



MEMORANDUM

Date: June 30, 2020

To: The Honorable Chairman and Members
Pima County Board of Supervisors

From: C.H. Huckelberry
County Administrator 

Re: **Pima County Transportation Vision**

The Pima County Transportation Department initiated a restructuring effort two and a half years ago due to the winding down of the 1997 Highway Revenue Bond Program and need to refocus on roadway maintenance and network optimization. Then newly appointed Transportation Director Ana Olivares submitted an improvement plan outlining opportunities for resource allocation, analysis-based focus, transportation network management technologies and retooling of standards, project management, processes and service enhancements. These efforts resulted in major organizational changes reducing budget units from 51 to 12 in Fiscal Year (FY) 2018/19 and staffing reductions from 286 to 199 FTE between FY 2018/19 and FY 2020/2021.

The successful implementation of most of these opportunities has transformed the Transportation Department into a lean organization employing modeling and analysis tools to optimize service, infrastructure and mobility. Technology has become prevalent in their operations as seen by pavement management modeling to generate a 10-year road repair plan, citizen apps for service requests and various traffic network management tools to enhance traveler mobility options and efficiency incorporated as proposed technology solutions within the Pima County RTAnext Project Submittal you received June 12, 2020.

These efforts are further outlined in the attached Transportation Department vision and strategy document focusing on continuous improvement and the future of our transportation system. Collaboration with our regional partners and leveraging of technology solutions are critical components of the planned approach. I commend Transportation Department leadership and staff for their efforts to improve operational and transportation network efficiencies and look forward to the mobility transformation we are likely to see over the next decade.

Please let me know if you have any questions.

Attachment

c: Carmine DeBonis, Jr., Deputy County Administrator for Public Works
Yves Khawam, PhD, Assistant County Administrator for Public Works
Ana Olivares, Director, Transportation Department



June 2020

Pima County's Use of New and Emerging Technologies in a Unified Approach to Transportation

This whitepaper provides a vision for how Pima County Department of Transportation (PCDOT) utilizes technology and innovative transportation strategies to enhance roadway users' mobility and improve system operations, maintenance, safety and augmentation through a unified approach to manage the overall multi-modal transportation network.

Background

Pima County, like many large and expanding communities in the West, has historically addressed transportation needs by building and widening arterial roadways to provide access to expanding residential development. The 1997 Highway User Revenue Fund Bond Program (HURF) was designed primarily to widen many arterial roadways in Pima County that were over capacity from years of development outpacing roadway infrastructure improvements. The 2006 Regional Transportation Authority (RTA) continued to fund needed roadway expansions, but also included funding for transit, bicycle and pedestrian improvements that increased access and mobility for users in more urban areas of Tucson. Safety concerns and solutions have historically been identified through crash analysis after the fact rather than statistical analysis of network benefit. Currently, the County is committing limited resources toward addressing deferred maintenance and failing roadway conditions to bring all County roadway pavement up to good or better condition in 10 years.

Challenges

Unincorporated Pima County is a geographically large area, representing many diverse communities and transportation needs. The diversity of the region requires the County to have the skills and equipment to maintain a variety of roadways and assets from high-speed arterials to snow covered mountain roadways, and from sidewalks to rural dirt roads. The County includes urbanized regions such as Flowing Wells and Drexel Heights, rural communities such as Vail, Corona de Tucson and Picture Rocks, and the senior community of Green Valley. Each community has a distinct character, and the requests made by each community reflect these differences. The County also includes five incorporated jurisdictions and two tribal regions that manage their own roadway networks; the traveling public rarely knows that they are crossing over these boundaries but they do pose challenges in the implementation of innovative solutions that can improve overall travel time and traveler experience. This diversity means that the County cannot prescribe a one size fits all policy or standard, but must tailor its response to the needs of the community and seek to be proactive rather than reactive.

Transportation funding is another challenge. Transportation improvements, operations and maintenance are all funded through state gas taxes (HURF) and Vehicle License Taxes (VLT) according to state formula. While VLT increases over time in proportion to the value of vehicles on the state's roadways, HURF increases require legislative change and has remained static since 1991. During this period, the cost of building and maintaining the County roadway network have increased with inflation, while the revenue collected per vehicle has decreased as the fleet has become more fuel efficient. Because of these factors, the buying power of HURF revenue has decreased by 61% since 1991, causing continual funding shortfalls that inhibit the County's capacity to provide services at the same level as has been provided historically.

This ongoing funding shortfall combined with the need to address expanding mobility needs and increasing maintenance costs requires Pima County to look to advances in transportation technology and innovative strategies in providing an effective and sustainable transportation system.

