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Cutting Edge ITS Planning at MR MPO

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Abstract

Intelligent Transportation Systems (ITS) planning at the Mid Region Metropolitan Organization (MRMPO) has matured over the years and has stayed on the forefront in utilizing the latest/state of the art in technology and advanced practice. For example, MRMPO has successfully integrated ITS Planning into the local transportation planning process by providing the regional forum for ITS development and coordination among stakeholders including the incorporation of our ITS Subcommittee into the monthly cycle of the MRCOG committees to act as a voice for the operations and management activities of ITS to the planning and programming at the mpo, but also the committee plays a key role in additional activities such as:

- Maintaining the Regional ITS Architecture
- Integrating all regional stakeholder ITS Infrastructure geo-data in a cloud-based GIS residing in ArcGIS Online©
- Generating valuable planning products from the integration of ITS Infrastructure and other planning datasets in GIS, ie, safety analyses, accessibility analyses, transit ridership/uilization
- Utilizing online/web-based forms for agency's project applications used in developing both the Transportation Improvement Program (TIP) and Metropolitan Transportation Plan (MTP)
- Future development – the integration of project tables between the Regional Architecture (project sequencing section) and the mpo's TIP/MTP project database.
    - Key considerations – phasing/programming, long term/MTP, unfunded projects, etc.

MRMPO has initiated the use of web-based GIS and online project submittal formats to optimize ITS Planning. These formats are proving beneficial for ease of use, data accessibility, information formatting, and integration with other databases.

KEYWORDS:
Planning, GIS, Cloud-based

Section Title

Planning for Operations from Architecture to CONOPS and Beyond

Cutting Edge ITS Planning at MR MPO

Transportation planning within a metropolitan region is facilitated by a metropolitan planning organization, or MPO, and requires the participation of federal, state, and local agencies for all modes of travel. The collaborative environment of an MPO provides an optimal framework to execute the process of planning, programming, and coordinating federally funded and regionally significant highway and transit investments ensuring planning is undertaken by a credible multi-modal process that addresses regional mobility needs and meets federal, state, and local guidelines. This process is detailed in the USDOT's code, 23 CFR Part 450c, with additional program guidance on implementation included in the FAST Act which continues the performance and results-driven transportation planning elements from its predecessor, MAP 21. The importance of an MPO's planning and coordination role in the transitioning to a performance-based program with performance goals tied to Federal-aid highway programs is critical to regional success as it involves the coordination among federal, state entities, and MPOs with their member agencies that plan, operate, and maintain the regional transportation system.

To summarize, an MPO's primary program areas of responsibility include:

- Development of the long range Metropolitan Transportation Plan (MTP)
- Short-range Transportation Improvement Program (TIP)
- Congestion Management Process (CMP)
- Ensure Project and Plan Consistency in the Maintenance of the Regional ITS Architecture
- Performance and Asset Management Systems under FAST (congestion, bridge and roadway condition/system preservation
- Public Transportation
- Safety Planning
- Freight Planning

Regional transportation policy including mobility goals are established by the MPO's Policy Board, which in the case of MRCOG, is the Metropolitan Transportation Board (MTB). Stipulation is made that entities representing all travel modes must be involved in the process, assuring that regional travel demand and operational/management issues are met with a wide range of strategy-options included in the region's travel program (MTP). With the new emphasis on system performance management, the coordination of Intelligent Transportation Systems (ITS) planning at an MPO becomes a high-value endeavor.

