system and an external facing customer relationship management module. The team has identified off-the-shelf

solutions for these modules and our ITD relationship manager has concurred that to serve our complete systems technology needs, local systems configuration will not exceed 10% of our overall technology implementation.


Due to our ability to leverage existing County systems to a greater extent than initially thought, our expenditure estimates for Fiscal 2019 have been reduced to \$1,262,259. This amount includes:

- Contracted LiDAR extraction of Transportation assets: \$405,000
- Purchase of field devices to support real-time work management (60 Panasonic Toughbook 33 with 4G and EZMaxmobile software): \$374,000
- Purchase of additional servers and licenses to support expanded Maximo environment (enabling modules currently not utilized by the County): \$150,000
- Purchase of ArcInfo licenses to support additional Maximo functionality (20 users): \$50,000
- Purchase of off-the-shelf software for pavement management (HDM4—20 users): \$119,659
- Purchase of customer relationship management software solution (InfloScanPro—40 user license): \$61,000
- User support training software (Articulate 360—2 licenses): \$2,600
- System integration contingency: \$100,000

These estimated costs are not-to-be exceeded amounts which could be further reduced during implementation. For example, ITD is currently looking to Microsoft Dynamics as an enterprise-wide platform for customer relationship management, which, contingent on implementation timeframe, may provide Transportation a reduced-cost option. Attached is project schedule indicating that prototyping of system functionality to include traffic analytics capability will come online as early as July, 2018, with the complete project concluding in July, 2019.


Please let us know if you require additional information.

Concurrence:



Carmine DeBonis, Jr.,
Deputy County Administrator—Public Works 3/21/18

Approved/Denied:



C.H. Huckelberry,
County Administrator 3/22/18



MEMORANDUM

Date: January 8, 2018

To: Carmine DeBonis, Jr.
Deputy County Administrator
for Public Works

From: C.H. Huckelberry
County Administrator

A handwritten signature in black ink, appearing to read "CHH", is written over the printed name "C.H. Huckelberry".

Re: **Transportation Department Improvement Plan**

I have read and reviewed the attached memorandum from Transportation Director Ana Olivares and Chief Deputy Director Yves Khawam regarding their plans to transform the Transportation Department through improvement processes, as well as improving mobility and safety. The plan is approved, with one major exception and that being the significant investment in new technology systems.

Our experience with implementing these new systems has not been stellar, in fact, I would rate them most problematic. It would appear much of the problems arise from our desire to acquire new complex information technology system, and then try to customize it to meet our own specific needs. Such has been proven highly problematic with delayed implementation and significant higher costs incurred implementing such a system. Before any approval will be given to acquire such a system, significant more detail is needed; what these systems are, where are they in place today, how they are they performing, who uses them. In addition, do we desire any modifications to fit what we perceive as our business practices even though those business practices may need to change to reflect conformity with modern information systems?

Other than this one modification, I believe department management is on the right track regarding the Improvement Plan.


CHH/lab


Attachment


c: Jan Leshar, Chief Assistant County Administrator
Tom Burke, Deputy County Administrator for Administration
Nanette Slusser, Assistant County Administrator for Public Works
John Voorhees, Assistant County Administrator

DATE: December 28, 2017

TO: C.H. Huckelberry, County Administrator

FROM: 
Ana M. Olivares, P.E.
Director

THRU: Carmine DeBonis, Jr. 
Deputy County Administrator—Public Works

THRU: 
Yves Khawam, Ph.D.
Chief Deputy Director

SUBJECT: Pima County Transportation Department Improvement Plan

Context

The 1997 Highway User Revenue Bond Program and 2006 Regional Transportation Authority (RTA) have been highly successful in that nearly all projects have been completed, resulting in 43% increased mobility within targeted corridors despite a traffic volume increase of 32%. With the winding down of this large capital effort, the department now needs to retool to address deferred maintenance and operational network management in an effective, efficient and customer service-focused manner.

The scale of our capital program effort has resulted in focus fragmentation across multiple capacity, safety and maintenance programs, which has hampered evaluating where the greatest needs lie across the network, as a whole. Part of the problem is that the department has historically lacked analysis tools to evaluate overall network performance so as to determine where best to apply limited resources. Moving forward there is a need to: 1) incorporate life-cycle costing and other performance-based analysis into operational decision making processes; 2) include quality/time/cost performance metrics in managing projects; 3) use predictive performance tools to determine more effective design methodologies; and 4) base material selection on forensic analytics performance so as to increase longevity of pavement and other infrastructure. Many of the Transportation current processes have frustrated staff and the community alike and will benefit from a more efficient, responsive, and task optimization approach to include the incorporation of automation.