Solutions

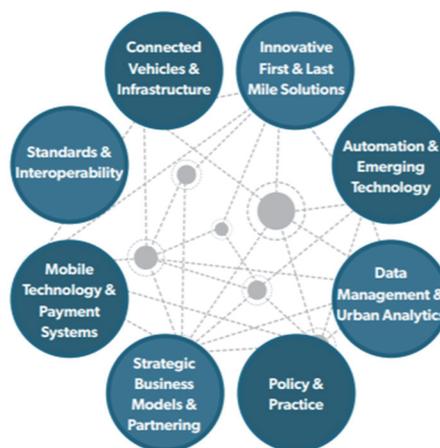
Recent years have seen the development of newer, more cost effective strategies to manage transportation assets and infrastructure and travel needs while addressing a broader range of transportation and community goals. Collectively, these strategies address operational and user demands simultaneously and are referred to as Mobility on Demand (MOD). Pima County is focused on providing a premier transportation network through timely, cost-effective and helpful service delivery and through strategic organizational and technological process and policy resulting in enhanced functionality at reduced cost.

In order to address the challenges presented above and to achieve our commitment to public mobility, Pima County must transition to a Smart Transportation approach that takes advantage of new mobility options and technological advancements to get the most from the current roadway network. Achieving this transition requires that all elements of PCDOT, from administration, maintenance, operations, planning, design and project delivery utilize modern technologies and be organized and operated in the most efficient manner possible.

To achieve its vision of utilizing new and emerging technologies and innovative transportation strategies, the County is utilizing a MOD model to focus and guide decision-making. As defined by the US Department of Transportation, “MOD is an innovative, user-focused approach which leverages emerging mobility services, integrated transit networks and operations, real-time data, connected travelers, and cooperative Intelligent Transportation Systems (ITS) to allow for a more traveler-centric, transportation system-of-systems approach, providing improved mobility options to all travelers and users of the system in an efficient and safe manner.”¹

For Pima County, this means giving roadway users the opportunity to complete their trips as efficiently as possible using multiple travel modes with the help of a unified, seamless transportation management system that provides real-time information to users through a one-stop Smart Transportation app. The County is utilizing the USDOT MOD Enablers, Figure 1, as a framework for implementation of MOD.

Figure 1: MOD Enablers



¹ <https://www.its.dot.gov/factsheets/mobilityondemand.htm>

Solutions - Implementation Strategy

- 1. Strategic Business Models & Partnering:** The PCDOT culture is evolving to one of continuous improvement. PCDOT reorganized in late 2017 to better align with MOD principles and other strategic goals. The organizational structure is continually reviewed to ensure that it aligns with workflow and is using the most efficient structure to meet the traveler needs.

The success of a MOD-focused transportation system is also contingent upon the Tucson region working together to implement MOD strategies. PCDOT and the Tucson Department of Transportation and Mobility (TDOT) are working together closely on these strategies. PCDOT, TDOT and Marana, along with the University of Arizona have collaborated to form the Center for Applied Transportation Sciences (CATS). CATS is a transportation operations and research center focused on developing new tools and technologies to better manage the network in the region. With CATS, the Pima County region will utilize the research resources, knowledge and experience of the University of Arizona to improve transportation operations throughout the region.

- 2. Data Management & Analytics:** PCDOT's Network Management System Division is dedicated to managing data, and developing technologies and workflow processes that allow for real time monitoring and data driven decision-making. PCDOT's Analysis and Programming Division works in cooperation with Network Management Systems Division to provide technical guidance for developing the analytic tools needed for planning, programming, engineering design, material selection and traffic safety analysis.
- 3. Automation & Emerging Technologies:** The Smart Transportation Application and the Transportation Dashboard and Transportation Data Hub are designed to use real-time data from a variety of sources. PCDOT is working with our partners at the University of Arizona to stay abreast on the latest developments and opportunities for integrating new technologies into our processes.
- 4. Policy & Practice:** PCDOT continually develops and revises Standard Operating Procedures and policies to optimize workflow and provide consistent and clear guidance for the public and staff. For example, the Roadway Design Manual and Subdivision Street Standards are being combined to a single Street Standards Manual to create a performance based design manual that includes context sensitive design elements. The Pavement Markings and Signing Manual, the Signal and Lighting Manual, and other design standards and manuals are being revised to align with MOD strategies, such as the inclusion of necessary signal communication equipment and design that accommodates modal choices. With rapid innovation and changing user needs in the transportation sector, continually revisiting existing County and PCDOT policies and practices ensures that the standards used to manage and operate the transportation system match with current demands. PCDOT implemented the San Joaquin pavement test section in order to methodically evaluate various pavement repair and preservation treatments for durability and cost effectiveness; tests such as these are an important part of a data driven approach to policy and practice decision making.
- 5. Standards & Interoperability:** As the County introduces new technologies and applications to implement its MOD strategy, partnering with other jurisdictions in the region is essential for a seamless experience for roadway users as they travel across jurisdictional boundaries.

Pima County engages in several collaborative efforts to ensure best standards and interoperability. For example, the PAG Transportation Systems Safety Subcommittee is attended by all regional partners and serves as a forum to collaborate and share strategies related to traffic operations.

Additionally, PCDOT and TDOT will continue to work together in the development of consistent design guidelines for the region.

