NSGIC

National States Geographic Information Council

Best Practices for State Geospatial Maturity

TRANSPORTATION

Growing from the 2019 Geospatial Maturity Assessment, this document is the fourth in a series of best practices collected from "honor roll" states based on individual GMA report cards. In addition to addresses, coordination, next generation 9-1-1, and now transportation, the series will also cover cadastre data, hydrography data, elevation data, and orthoimagery data.

A viable transportation network, particularly a roadway network, is of paramount importance in our society, having the primary purposes of connecting people and places and allowing the movement of people, goods, and vehicles safely and efficiently. Transportation data allows us to spatially model and depict the network for the purposes of planning, asset management, navigation, and routing. In addition to the traditional transportation network management uses typically vested with state departments of transportation, these data have become the backbone of our public safety and emergency management infrastructure systems, as well as having achieved near-ubiquity in the hands of every smart device user.

The National States Geographic Information Council (NSGIC) launched the Geospatial Maturity Assessment (GMA) in 2009 as a national effort to document each state's current geospatial development practices and uses. In the decade since, the GMA provided a biennial snapshot of the state of each state's geospatial maturity. Inspired by the National Spatial Data Infrastructure theme grading undertaken by the Coalition of Geospatial Organizations (of which NSGIC is a founding member), an entirely new process was developed for the 2019 GMA. Nine-grade "report cards" were produced for individual state spatial data infrastructures and state geospatial coordination, in addition to overall theme and topical analysis. Explore the full GMA with interactive maps and dashboards.

NSGIC reached out to states in the top tier of transportation to learn more about what drove the development of the data layer, what resources were tapped, how efforts were structured, and what challenges they faced.

Kentucky | *Kent Anness, Acting Director, Division of Geographic Information*

Transportation was one of the first statewide layers assembled in Kentucky, and repeatedly we found there to be a substantial return on investment by compiling and sharing the data. This was the primary business driver for working on this layer.

Housed within the Kentucky Transportation Cabinet (KYTC), with ongoing maintenance at the Division of Planning by several dedicated staff, the work requires the Division of Planning to contract with Kentucky's 15 Area Development Districts (ADDs) to gather and submit local road data in a structured format.

Given transportation is a key framework layer, funding is a high priority, and the program has been well funded from administration to administration over the past 20 years. KYTC works closely with the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO) to manage this data resource in a standardized format

using industry-standard tools and best practices. Some federal funding is used to support a portion of our efforts within KYTC's Division of Planning.

Our transportation products are used heavily by the private sector, with the data available for direct download and accessible at no cost through a dynamic service; however, the private sector plays no direct role in building or maintaining the data resources.

While there are no statutes in place to regulate the program, many champions, including executives, support the effort. KYTC's leadership has supported the effort, engineers get it and see the value and return on investment, and long-term managers within the cabinet, some serving over 20 years, see the need to manage the data and workflows and use a spatial approach. The long-term success of GIS within KYTC is a model for other executive branch cabinets.

Having a robust transportation network layer is crucial. The state has benefited from sharing this and other critical themes, significantly increasing the efficiency in state and local government and stimulating economic opportunities.

Mississippi | *Jim Steil, Director, Mississippi Automated Resource Information System*

Meeting requirements of the Federal Highway Administration (FWHA) is the primary business driver for this theme in Mississippi, as the state effort is almost exclusively in response to federal requirements. Four to six full-time employees accomplish the work of the transportation theme; none of these individuals focus solely on this work. They are situated in the Mississippi Department of Transportation (MDOT), the Planning Division specifically.

Funding is consistent and constant for the program and is split with 80% through the Federal State Planning and Research program (SPR) and 20% through a state match program. Although local governments currently do not play an active role in this theme, data sharing does occur with our Municipal Planning Organizations (MPOs). The federal government plays a very integral role in this theme, while we see a more supporting role played by the private sector.

Champions, including executive support, tend to be elected and appointed officials, all who understand the importance of maintaining the Linear Referencing System (LRS) as a federal requirement. The program is regulated, Highway Performance Monitoring System (HPMS) Program Requirements/Certified Public Mileage 23 CFR 460.3, ARNOLD, and MIRE. Our biggest challenge to date has been the lack of up-to-date statewide aerial photography to assist with maintaining this theme.

Nevada | *Rachel Micander, GIS Analyst/Cartographer - Geologist,* with contributions from *John Burgess, Geospatial Data Manager, Nevada DOT*

In Nevada, the primary business driver was the need for readily available geospatial information for asset management, survey control, and engineering design. A viable road network in the GIS was needed to tie all of this information together.