This improvement plan has as a goal to re-orient the department's primary purpose to provide and maintain an effective transportation network through timely, cost-effective and helpful service delivery and through strategic organizational, technological, process and policy changes resulting in enhanced functionality and service delivery at reduced cost.

Opportunities

Allocation of Resources

The large capacity enhancement projects of the past two decades has resulted in replication of services across multiple areas. Examples include: project management which occurs in Engineering, Traffic and Maintenance; admin support services which occurs across most department units; and the client interface, which provides multiple contact points for constituents within each division, resulting in confusion and lack of efficiencies.

This fragmentation is reflected in the current Transportation operational budget structure which contains forty-six budget units distributed among three programs. In order to simplify the allocation and tracking of resources, the Fiscal Year 2018/2019 budget structure has been recast into a single program to support transportation network performance through ten operational units and two tracking units for non-HURF and real property right-of-way transactions. The ten operational units by proportion of requested operational budget expenditure are:

- Analytics 16%
- Design 3%
- Maintenance 54%
- Warehoused maintenance materials 7%
- Right-of-way management 2%
- Materials evaluation 3%
- Survey 1%
- Project delivery 4%
- Community and department support services 8%
- Director's office 2%.

This new structure provides greater transparency into how resources are spent. Consolidating tasks and points of contact for duplicated services provides for greater clarity, consistency, efficiency, service depth and elimination of redundancy so that service controls and coverage can better be maintained.

Analysis-Based Focus

Transportation will implement an analysis-based focus approach that will provide for the evaluation, determination and prioritization of transportation network needs prior to selecting solutions. This is a shift from an approach where individual programs have focused on spot improvement areas such as signals, guardrail and HAWKs, which can result in the solution conflicting with other network needs and priorities in the area selected to receive it. A preferred analysis-based approach analyzes network performance first and then determines the best needs to enhance performance which may uncover an entirely different solution yielding overall greater gains.

The analysis process will also better account for risk/life-cycle costing associated with infrastructure decisions so as to select the best and most cost-effective solutions over the long term. Safety and risk have not traditionally been quantified to the same level as mobility and longevity of infrastructure. As such, we have not been able to directly compare or evaluate them against each other in our infrastructure planning decisions. By projecting risk and safety in terms of economic impact and value, they can be quantified and directly incorporated into a comprehensive analysis of all factors affecting transportation network decisions. This analysis can also incorporate the projected effects of technologies to curtail investments which may no longer be needed within ten years.

Rethinking transportation network needs based on new technologies

The next decade will see many changes in technology which will likely transform the operation of our transportation network resulting in a reduced need for capacity expansion and safety initiatives. The U.S.

National Highways Traffic Safety Administration (NHTSA) is reporting that 94% of the 37,461 lives lost on U.S. highways in 2016 were due to human error and annual fatalities are up across the Nation. This is reinforced in that unincorporated Pima County fatalities increased in 2016 compared to 2015, despite the investments made in safety enhancement projects. NHTSA is projecting that within 2016-2025 the majority of vehicles on US highways will have partially automated safety features such as lane-keeping assist, adaptive cruise control and traffic jam assist, and that following 2025, the majority of vehicles will have fully automated safety features and highway autopilot.

While the benefits of vehicle automation are clear for increasing level of safety without having to invest billions in reconfiguring transportation infrastructure, there are additional benefits when taking into consideration the NHTSA projections of \$894 billion in national economic and societal savings associated with reduced crashes, and increased mobility. For example, a recent NHTSA commissioned McKinsey study found that automated vehicles could free up as much as 50 commuting minutes a day that had previously been dedicated to driving, thereby curtailing need for investing in new capacity enhancement projects. This is especially important in that most of our future large capacity planning spans at least 10 years from the start of the planning effort to completion of the roadway project. That timeframe for a project initiated today takes us to 2028 or well into the autonomous vehicle NHTSA projected timeframe, thereby potentially rendering the improvement unnecessary.