6. **Connected Vehicles & Infrastructure:** Technology related to connected vehicles is being developed and implemented by private industry in the cars we drive. Pima County is building a roadway and traffic signal network that will be able to incorporate these new communication systems as they emerge. The County has prepared a request for a communication system for all signals that will be considered once Transportation revenues have recovered from the COVID-19 economic contraction. This system may be 5G, fiber optic, or a combination and will be capable of upload and download speeds necessary to synchronize and improve signal coordination with an ultimate goal of adaptive signals.
7. **Innovative First & Last Mile Solutions:** The first and last mile of a roadway user's trip often present the most significant bottlenecks to allowing users to freely and conveniently adopt more efficient, multimodal travel behaviors. The Smart Transportation Application (app) for smart phones will generate complete transportation options, including pedestrian routes, and scooter or bike rental locations that can provide the first and last mile portion of trip planning for those living in the urban areas. For those in rural areas, shared mobility options may be available. The app will include cost and time information so that the user can choose which transportation mode is the best option.
8. **Mobile Technology & Payment Systems:** When fully developed and implemented, the County's Smart Transportation app will be a one-stop mobile application for complete trips, from planning a trip to reaching one's final destination as quickly and efficiently as possible. The app will be able to safely and securely share user data to the Transportation Dashboards to improve system monitoring.

The app will include:

- Incentive programs to encourage drivers to leave before or after peak times, use other modes, or carpool and school pool to reduce the number of vehicles on the road;
- Multi-modal route planning to enable users to use and combine driving, transit, bicycling and walking modes of transportation;
- Incentive programs to encourage safe driving speeds, low acceleration and not using a cell phone while driving;
- Payment options for transit and public parking;
- Ride sharing options;
- Real-time routing to avoid congestion avoidance, construction and road closures.

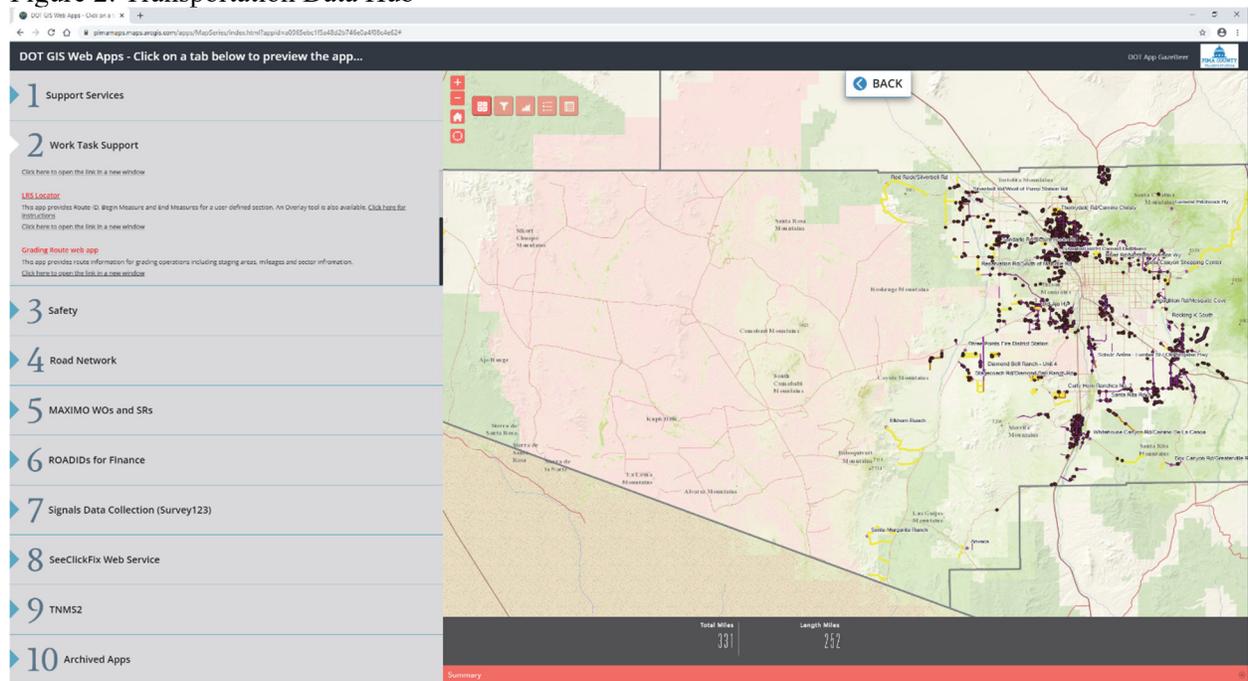
All the focus areas described above center on the ultimate goal of a MOD-based transportation network that provides a user-focused experience offering travelers the options and information they need to choose the best travel options for themselves while also providing an efficient, safe, sustainable, and equitable transportation system for the community as a whole.

Internal Tools

One of the core requirements for implementing new and emerging technologies, including MOD strategies, is the organization of data so that practitioners can readily access it for analysis and work management. PCDOT has been reviewing existing datasets, collecting new data, and utilizing various software programs to aide this effort. Some of these tools are for internal use only and some are available to the public.