The structure is quite straightforward, individual data stewards are responsible for maintaining their data, the platform is managed by the IT division, and the geospatial data is stored and maintained in a federated system at the Department of Transportation.

We do not have funding issues and see some programs funded through statewide planning and research funds, with the bulk of the platform state-funded through the IT division. The majority of our funding challenges are related to timelines, where funding can be obtained in a shorter time frame for smaller projects, while larger projects take multi-year planning to implement. We have worked closely with our university partners to expedite the larger projects. Our champions do include executive management and including them is important given the significant dollar amounts involved in this theme.

Although most data are created and maintained internally, there is some collaboration with local governments, particularly with the road network data. The federal government, specifically the Federal Highway Administration, has inspired some of the geospatial projects, and Highway Performance Monitoring System (HPMS), the All Road Network of Linear Referenced Roads (ARNOLD), and the need for asset and stormwater management, are the result of federal requirements. The private sector has been influential in developing the Location Information System (LoIS) for survey control and with the upcoming Right of Way GIS layer that will be published public-facing.

No statutes regulate the program, although individual datasets may have legislatively derived mandates to help drive the overall success of the program. Our biggest challenge in this work continues to be stakeholder accountability and responsibility for the data as they participate in this department-wide GIS program.

New Mexico | *Gar Clarke, Geospatial Information Officer*

In New Mexico, public safety, pushing for the development of an improved permitting system, and federal requirements of ARNOLD were the primary drivers for building a transportation dataset. The collaborative structure around the transportation dataset contributes to the success of the program. The glue of this structure is the Department of Information Technology (NM DoIT) GIO, who chairs the NM Geospatial Advisory Committee (NM GAC) that includes an interagency subcommittee on transportation and addresses.

The program has solid but varied funding support, including state and federal appropriations with regards to NM DOT/ARNOLD, the NM DOT large/wide load permitting system, NM911

through phone surcharge, and the NM Department of Public Safety Computer Aided Dispatch System (DPS/CAD) from general funds. Building trusting relationships with local governments is instrumental. Our outreach to Metropolitan Planning Organization and Regional Transportation Planning Organization (MPO/RTPO) and the tribal communities are active, strong, and collaborative.

The NM911 program acquires road centerline, addresses, and other data from over 95 separate local public geo providers, and then the NM GeoData Clearinghouse compiles the NM911 data and expands it to include ancillary transportation data into a routable network. The federal government is an important partner providing standards and funding for NM DOT. Playing the role of users and enhancers of transportation data, the private sector could assist the process by sharing their data in a non-proprietary environment.

Geospatial specialists in a variety of agencies champion this work, including executive management, cabinet secretaries, educating and evangelizing for GIS and geospatial technology through NM GAC. In NM, legislation directs the program; the NM911 Act created the program and established operation requirements and reporting metrics.

This work has been challenged by previous administrations, while also struggling to create an actionable collaborative across agencies able to sustain the program. Transportation is multi-faceted, and not all of the work perfectly fits under the Department of Transportation. As such, the centric and collaborative models, I believe, are stepping off points.

New York | *Frank Winters, Geographic Information Officer*

New York first built a statewide street network in response to the need for a statewide accident location application. Now the 9-1-1 community is the biggest supporter in need of an accurate street network.

The Street and Address Maintenance Team is located within the GIS Program Office in New York State's Office of Information Technology Services. The team consists of the program manager, the application manager, the outreach and data coordinator, and five GIS specialists/data editors.

Funding comes entirely through personnel service, and it has been difficult to secure additional funding or replace staff vacancies.

Relationships with local governments are vital because almost all updates come from local governments. This program is successful in part by the flexibility we show to the local governments since updates come to us in multiple ways and multiple timeframes.

Regarding the federal government, our street network is used as the US Census Bureau's street network. When Census boundaries are built using streets, analysis and mapping are much

easier since the data is coincident. Our good relationship with the USDOT has resulted in us being asked to participate on various committees.

Private businesses across the state rely heavily on our services, including our streets dataset and our geocoding service. Showing how useful our publicly available services are helps to sustain the program. There is broad support for the transportation theme in New York. We provide a high-quality, dependable product and go out of our way to be friendly and helpful to all customers. There is no regulatory statute yet, but a state NG9-1-1 plan is in the works.

One of the biggest challenges had been a revolving door of consultants, so obtaining permission to hire state GIS specialists has been an enormous help. Another challenge has been the lack of a suitable editing environment. Getting better servers has given us a faster, much more stable environment, increasing productivity.