To plan for this future, Transportation will view capacity and safety enhancements differently and incorporate infrastructure facilitating vehicle automation such as intelligent adaptive signals as well as concentrate resources toward infrastructure that will remain important within the new technological paradigm, such as pavement preservation and drainage improvements.

Rethinking Standards

Transportation will revamp our transportation system standards. Transportation engineering has traditionally relied on prescriptive national standards, such as the *AASHTO Policy on Geometric Design* which contains prescribed standards often applied without ability to measure or infer performance within a specific application. However, in 2010 AASHTO published the *Highway Safety Manual* which provided for the first time in transportation engineering, a methodology for evaluating predictive performance for geometric and other roadway elements. This regression approach can be expanded beyond measurement of safety and can be incorporated throughout our design process to better evaluate and guide empirical contextual infrastructure performance within the local network.

Materials forensic evaluation is another area which can benefit from a better analysis approach. Currently, we have little data in usable form to assist with decisions such as optimal pavement design for local conditions. However, development of a system to perform regression analysis across our pavement inventory as to geotechnical data, structural section, treatment and observed condition, can better identify the factors contributing to both failure and longevity so as to inform materials and structure standards.

Finally, our overarching standards such as the *Roadway Design Manual* and the *Subdivision & Development Street Standards* can benefit from recasting into a single transportation design manual better reflecting performance-based multi-modal elements to include markings and signage. Additionally, project approval processes can be removed from the manual and transferred to substantive policies, so that the same standards may be applicable to both private development and County projects.

Network Management

In order to fully capitalize on an analysis-based approach, an active systems model of our infrastructure and traffic representation is needed. Transportation will begin building a transportation network management system to include:

- A geospatial representation with ability to process planning, safety, capacity, assets, work requests, network status and maintenance functions
- Volume, crash, speed and other traffic analytics
- Structures analytics (pavement sections, bridges, drainage structures, etc.)
- Horizons for future growth projections
- Intelligent systems and projected effects of new technologies (platooning, autonomous vehicles, adaptive intersection controls, etc.)
- Assets and associated maintenance rating, status and schedules
- Statistical analysis tools to generate and calibrate performance functions and write outputs to network geometric elements
- Real-time management dashboards for performance evaluation
- Reporting across network infrastructure and traffic analytics
- Analysis of mobility performance across corridors (to include intersection cumulative dwell times)
- Analysis of risk/life-cycle costing for econometric infrastructure decisions
- Workflow of maintenance tasks and constituent requests
- Generation of infrastructure plan needs as report from model
- Construction project traffic control identifiers to feed commercial GPS routing systems
- Potential to form basis of larger County infrastructure model

Development of this system will allow us to evaluate, create tools, measure performance, assign maintenance tasks and virtually navigate and adjust our network for optimal traffic and infrastructure management in real time.

Project Management

Project management and delivery could benefit from adjustments to reduce costs and timeframe as well as enhance quality. Initial analysis suggests we could benefit by providing a more complete in-house pre-design to include traffic needs, survey, pavement design and preliminary hydraulic analysis with the assistance of Regional Flood Control District staff. To limit internal re-design and associated costs following pre-design delivery, the Transportation pre-design group will be separated from the project delivery group.

Transportation will also implement a quality management oversight program to provide project managers with more authority along with greater performance accountability. In the interest of capitalizing on volume efficiencies as well as standardization, this oversight is best suited to reside in the Public Works Office of Capital Improvement Projects. Transportation staff will assist and provide input into the development of expanded Office of Capital Improvement Projects standard operating procedures and quality management program.

Process and Service Enhancements

Imagine a scenario where a constituent is able to self-report a network problem through our website or main phone number. Transportation will develop a system whereby constituents select a location based on a simple GIS interface, select a condition requiring mitigation from a dropdown list, add additional descriptive information and enter contact information. In this system, the request is automatically validated as to location on the County street network, checked against other requests in that vicinity, the condition of the roadway, the type of mitigation requested, and the current workload/capacity already in the system. Within a few seconds of submittal, the constituent receives an emailed auto-response providing a date by which the mitigation or investigation will occur.

The request is then automatically work-flowed into the maintenance work-pool where it is prioritized and auto-scheduled based on location and type of work. The first time a staff person sees the request, it is downloaded to the crew supervisor's computer tablet among the work to be conducted that day, to include a GPS route on how to most effectively organize the daily work, minimizing drive times for material pickup and job locations. As soon as the work is logged as complete on the field tablet, an auto-email is generated updating the constituent of the current status, thereby closing out the work order or scheduling a follow-up if needed.