The internally developed GIS tools are all located in the Transportation Data Hub, Figure 2.

Figure 2: Transportation Data Hub



The Transportation Data Hub has a catalog of GIS based applications sorted by category. Applications are consistently refined and added as needed to meet organizational operational needs. Currently, the hub includes the following applications:

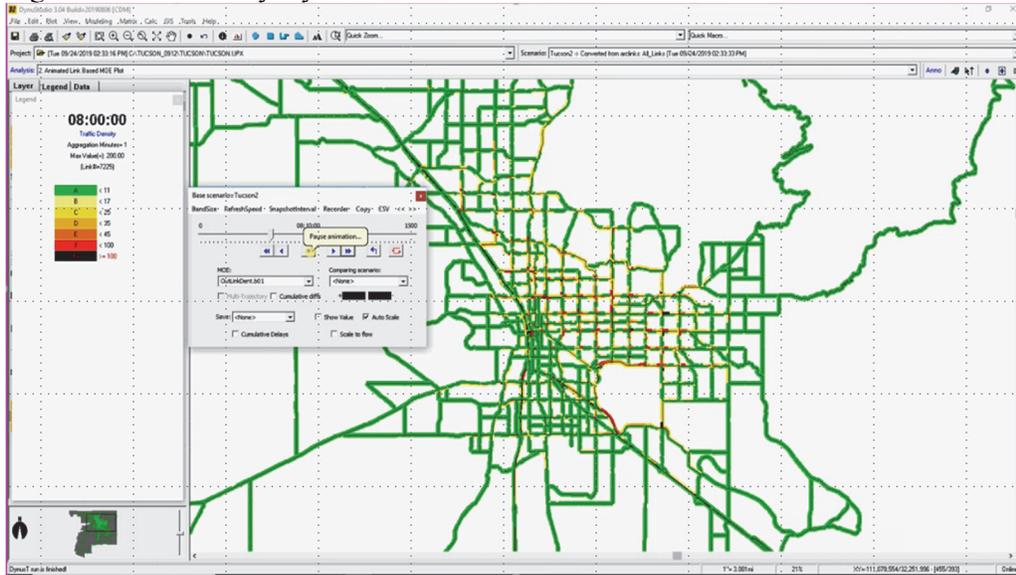
1. Support Services
 - a. Customer Relations app – used by front-line staff to provide answers to constituents about activity in their neighborhood.
 - b. Mailings Generator (enhancement in progress) – used to generate mailing labels by user-defined geographic area.
 - c. My DOT app – utilized by field staff to send geographically located photos to community relations staff.
2. Work Task Support
 - a. Failed Sign Replacement Dashboard, Workforce Management – used to assign, track, and manage sign replacement work.
 - b. LRS Locator – provides Route-ID, Begin and End measures for user-defined sections.
 - c. Grading Route web app – provides route information for grading operations including staging areas, mileages and sector information.
3. Safety
 - a. Crash Dashboard – current crash information.
 - b. Speed Management Infrastructure (SMI) (under development) – proof of concept (POC) to explore impact strategies to address speeding.
 - c. Road Closures app – a smartphone app for field staff to close and open roads and have the status sent to Transview in real time to inform the driving public.
4. Road Network
 - a. Road Repair and Preservation Projects – Public web app provides information on past, current and future projects.
 - b. StreetSaver Management Section Viewer – allows search by Street ID and/or Section ID.

- c. Highway Performance Management System (HPMS) International Roughness Index (IRI) Comparison (under development) – visualization of ADOT HPMS IRI datasets by year, jurisdiction and functional class.
- 5. Maximo Work Orders (WO) and Service Requests (SR)
 - a. Maintenance Response Times KPI – developed by Analytics and Data Governance; this is a Power BI interactive report to evaluate response time of Maximo SR's and WOs.
 - b. Maximo WOs and SRs – All WOs with associated costs in hours and dollars.
 - c. Director's SR Status Report – allows filtering and query of work orders by status, type and date.
 - d. Cost by Asset – under development, allows the user to find cost by asset by geographic area.
 - e. Active SRs by District – pulls data from Maximo and SQL Server to highlight Active SRs for Board of Supervisors staff.
 - f. Active SR Reporter – used to filter and export active SR to MS Excel.
- 6. ROADIDs for Finance
 - a. ROADIDs for Finance – reports ROADIDs for any given length of roadway to Finance.
- 7. Signals Data Collection (Survey 123)
 - a. Signals Data Collection – visualization (map) used by Survey 123 for signals field data collection.
- 8. SeeClickFix Web Service
 - a. SeeClickFix dashboard (under development) - this app consumes the service published by SeeClickFix
- 9. Transportation Network Management System for Analytics and Planning
 - a. Traffic Operations Viewer (under development) – dashboard brings together a variety of real time traffic layers including WAZE Incidents, WAZE Jams and HERE traffic flow, as well as quick links to MioVision cameras and analytics.
 - b. 2D Visualization Tool (under development) – visual screening tool for safety and mobility analysis. This map includes StreetLight Data traffic volume and congestion output, usRAP safety ratings based on existing roadway geometrics, and statistical hotspot analysis of crash data.

