CITIZENS RESEARCH COUNCIL OF MICHIGAN

"The right to criticize government is also an obligation to know what you're talking about."
Lent Upson, First Director of the Citizens Research Council

June 21, 2023

Legislative Direction is Needed to Facilitate Infrastructure Coordination

In a Nutshell

- Infrastructure management in Michigan is largely uncoordinated between various infrastructure owners who must share common right-of-ways. This imposes cost inefficiencies for all agencies, which are passed-on to the public as taxpayers and utility ratepayers.
- The cost burden of all types of infrastructure could be reduced if the various agencies were to pool resources for multi-agency construction projects, share quality data on the location of their assets, and adopt a shared long-term vision for right-of-way management.
- Michigan should pursue statutory options that will enable and support infrastructure owners and operators to more efficiently coordinate towards common objectives in the public interest.

In a previous post, we investigated the potential for 'dig-once' and related policies to facilitate the undergrounding of power distribution lines and reduce the frequency of storm-related power outages. Most utilities and road agencies understand the potential benefits of cooperation and coordination, such as dig-once construction. However, there are practical barriers to putting such ideas into action. Each individual agency must be responsive to individual incentives and unique regulatory requirements.

This is a collective action problem that will require state legislation to sufficiently address. This post explores how Michigan could incentivize more efficient and beneficial infrastructure policy through concepts like 'dig once,' subsurface utility engineering (SUE), and building information modeling (BIM).

The Problem

Public infrastructure management in the United States is a result of a long evolution of compromises between public and private agencies. Public roads are typically owned and operated by state, county, or municipal road agencies. However, a road is not only a road, but a public right-of-way (ROW) that is permitted for use by various other infrastructure and utility providers, such as water, sewer, electric power, natural gas, and telecommunications. ROWs are rarely designed to accommodate these utilities in a rational manner. Each infrastructure provider conducts planning and construction work with minimal coordination with other ROW users.

When doing any excavation work within the ROW, agencies are required to have existing underground utilities located and marked in the field. However, the construction records used to inform this process are often inaccurate. As such, construction excavation often proceeds with incomplete knowledge of the location of underground utilities, requiring slow and costly excavation methods. Despite efforts to locate and avoid underground utilities, accidental damage during excavation is common, leading to service disruptions and added costs. There were nearly 5,000 reported damaging utility hits in Michigan in 2022 alone.

The lack of coordination between ROW users imposes substantial inefficiencies and costs. These costs are passed-on to the public as taxpayers, ratepayers, and users of the infrastructure.

The Solution

New technologies provide opportunities to more efficiently manage infrastructure assets in a variety of ways. But utilizing such technologies will require ROW users to invest in institutional changes that impact their fundamental business practices. Most agencies are adopting new technologies for their own purposes. However, if each individual agency invests in technology solutions without consideration of how their digital platform can share data with other ROW users, Michigan will miss opportunities to enable meaningful collaboration between agencies.

Michigan has an opportunity to encourage and coordinate the adoption of digital technologies by infrastructure providers to assure that future infrastructure management is more collaborative and efficient. It should be emphasized that doing so is not trivial, and would involve meaningful near-term investments and long-term commitments to the effort. The development of a statewide approach to infrastructure life-cycle management would require earnest participation by hundreds, if not thousands of individual organizations that are stakeholders within public ROWs. This would represent a paradigm shift in infrastructure management, yet a necessary investment to assure the long-term fiscal sustainability of Michigan's infrastructure.

Establishing a statewide framework for management of ROW assets will require legislation that enables and supports needed investments, as well as provides regulatory compliance monitoring. Such legislation should enable ROW users to share resources, share data, and even share a common vision for long-term life-cycle management of all utilities and public assets within the ROW.

Shared Resources (Dig-once Construction)

In recent years, the phrase "dig once" has become a popular mantra to capture the idea of coordinating across agencies to improve project design and reduce construction costs. There are multiple efforts within Michigan to better enable dig-once practices. Most successful dig-once projects have resulted from intra-governmental coordination; for example, a municipal road agency will coordinate with the municipal public works department to replace water and sewer infrastructure when a road is reconstructed. In this case, the collaboration is facilitated because the different infrastructures are owned by the same government, though likely operated by different departments.

Coordination between multiple infrastructure owners is difficult. Michigan is trying to enable such coordination, for example, with the Dig-Once Project Portal maintained by the Michigan Infrastructure Council (MIC). However, this approach relies on the voluntary participation of ROW users, many of whom may not have the resources or expertise to pursue multi-agency coordination.

This voluntary approach to dig-once policy is likely to capture only the lowest-hanging fruit of inefficiencies in infrastructure management. Many dig-once projects that would be in the public interest are likely to be overlooked unless it is also in the individual interest of each agency to pursue them. For example, the MIC Dig-Once Project Portal would allow utility companies to view the project location and start date for planned road construction projects. If underground utility infrastructure happens to be scheduled for replacement around that same time, it might make sense to combine resources for a dig-once construction project. Having the ROW 'open' during road construction would save excavation costs for the utility, some of which could be 'donated' to the excavation costs of the road project, saving money for the road agency. This would also prevent the utility company from having to excavate through new road pavement to access their infrastructure.

From an outsider's perspective, it might seem that when two separate agencies are scheduling excavation work around the same time, it is obvious that they should pursue a collaborative project. However, the agencies are looking from their own perspective. By initiating a collaborative construction project, these agencies each invite new costs, complications, and uncertainties. Many potential dig-once projects will be passed-on unless there is an independent infrastructure coordinator who is able to independently identify and promote dig-once opportunities, dedicate funding to subsidize collaborative efforts, and adjudicate conflicts between agencies.