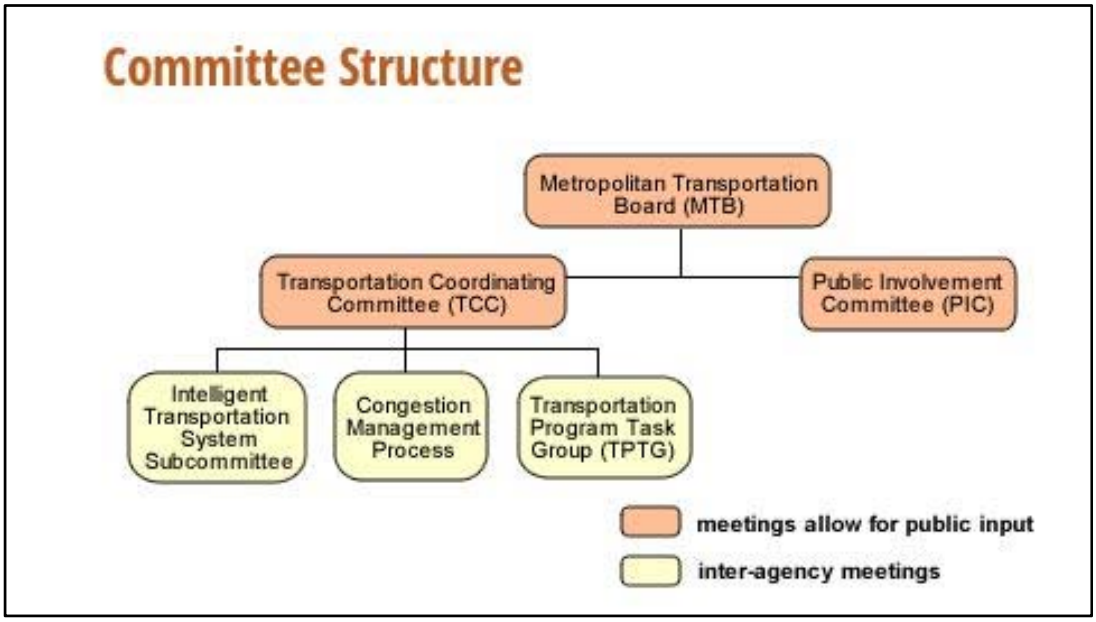


FIGURE 1 – MRCOG Committee Structure, *Periodic Meetings (monthly)*

ITS Innovation in the MPO Planning Process

To begin with, MRCOG has established an ITS Subcommittee (ITS SC) with stakeholder representation mirroring that of the membership of the MPO, ie, owners and operators of the multi-modal transportation system. The difference with this committee from others at MRCOG is that the representatives focus on operations in addition to the planning and project development/engineering focus that commonly exists with MRCOG's other technical committees. The ITS SC meets on a monthly basis, in sync with the monthly meeting cycle for all the MRCOG committees. The Metropolitan Transportation Board (MTB) is comprised of elected leaders from local transportation agencies, and is charged with the setting of policy for transportation issues in the urban area. Below the MTB is the Transportation Coordinating Committee (TCC), which is comprised of mid-level technical staff and serves to review all technical items prior being presented to the MTB. As a standing committee of the TCC, the ITS SC, provides the technical forum to handle the coordination of project related issues and is tasked with maintain the Regional ITS Infrastructure, reviewing projects submitted to the Transportation Improvement Program (TIP), and all other ITS/operational activities. The ITS SC reports directly to the TCC thus providing a direct dialog between the operators of the system and the policy-development activities associated with the MPO's transportation planning process.

Application of Advanced Tools and Resources used in ITS Technical Planning
MRCOG has long recognized the value that advanced applications have in effective planning. As with most planning agencies, MRCOG relies on an advanced geographic Information System (GIS) to support nearly all of its analyses and planning/policy development. Recently, MRCOG has upgraded its ArcGIS® licenses to include ArcGIS Online® which is a "cloud" based application that allows users to develop/access the map/spatial information using a simple web-browser. The ITS SC has maintained a regional GIS with ITS infrastructure data gathered from

each of the stakeholder agencies and has used the MPO multi-agency framework as a central repository for summary and distribution among the stakeholders. The geo-dataset is comprised of agency-supplied shapefiles with ITS infrastructure features such as DMS, CCTVs, RTMS devices, etc, and has historically resided in ArcGIS Desktop in an ArcMap project file. Access was limited based on the virtue that the GIS data and maps could only be accessed from a single machine, limiting data distribution to either hard copy maps or by the use of *laptops-and-large-video-screens-in-meetings.* With the cloud-based format of ArcGIS® online, MRCOG/MPO staff still collects GIS data (typically shapefile format) from stakeholders, but now is able to process the layers into a "feature service" which is then published to the web as a service using ArcGIS Server®. At the time of this writing, the ITS SC is reviewing the level of data-access provided to both the public and to the stakeholder agencies, and as the system matures it is the intent to formalize expanded editing/managing capabilities among the group while preserving public access to GIS "Story Maps" as described below. The ultimate state will be to realize a cloud-based "shared" GIS for expanded access and better public outreach of ITS information. The two ArcGIS Online "products" developed so far are shown below:

- **ITS Planning and System Coordination, "Story Map"** – This is the front-end product for the ITS SC intended for public viewing from the ITS SC's webpage. It offers a summary of the ITS Services that are in place and available to the traveling public. A narrative in the left panel describes, in layman's terms, the various ITS Services currently offered, ie, "what to expect as a traveler", while the main panel allows the viewer an interactive map with pan/zoom capabilities **(Figure 2)**. The Story Map has four sections:

    - *ITS Services available to the traveler, on the roadside, "in real-time"* – shows ITS services that the traveling public can expect by corridor
    - *AMPA's System of ITS and Priority Corridors* – shows key-corridors targeted for specific ITS project-level investment
    - *Arterial Roadways of Significance for "Real Time" Information and Management* – Corridors identified for real-time information under Rule 940.511
    - *Current ITS Deployment* – Existing ITS roadside devices

The link for Figure 2 is here: ***http://arcg.is/1S6wyml***

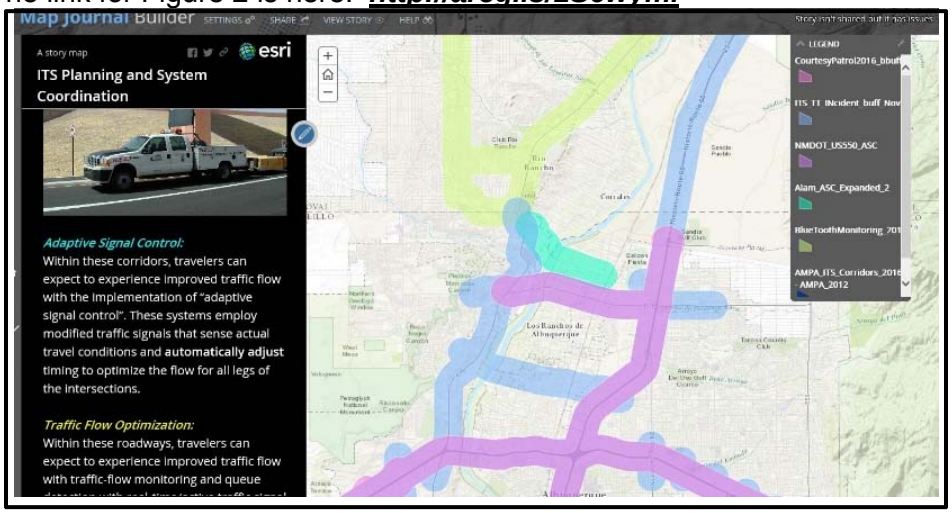


Figure 2, ITS Planning and System Coordination "Story Map" using ArcGIS Online

- **ITS Existing Infrastructure** – Utilizing the web-based feature, the ITS SC is able to share the regional stakeholder's ITS infrastructure deployment "regionally". Permissions are set to include stakeholder agencies only. This product was recently used in the TIP Development as a compliment to the ITS Priority Corridors strategies matrix to assist in the identification of ITS Service "Gaps" to inform planners and engineers what infrastructure might be needed and/or to complement existing regional deployments along multi-agency corridors **(Figure 3)**.