PCDOT has procured or has access to additional data and analysis programs. These include:

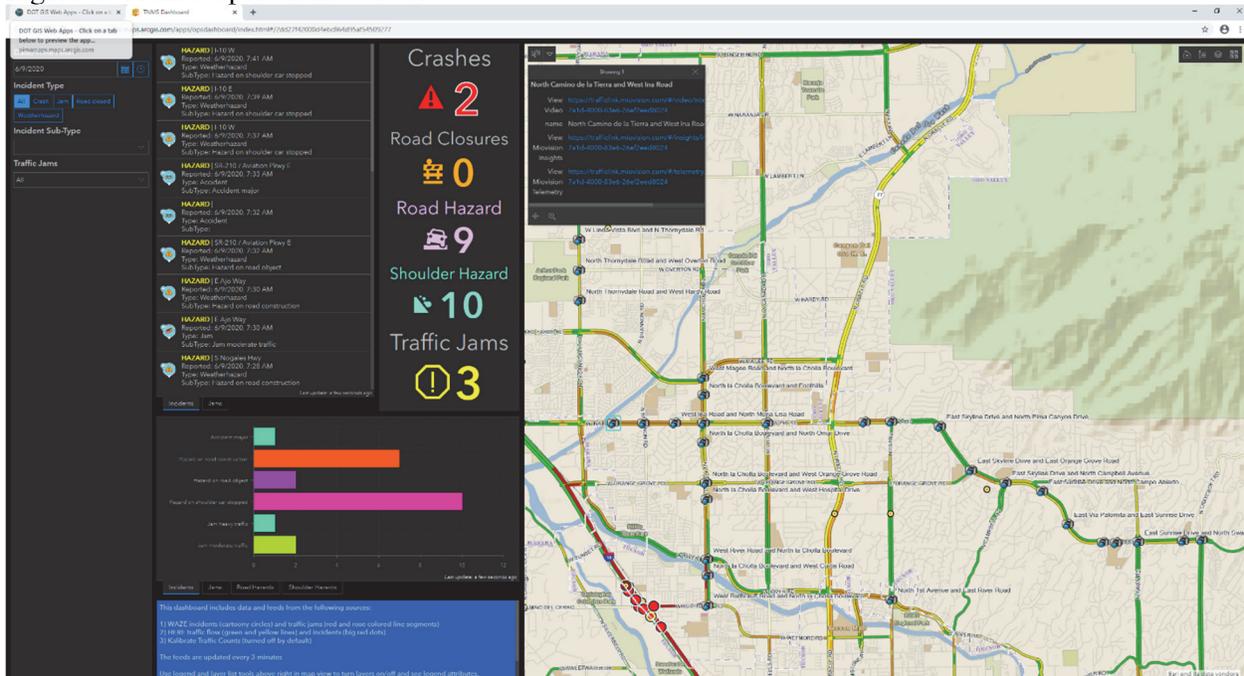
- 1. MioVision Traffic Insights – Intersection cameras and cloud-based analytic program that provides tools for signal optimization, intersection counts, performance measures, etc.
- 2. Streetlight Data – Cloud-based analytic program that provides origin-destination, AADT, AAHT, and zone analysis utilizing location-based service and GPS data.
- 3. INRIX – Cloud-based tool providing congestion, traffic and bottleneck analysis, the County has limited access to data via the State's contract.
- 4. DynusT – Dynamic traffic simulation and assignment software. As part of the partnership with the University of Arizona, a roadway network model has been built for the Pima County region (Figure 3). This model allows for scenario planning and evaluation of potential supply/demand solutions to address traffic congestion and capacity issues.