North Carolina | *Tim Johnson, Director, Center for Geographic Information and Analysis*

Support of the Department of Transportation's mission was the primary driver for the transportation program in North Carolina (NC). This mission is, "Connecting people, products, and places safely and efficiently with customer focus, accountability, and environmental sensitivity to enhance the economy and vitality of North Carolina." The program that maintains the road centerlines for NC is housed in a GIS unit of approximately 50 full-time and contract staff. The unit reports to the Deputy CIO within the Department of Information Technology - Transportation (DIT-T). This individual reports to both the state CIO and Secretary of the Department of Transportation.

The funding for the NCDIT-T, GIS unit comes from an internal IT operations budget that supports the NCDOT agency. NCDOT's funding is varied, coming from the federal government, a state gas tax, state sales tax revenue, grants, and small direct appropriations.

Relationships and cooperation with local governments are critical components of the road centerline dataset. The state has federal reporting requirements for all public roads. Local governments are responsible for maintaining some public roads and reporting the information to the state. Some conflation is required with the state road system, and thanks to robust local government GIS offices, consumption is generally easy.

The federal government plays a key role, providing financial and technical assistance through the Federal Highway Administration (FHWA), and the FGDC's framework datasets work and development of data sharing guidelines has also influenced the administration of the state's road centerlines.

Like the local and federal government, the private sector is also a critical partner involved in every aspect of the data lifecycle. We have champions in NCDOT leadership, including champions in executive management. The state centerline data is a source of the Highway Performance Monitoring System reports; therefore, it is used to determine federal funding

amounts for NCDOT. Work tied to funding often has a high level of executive support. There is a strong GIS community in NC, starting with the NC Geographic Information Coordinating Council, a legislatively established body that guides GIS implementation statewide; the GIS unit receives input and feedback from a broad geographic community to help keep the transportation framework dataset modern and in alignment with the community's needs.

The transportation program is mainly governed by Chapter 136 of the North Carolina General Statutes. A new statute came into effect in January 2020 outlining the agency's responsibility to provide a readily available public street information database.

Finally, there have been several challenges to getting our transportation program to where we are today. Certainly, resources, both human and technology, exist. But perhaps different from what others have shared, competing requirements for the road centerline data has been an issue. We will continue to implore people to document their work appropriately for the success of the program.

Pennsylvania | *Mary Fulton, Chief, Geospatial Services*

The primary business driver for the transportation program in Pennsylvania is the current, ongoing effort to establish base themes and authoritative data in a statewide aggregation that aligns with National Spatial Data Infrastructure (NSDI) themes.

The Office of Planning houses the GIS Program in the Pennsylvania Department of Transportation, and currently, there are 13 staff persons mostly classified as transportation planners. The staff is divided into two sections, maintenance and support and special projects.

We have had no funding challenges because GIS is essential to Highway Performance Monitoring System (HPMS). Eighty percent of the funding is from Federal State Planning and Research funds and 20% is from state gasoline tax receipts.

Local governments have a small role to play in the transportation theme, as we primarily coordinate road name data and boundary data with the locals, but do not directly integrate their data. Additionally, the PADOT serves in an advisory role to next generation 9-1-1. Our relationship with the federal government is primarily through funding, reporting, and educational opportunities. Mainly through consultant activities, the private sector plays a large role in the transportation spatial effort.

Many groups serve as champions, including the State Geospatial Coordinating Board, state agency users, and the public. Executive management support comes from the USDOT and the State Geospatial Coordinating Board. Currently, there are no statutes for spatial transportation GIS.

One of our larger challenges has been that the IT shop at PADOT has been slow to embrace and understand spatial technology. Success has come to the program through the dedication of

many business-side supporters over the last three generations, as well as fostering a customer service attitude and listening intently to their needs.

Utah | *Matt Peters, Director of Utah Automated Geographic Resource Center (AGRC)*

In Utah, the primary business drivers for the transportation program are 9-1-1 and public land issues. AGRC, under the Department of Technology Services Division of Integrated Services, employs 12 staff, and is responsible for the creation and maintenance of the Utah road centerline data. We work with the most populated counties to perform monthly aggregations and 2.5 staff make this work happen.

The transportation road centerline data creation is funded by the state 9-1-1 program through a $0.96 surcharge to all access lines in the state. AGRC receives $0.01 of that fee, and we use it to maintain the road centerline and address points layer, while providing data and services to a handful of Public Safety Answering Points (PSAPs). A small amount of our funding for the transportation program comes from Blue Stakes of Utah 811, the "Know Before You Dig" program. Although we do have consistent funding, it will not be enough for the transportation program as we migrate to NG9-1-1. We have begun to have these discussions to obtain more money from the $0.96 surcharge fee.