  The link for Figure 3 is here: **http://arcg.is/2IT6F2n**

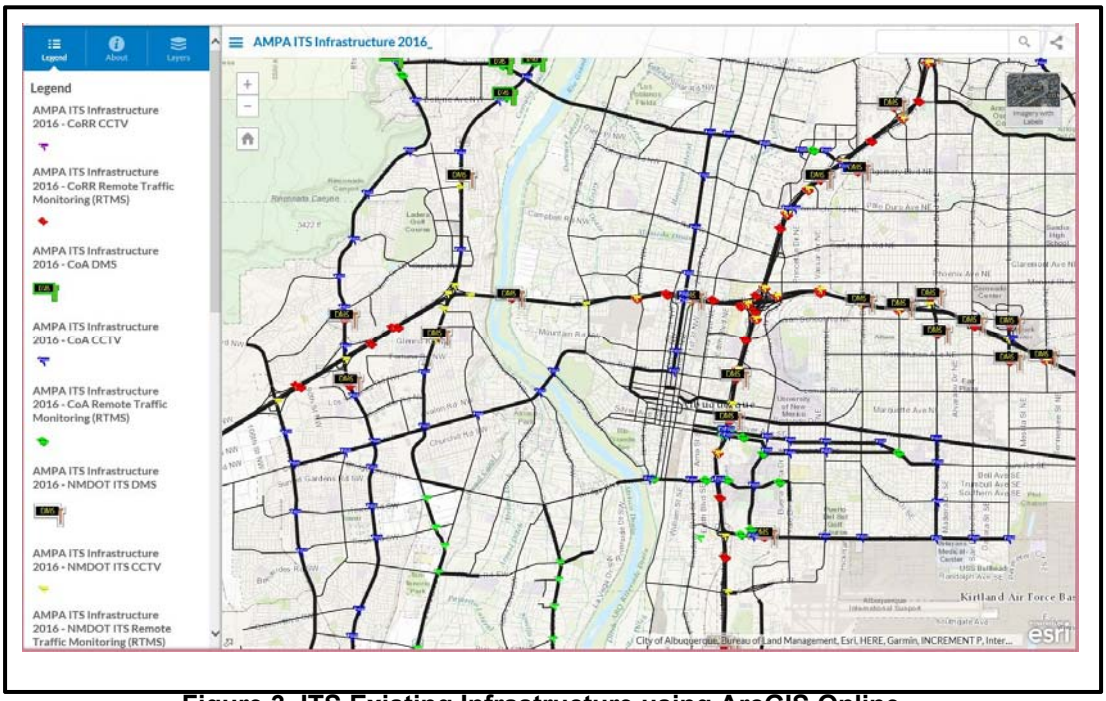
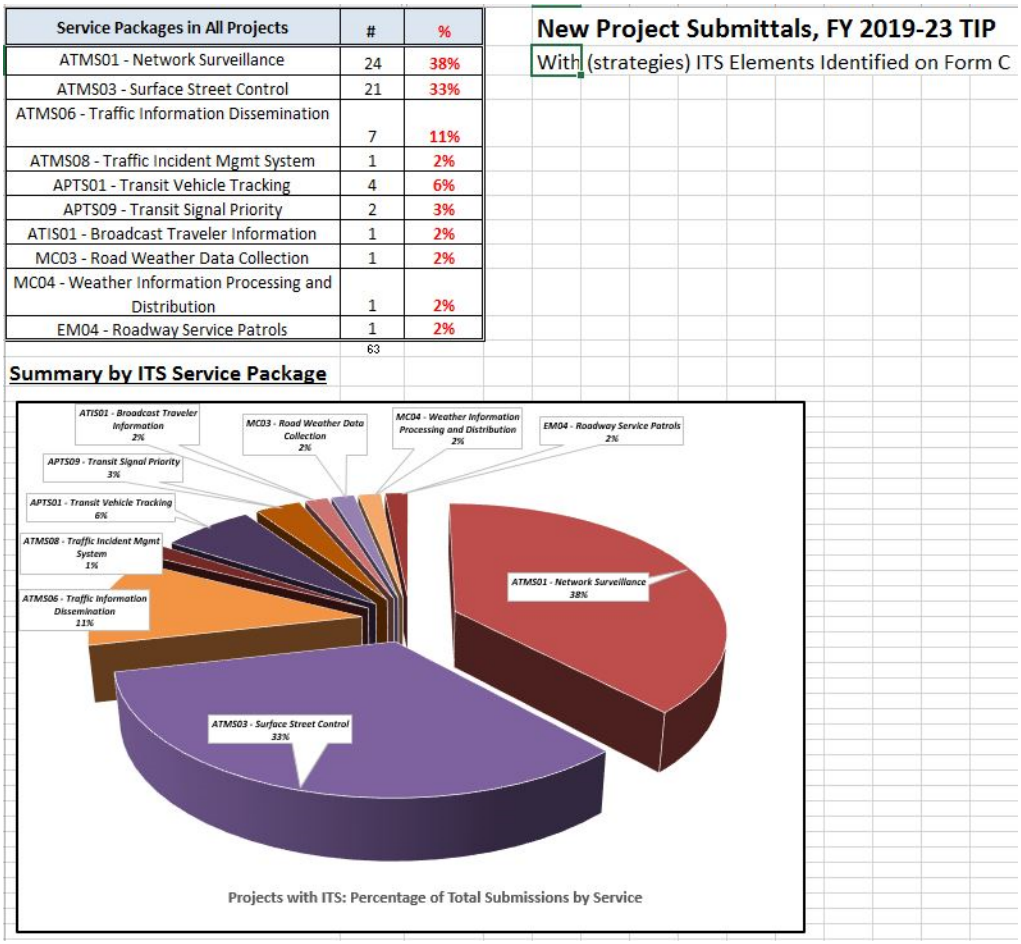