Figure 3: Pima County DynusT model



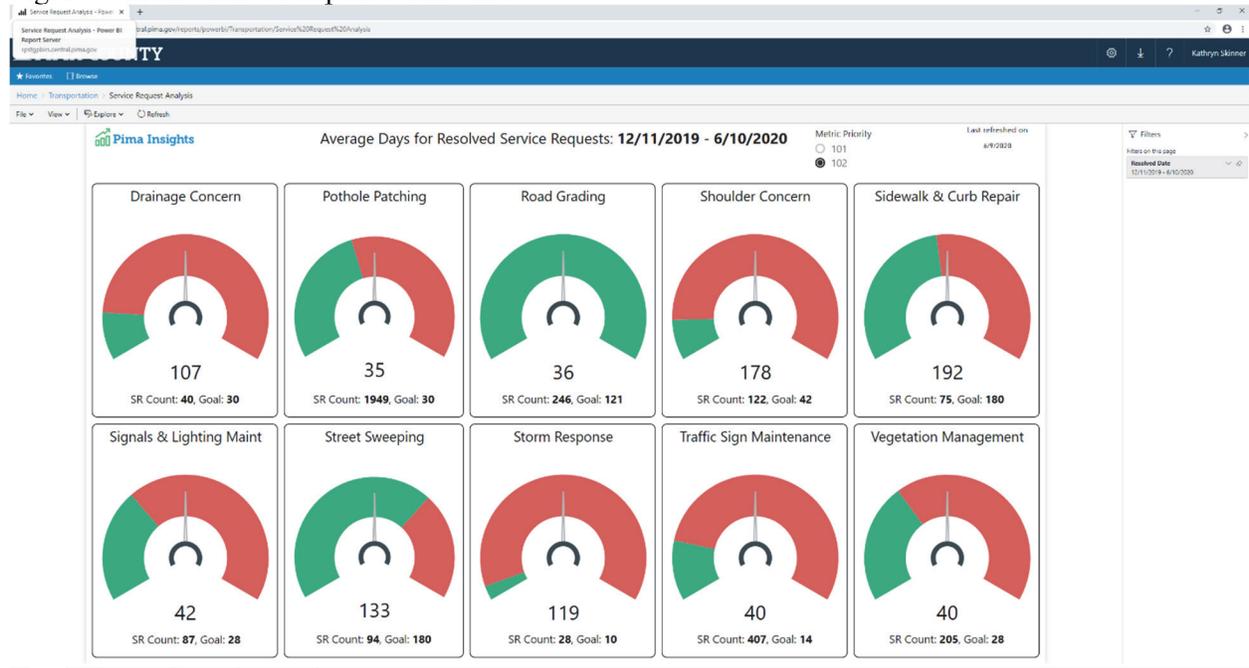
Each of the above applications provides PCDOT staff immediate real-time information about the transportation system, one example is the Traffic Operations Viewer (9a) proof of concept shown in Figure 4. This application brings together real-time traffic data from WAZE, links directly to MioVision cameras at each signalized County intersection and incident information from HERE. Utilizing a real-time traffic monitoring system provides the opportunity to address issues in a timely manner and monitor corridor performance without physically setting any new equipment along the roadway.

Figure 4: Traffic Operations Viewer



Another application is the Maintenance Response Times KPI (5a), Figure 5, developed by Analytics and Data Governance. Available on Pima Insights or the Transportation Data Hub, these Power BI tools have been built specifically for PCDOT to review various Maximo SRs metrics.

Figure 5: Maintenance Response Time KPI



External Tools

Accessing accurate information on demand is important to the public and key to providing superior customer service. In order to serve the public needs, PCDOT’s website will be rebuilt, focusing on a more graphic and easy to navigate layout.

PCDOT is utilizing SeeClickFix, Figure 6 and 7, as the main platform for receiving SRs from the public. PCDOT has customized SeeClickFix to automatically create SRs in Maximo, the County’s work tracking program. SeeClickFix has a smartphone application that the public can use to send geo-located requests to the County. PCDOT staff utilize the cloud-based program to visualize requests and review auto-generated reports.