Local governments play a very integral role, and one of AGRC's biggest assets is our relationships with local governments and agencies. We have a good relationship with the federal government, too, as the original building of the road layer required close work with USFS and BLM. Unfortunately, the relationships with these agencies subsided as the layer became stable, and we are now working to build the relationship once again. The private sector does have a role to play. Blue Stakes of Utah 811 relies on the road centerline dataset for their mission, and they are instrumental in providing corrections to this data. AGRC also works with the private sector to identify missing segments, and we are currently working with county stewards to get those missing segments added to the state data.

We do have champions, including the UDOT and Blue Stakes of Utah 811, and we do have executive management support; however, not in the traditional sense. As an example, for 9-1-1 work, PSAP directors support the work in the legislature and help to ensure proper 9-1-1 program funding. We are currently supported and funded and if we need more support, I know where to turn.

The transportation program is regulated by statute, and the statutes define AGRC's role. Utah Code Title 63F, Chapter 1, Part 5, Section 507 is integral in providing a central GIS database. The road centerlines are identified in section 507, 2, e as one of the layers to be maintained. Additionally, in Section 507, 2, 3, the statute states that AGRC will coordinate with municipalities, counties, emergency communication centers, and the DOT to develop this layer.

The biggest challenge to our program has been the time and resources it requires to aggregate the data. We are tasked with state connectivity and standardizing schemas, and this is

challenging. NG9-1-1 will provide us with an opportunity to take this layer to the next level. Potentially providing a near-live road centerline dataset, one in which county stewards can edit directly. We also see an opportunity for AGRC to take on a quality assurance role, providing needed quality checks.

BEST PRACTICES

- Connect the program to the mission of the agencies and organizations core to service delivery (e.g., State Department of Transportation).
  - For example, transportation data is critical to economic development, public safety, saving lives, and the safe and efficient movement of goods and people.
  - Provide information to leaders and users on the value and return on investment a shared road centerline can provide.
- Establish strong relationships with local and tribal governments and other authoritative road information providers because they are vital to the success of a transportation program.
  - Find and agree upon common goals and needs building a shared vision.
  - Encourage participation in the beginning.
  - Many data updates come from local governments. Show flexibility, allowing updates to come in multiple ways and at multiple timeframes.
  - Correctly execute your outreach, as locals must see the value in the products, so they understand that their participation helps them in the end.
  - Find ways to assist those that may not have the resources to contribute.
- Find the funding and resources.
  - Leverage State Planning and Research (SPR) and Highway Safety Improvement Program (HSIP) funding to assist with the development and maintenance of road centerlines and LRS for all public roads.
  - Pursue NG9-1-1 as an opportunity for program growth.
  - Ensure executive leadership understands the importance of the program for agency/division/group funding.
- Advocate for statutes that will identify the role of stakeholders and support statewide coordination for the program.
- Identify strong champions, including executive support.
  - Earn support with good products and sharing solutions and ideas.
  - Ensure champions include the state Department of Transportation.
- Foster a strong customer service attitude and listen intently to each client's needs.
- Share the data back with the masses.

These honor roll states noted several challenges in building a successful transportation program:

- Stakeholders, at times, are slow to embrace GIS and spatial technology.
- Transportation is multi-faceted and not all of the work perfectly fits under the state Department of Transportation.
- Required time and resources to aggregate the data can often be underestimated.
- Although stakeholders participate in a department-wide GIS program, there can remain a lack of accountability and responsibility for the data.
- Short-term consultants who help create and maintain the transportation data are often the reality.
- Challenges obtaining needed technology: Better, faster, and more stable environments to increase productivity are required.

Lessons learned by honor roll states in building a successful transportation program:

- NG9-1-1 work is happening now. Review plans and determine if NG9-1-1 can provide opportunities to improve state transportation programs.
- Clear statutes can make all of the difference in roles and authority.
  - o It is vital to advocate for statute that promotes and identifies state GIS as an authoritative role while promoting open data sharing.
- Leadership changes are a normalcy in all levels of state government.
  - o As key leadership positions change, it is important for GIOs, state GIS coordinators, or equivalents to meet with new partners and stakeholders and advocate for GIS.
- Ensure changes to program and scope, as well as data management and government practices are clearly defined.
- Because transportation is multi-faceted and not all of the work perfectly fits under the Department of Transportation, consider centric and collaborative models when building a transportation program.

NSGIC advances state-led geospatial coordination for the nation. Founded in 1991 by state Geographic Information Officers and statewide GIS coordinators, NSGIC serves as a national forum to develop future-oriented geospatial leadership and advance sound policies and practices for geospatial activities. Learn more at www.NSGIC.org. NSGIC invites further input from the GIS community by contact with NSGIC Director of Programs Jamie Chesser at jamie.chesser@nsgic.org.