Additional like opportunities include proactively scheduling routine maintenance work out of our future network management system based on funding availability and scheduling and routing of field inspection staff through smart scheduling and routing systems. A similar approach to deliver private development building inspection has been successfully implemented in Development Services where it has resulted in a 25% inspection program cost saving.

Staff and processes will be organized and technological changes implemented to develop such systems in the upcoming years, and associated performance measurements for service delivery and cost efficiency will be implemented.

Return on Investment

Opportunities abound for greater operational efficiencies in many of the tasks currently conducted in the department ranging from fiscal tracking and how data is organized to operational implementation of improvements. The department new budget structure is an example of refining a fiscal tool for better overall resource management through simplification, thereby saving personnel time associated with allocations and evaluation.

All the above identified opportunities require initial funding prior to realizing the long-term return on investment. The largest of these is the transportation network management system which is requisite to fully implementing all identified opportunities. The department has requested \$1.7M in the 2018/2019 budget to purchase and implement the system(s) which will include consolidation of the more than thirty currently deployed traffic, asset management and workflow department databases. An additional investment in the 2018/2019 requested budget involves \$478,000 for automated traffic counting technology and *Miovision* intelligent roadway network monitoring. These tools will not only facilitate future adaptive signal technology to enhance constituent mobility through major corridors, but will reduce costs by automating manual counts associated with traffic studies.

The investment in the transportation network management system and traffic technologies alone have the potential to reduce annual costs of operating the Transportation Department by forty percent following full implementation of the network management system and associated workflow and traffic data automation, currently projected to occur by Fiscal 2021. The savings are attributable to automation providing for reduced personnel need, as well as associated reductions in vehicle, computing and overhead related charges. The savings is projected to occur gradually following system implementation through natural attrition of departing employees and elimination of the vacated positions.

The largest investment needed to implement a quality transportation network has not been included in the budget request as it requires budget capacity far larger than can be accommodated within the department's currently allocated State-shared gas tax and vehicle license revenues. This items relates to road repair and preservation which respectively require at least \$372M to bring all roads to a good condition, indexed for inflation over 10 years, and \$155M to preserve those roadways in good condition from falling back into disrepair over the same 10-year period.

Performance measurement

While approval of the requested Fiscal Year 2018/2019 budget is needed to implement the proposed improvement plan, the department has already initiated multiple efforts providing the groundwork to achieving this overall vision. It is also necessary that roadway repair and preservation plan funding be approved to meet constituent expectations of driving surfaces and which in turn will also result in a decrease in operational expenses associated with responding to pavement failures.

The new Transportation Department budget performance measures include:

- 100% of constituent requests will be acknowledged within 24 hours of receipt
- 100% of roadway system network outages are responded to within 6 hours of weather event or notification
- 100% of infrastructure will be maintained on a routine schedule to maximize Return on Investment (ROI):
 - Pavements: 4 years
 - Signals: 1 year
 - Lights: 3 years
 - Signs: 9 years
 - Markings: 2 years
- 100% funding needs shall be secured to support network management and preservation needs
- Deliver 100% of projects within the performance criteria established by the Office of Capital Improvement Projects

In addition and upon completion of the analytic transportation network management system, measures will be developed to track mobility, safety and customer satisfaction based on parameters and criteria to be established through a Transportation Advisory Committee and Board of Supervisors approved process.

Improvement Plan Summary

The following summarizes the key improvement plan actions and the anticipated timeframe for completion of each:

- Organizational and resource allocation restructuring: December 2017 to June 2018
- Development of transportation management system: July 2018 to December 2019
- Implementation of analysis-based approach and technology-based considerations: July 2018 to June 2020 (completion of transportation management system needed for full implementation)
- Process and service enhancements: January 2018 to December 2019 (completion of transportation management system needed for full implementation)
- Revamped transportation standards: June 2020 adoption
- Project performance management program in conjunction with Office of Capital Improvement Projects: December 2018 implementation

The Transportation Department will provide an annual update of this improvement plan with the goal of continued alignment for success in managing transportation network enhanced functionality and service delivery at reduced cost.