Figure 3, ITS Existing Infrastructure using ArcGIS Online

Using a web-based online form for TIP Program Development – the importance of an integrated process. As noted above, the project-programming mechanism at an MPO centers on the development of the long-term Metropolitan Transportation Plan (MTP) and the near-term Transportation Improvement Program (TIP). These two programs must encompass all applicable policy and guidance from the federal program (FAST Act) and complement one another to provide the planning and programming/funding mechanism for all transportation projects. They consider anticipated funding levels (financially-constrained) in the 20+ year anticipated socioeconomic growth horizon along with the regional goals set forth by the MTB to identify multi-modal travel infrastructure needs to improve mobility, safety, and economic sustainability.

The TIP is considered the "implementation' element of the MTP and covers the first 6 years of the longer term MTP. Developed on a 2-year cycle, agencies submit their projects for the programming of federal-assistance funding, project certifications, and implementation. The MPO, as the steward of the transportation planning and programming process, is responsible for coordinating the development of the program with all agencies submitting projects through the committee structure identified in **Figure 1** above. The project program resides in a single

project database, however, it was stand-alone and historically, agency project submittals were made with hard-copy *.pdf forms filled out manually and submitted via email. Standardization was unclear, and often times the files were submitted with missing or incomplete sections. This clumsy and cumbersome process required manual entry of project information into the MRCOG Access® project database, follow-up with the project manager for additional detail and requiring staff time, and was prone to error. Recently, MRCOG implemented an online-submittal process that integrates the current forms and capitalizes on the distribution and summary benefits of the web, introducing the entire submittal process into the virtual world for a vastly-improved process. This online form provides an electronic export of projects which are then imported into the larger project database. Projects are easily categorized into their project type, and additional project level detail can but summarized and referenced for separate areas of program analysis such as those involving performance strategies. An example of this new summary capability is in **Figure 4** below showing the distribution of new project submittals for the FY 2019-2023 TIP including the quantity of new projects with ITS elements, correlated to ITS Services from the architecture.



Service Packages in All Projects	#	%
ATMS01 - Network Surveillance	24	38%
ATMS03 - Surface Street Control	21	33%
ATMS06 - Traffic Information Dissemination	7	11%
ATMS08 - Traffic Incident Mgmt System	1	2%
APTS01 - Transit Vehicle Tracking	4	6%
APTS09 - Transit Signal Priority	2	3%
ATIS01 - Broadcast Traveler Information	1	2%
MC03 - Road Weather Data Collection	1	2%
MC04 - Weather Information Processing and Distribution	1	2%
EM04 - Roadway Service Patrols	1	2%
	63	

Figure 4, Summary of New Projects submitted for a TIP update, distinguished by ITS Service.