Figure 6: SeeClickFix Smartphone Application

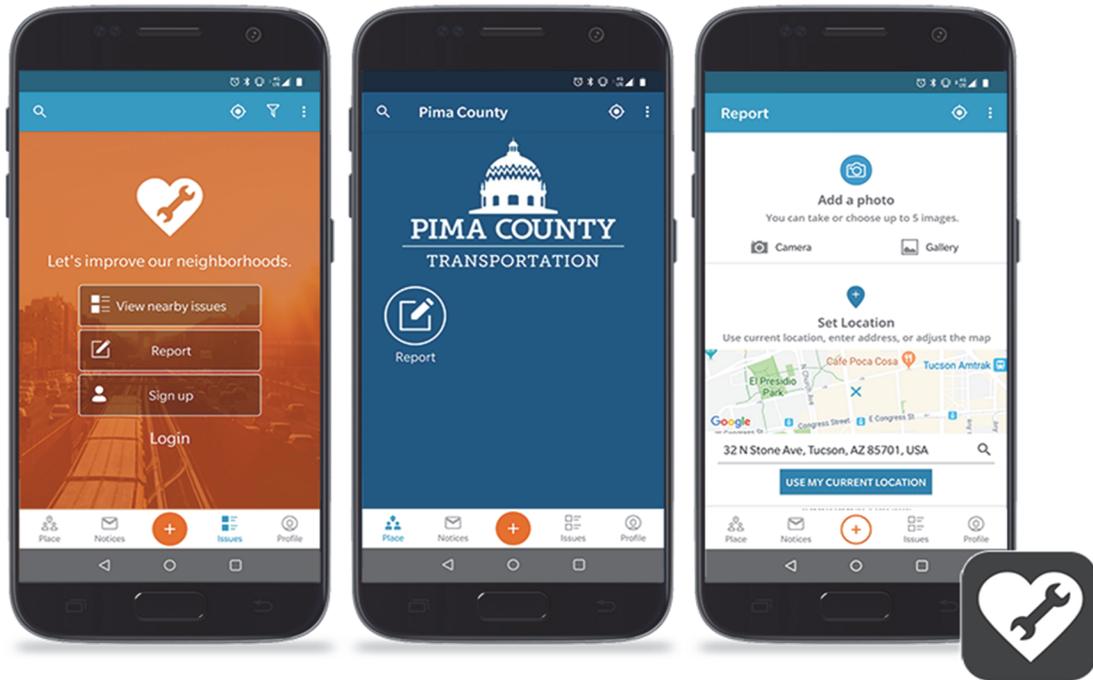
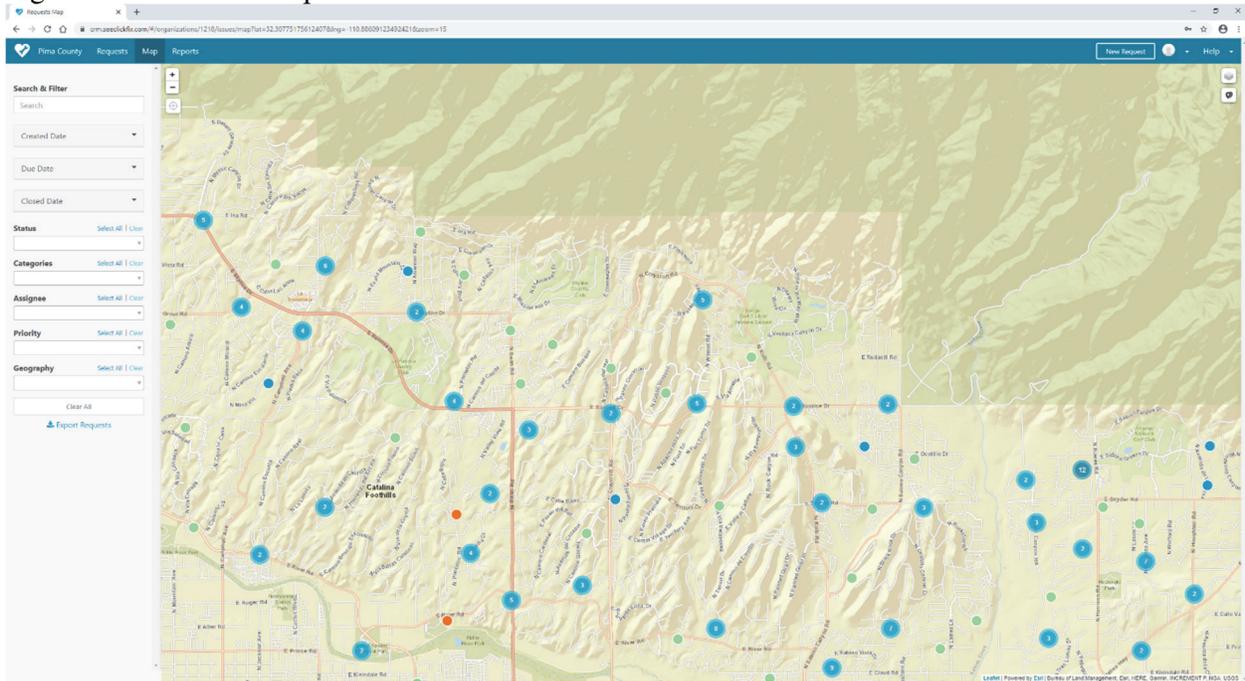