The *newly-streamlined* web-based project submittal process allows the ITS SC the direct ability to ascertain projects in order to establish a link/association with their project elements and the

ITS Services in the Regional ITS Architecture. For example, projects vary in purpose and need, that is, the mobility/preservation issue the project is attempting to address. Some are "ITS/TSM" intended to fulfill a clearly defined ITS service/function, but the majority are not but are "capacity", "bridge and roadway preservation", "transit", and so on. The MPO's transportation planning and programming process considers all projects and must distinguish project type in order to identify appropriate funding category but also mitigation strategy. To do this effectively in consideration of the many management systems required in the federal transportation program, MRCOG has established a robust mechanism that can identify not only the ITS "stand alone" project types but also the specific ITS elements within larger project scope and type category of other project types such as Roadway and Bridge Preservation, Capacity, Transit, or Bike/Ped.

It is important to note the role of the Congestion Management Process (CMP) has in project development and implementation for a metropolitan area, especially when it comes to ITS strategies. It is a requirement for all Transportation Management Areas (TMAs), which are metropolitan regions over 200,000 persons, and must be developed as an integrated part of the metropolitan transportation planning process. The Federal Highway Administration's requirement in 23 CFR 450.320(a) concerning Metropolitan Transportation Planning states:

"The transportation planning process (for an MPO) shall address congestion management through a process that provides for safe and effective integrated management and operation of the multimodal transportation system, based on a cooperatively developed and implemented metropolitan-wide strategy, if new and existing transportation facilities…through the use of travel demand reduction and **operational management strategies**. The development of a congestion management process should result in multimodal system performance measures and strategies that can be reflected in the metropolitan transportation plan and TIP."

What is critical in the requirement above is that for any metro region to receive federal transportation dollars, there must be a CMP with local/stakeholder defined **operations and management strategies.** This presents a clear association and connection to the specific **ITS Services** in the Regional ITS Architecture. At MRCOG, the ITS SC has recognized this and has incorporated it into practice. The mission of the ITS SC, and per the Architecture Maintenance Plan, states the role of reviewing projects for consistency with the architecture and to meet the goals in the various planning documents including the MTP and the CMP. Fortunately, there is a clear association with broadly defined MTP and CMP goals such as those to improve mobility, safety, and system preservation. On a project level, this often means interpreting **ITS Services** to project elements noted on the project description that may or may not be as clearly identified, especially for non-ITS projects developed by departments not directly involved in or familiar with ITS. This ability has proven to be a huge windfall for the ITS SC to improve the management and integration of ITS deployments across the region. The section to identify "Operations and Management Strategies" from the CMP is shown in **Figure 5** below, with the associated ITS Services shown depicting how the online form is assisting the ITS SC in correlating project information to the architecture.

Figure 5, Online TIP Project Form, CMP Section with Management and Operations Strategies and Association of ITS Services from the Regional Architecture

This identical approach is also used to consider a project's Management and Operations Strategies with the ITS SC's "Priority Corridors Matrix" (a corridor and strategy specific reference table), the Existing Infrastructure GIS map (as noted above), and the task of correlating the CMP's Operations and Management Strategies to ITS Services in the architecture. Also noted is the existence of other ITS Services in the project vicinity to identify integration needs and gap-filling opportunities. The ITS SC also has a set of system-level Corridors, aligned but a subset of the CMP corridors, but also with congestion mitigation strategies with relevant "operations-based detail" appropriate for them. Again, the composition of the ITS SC is more operations-based, and the CMP is more planner-engineer based. At least here in the AMPA, this distinction is important, and is probably not unlike many regions across the country. **Figure 6** below captures the portion of the form with these project-specific questions.

MANAGE CONGESTION AND OPERATIONS / Does any ITS Service currently exist on the corridor (deployed by your agency or another agency)?

- ○ Yes
- ○ No - Not applicable

Interactive ITS map of currently deployed infrastructure

If Yes, please explain how your agency will employ ITS Service and integrate it with existing service:

MANAGE CONGESTION AND OPERATIONS / Is the project on one of the ITS corridors listed in the ITS Priority Matrix? If so, provide the name of the corridor that your project is on:

View ITS Priority Corridors

	ITS Priority Corridors	2014 CMP Ranking (draft)	Current Deployment-based Criteria = 1 - 5 (1 best, 5 deficient)						
			Signal timing and coord. Date/#Plans	Traffic signal equipment modernization (Mstg yiw)	Traveler Information (DMS)	Communications networks	Roadway surveillance coverage	Bus-Transit Pre-emption/Priority	Transit Veh Realtime Location (App or Kiosk)
1	Alameda Blvd. *Cottonwood to I-25	1							
2	Montano Rd. (Unser to I-25) new sig at RR = 13	2							
3	Bridge/Cesar Chavez Blvd. *	4							
4	US 550 * PdV to I-25	6							
5	Coors Blvd. 1 (5/I40)	13							
6	Coors Blvd. 2 (N/I40 incl. Ellison)	13							
7	PdN Blvd. 1 (Universe to Coors)*	5							
8	PdN Blvd. 2 (Coors to W/I-25) *	5							
9	PdN Blvd. 3 (E/I-25 to Tramway)*	5							
10	Dennis Chavez (118th to Coors)	20							
11	Rio Bravo 1 (Coors to Isleta)	20							
12	Rio Bravo 2 (Isleta to University)	20							
13	Tramway Blvd. (Central to Cedar Hill)	32							
14	Central Ave. (98th to Rio Grande Blvd)	15							

Figure 6, Online TIP Project Form, ITS-related information such as existing ITS service and correlation with the ITS Priority Corridors Matrix and Strategies.

Integration of the MRCOG's TIP Project Database, Linkages to the ITS Regional Architecture

MRCOG maintains a project database in Access for all projects included in the MTP and the TIP. These databases are shared among all of the MPO's in the state of New Mexico, and are consistent with the NMDOT's Statewide TIP (STIP), allowing direct uploads to ensure the required consistency between the two (see 23 CFR, Part 450.324). With the development of the TIP and the long-range/planning MTP, MRCOG assigns tracking numbers for each project; an MPO-ID for projects in the MTP, and as projects are programmed in the near-term TIP they are given a Control Number (CN). This allows projects to be tracked throughout their "life" in the project development process, cradle to grave. With the new approach, the identification of ITS Services on a project by project basis is now in place, which allows, **1 -** an upfront ability to summarize their inclusion in the collection of projects in the program, and **2 -** the ability for MRCOG to track these strategies and assess that they are retained through design and not befallen to "cost-cutting", or the ironically-named, "value-engineering" process. Later this year MRCOG will begin the assessment of final projects by comparing project-level strategies when a project is first programmed with the final project upon construction and implementation by evaluating the *Annual Project Listing and Obligation Report* which the MPO already produces. At the time of this writing MRCOG is vetting the process of a close integration of two federally required processes (TIP development and maintenance of the ITS architecture) and the integration of program development with a clear and concise relationship between the TIP, the CMP, and the ITS Regional Architecture. Performance measures from FAST such as those related to congestion, safety, travel time reliability, freight, etc, can be more readily tracked not only in their performance results as revealed in data-collection, but also through the transportation planning and project development and programming process.

Forthcoming Improvements

What is opportune with the ITS SC's embrace of the latest in advanced planning and advanced computer application tools is the ability to anticipate improvements with existing-and-yet-unexplored tools such as cloud-based geodatabase and database management, SQL, and other new capabilities that technology will present. At this point, the database configuration (Access) does not include a geospatial component, therefore, a direct mapping of each project is limited. On the immediate horizon is the migration of MRCOG's project database from Access to SQL, which combined with location-specific detail in the project submittal process, will support a geo referencing of all projects spatially in GIS and the ability for viewing in ArcGIS Online. Once this process is completed, the project-database at MRCOG will be georeferenced and mappable. The new geospatial project information will dovetail with the anticipated state and regional Linear Referencing-based networks now in development by the New Mexico Department of Transportation. Not only will this enhance member agency project coordination capabilities and improve access to regional project activity, it will allow for a coherent project sequencing process to be established that will minimize the operational disruptions due to construction on adjacent or alternative routes/corridors. This latter outcome is included in the FHWA's Every Day Counts (EDC) initiative to promote Geospatial Data Collaboration in GIS and supported by the NMDOT.