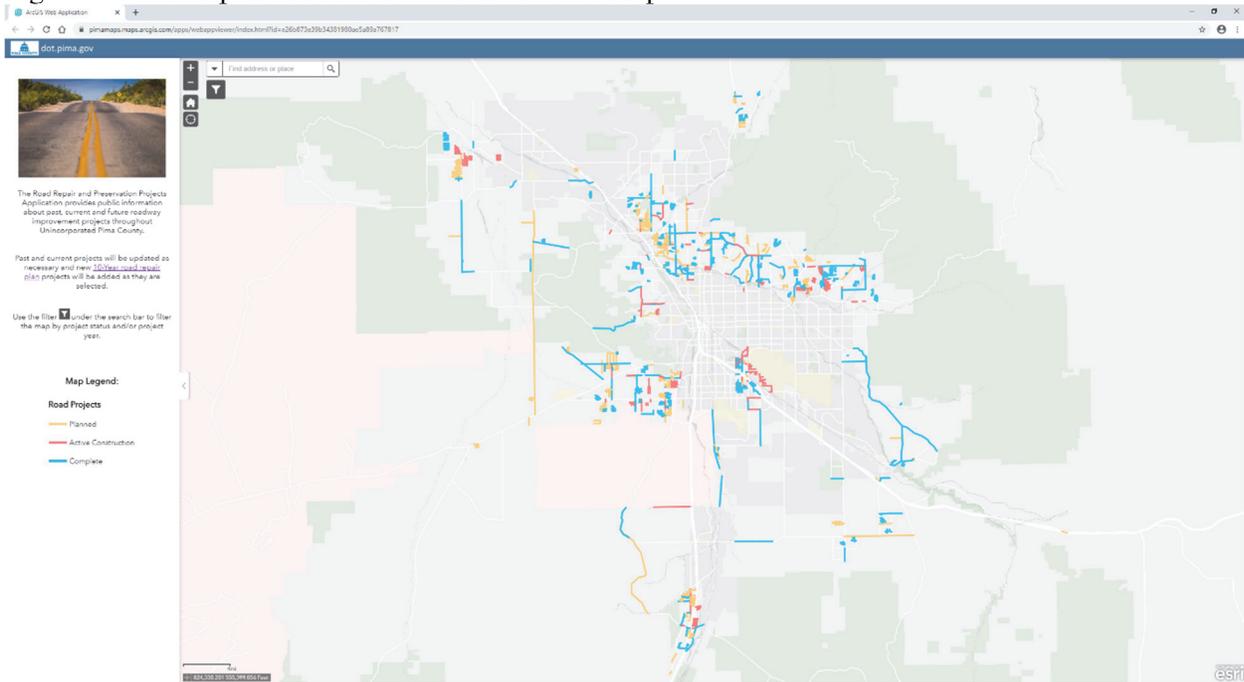
Figure 7: SeeClickFix Report



Road Repair and Preservation is the highest current priority for the County. Fiscal Year 2021 has a planned \$56 million of road repair and preservation work, which includes work on local, collector and arterial roads across the unincorporated County. The Road Repair and Preservation Interactive Map, Figure 8, is available to the public. This map provides a visualization of all planned, active construction and completed pavement

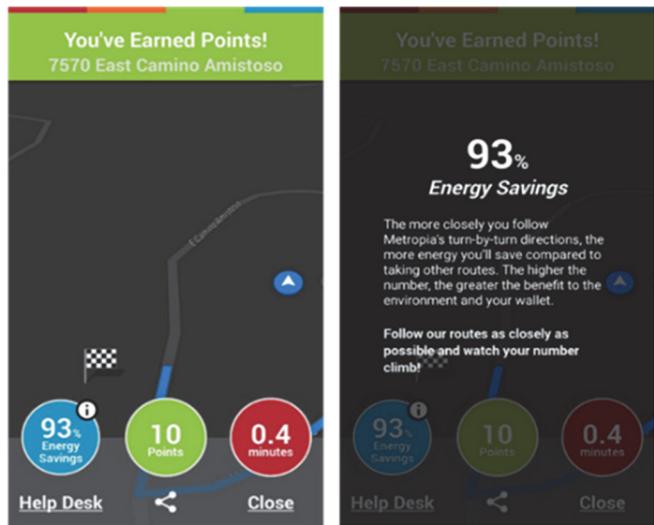
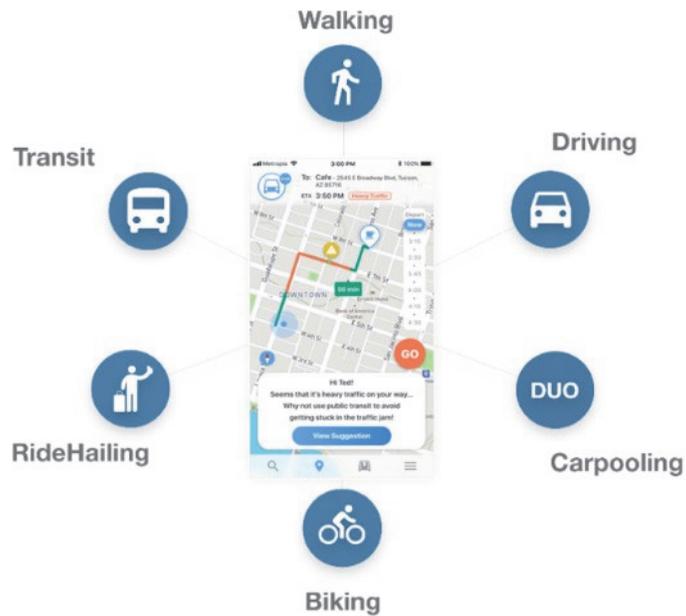
repair and preservation work. The public has access to data such as year of completion and treatment type for each identified road.

Figure 8: Road Repair and Preservation Interactive Map



PCDOT plans to develop a MOD-focused smartphone app, Figure 9, which will provide full door-to-door options for trip planning, travel reduction, peak-shift, mode-shift, and distributed routing. Integrated in the application will be incentives that will trigger behavior changes – this is a key to getting more efficient use of existing roadways and expanding the toolkit of options for addressing traffic congestion issues.

Figure 9: Samples of MOD-focused applications:



Conclusion

As the region contemplates how it will invest in its transportation system in the future, it has a choice between a plan that continues the unsustainable status quo or anticipates the need to evolve with future technological and societal change. The PCDOT vision, which incorporates MOD principles throughout all elements of the PCDOT, allows the County to realize the best return on its transportation investments while adapting to and thriving from a quickly innovating transportation sector.