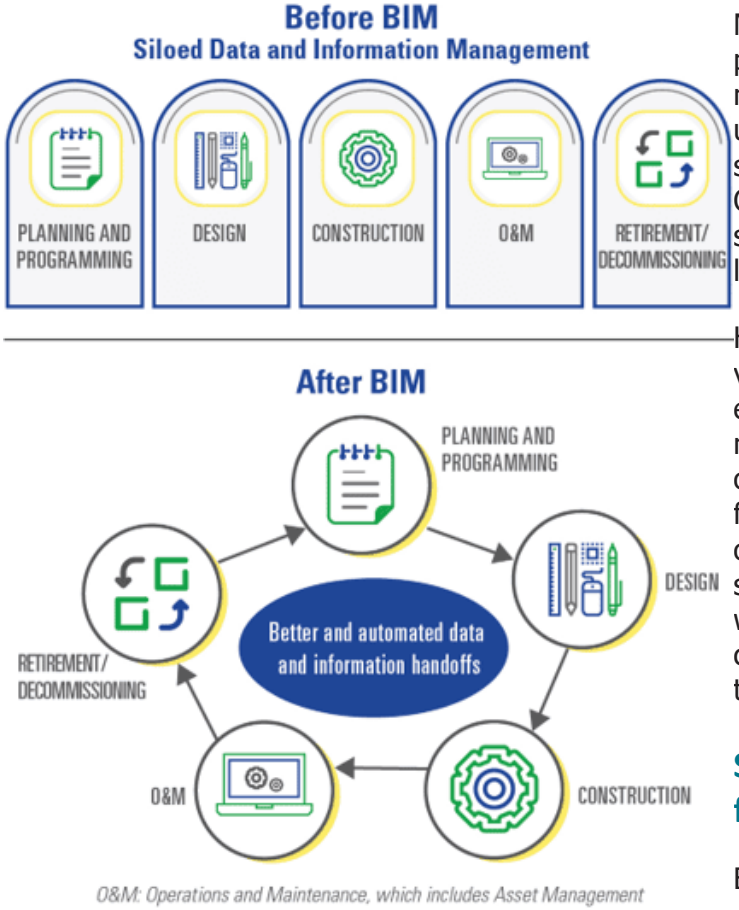
Shared Data (Subsurface Utility Engineering)

Identifying and managing collaborative dig-once projects would be easier with good data on the location and condition of underground utilities. Subsurface utility engineering (SUE) is the formal process of locating, identifying, and mapping underground utilities. SUE utilizes a combination of utility records and field surveys to precisely determine the location and characteristics of existing subsurface infrastructure. The output of SUE is a standard 3D digital model of the underground assets that can be used by agencies in the design, engineering, and construction of projects. This helps in reducing the risk of accidental utility damage during excavation, resulting in cost savings and increased safety.

SUE is a different approach than that typically used by Michigan's 811 service (MISS DIG). Before construction excavation is initiated, the MISS DIG service notifies utilities the agencies with assets within the project area. The agencies are then required to mark the approximate locations of their underground utilities within three business days. Excavation work within four feet of the marked line must use hand-digging or "soft digging" methods until the utility line is sufficiently located such that its precise location can be inferred.

However, the utilities are often working with records that are incomplete or inaccurate, and underground infrastructure may fall outside of the four-foot safety zone or not be marked at all. It is common for excavation work to damage underground utilities. These utility hits often delay projects and increase costs. Utility hits can also be dangerous for construction workers – for example when live gas lines are ruptured (which is a common occurrence). Including SUE in construction planning can substantially reduce the costs and risks of underground construction.

Other states have made progress in adopting SUE for construction within the ROW. For example, in Colorado, all major public civil engineering projects are required to use SUE standards in construction and submittal of as-built construction records. Florida law requires subsurface utility engineering for most construction projects within the public ROW. Other states, such as Texas, Minnesota, and Kentucky, have adopted (though not mandated) SUE for infrastructure as an accepted best practice.



O&M: Operations and Maintenance, which includes Asset Management

Many infrastructure owners decline to utilize SUE in projects because it adds significant costs. Project managers understand that they risk utility hits by not using SUE, but accept the marginal risk of an expensive utility hit rather than the certain expense of SUE. On average, this works out for them, and makes fiscal sense when considering the trade-offs at a project level.

However, this approach does not take a long-term view. If a project manager were to employ SUE on an excavation project, that data would still exist for the next excavation project, whether by the same agency or another ROW user. This would reduce costs for any future projects within that ROW. The establishment of a statewide program and funding mechanism to subsidize SUE as a component of excavation projects would be an investment that enables safe and efficient construction and management of all ROW assets in the long-term.

Shared Vision (Building Information Modeling for Infrastructure)

Building information modeling (BIM) for infrastructure

is a set of technology-based concepts that allow for a coherent data-based approach for managing infrastructure assets. Initial implementations of BIM typically focus on design and construction. The long-term vision of BIM is as a comprehensive platform for data-based management of infrastructure across the entire life-cycle.

BIM for infrastructure enables data-based life-cycle management of infrastructure assets.

BIM was pioneered to support complex architectural projects such as large buildings. More recently, BIM concepts have been extended to infrastructure, typically called "BIM for infrastructure." While the U.S. is a global leader in BIM for architectural projects, overseas nations are leading the adoption of BIM for infrastructure.

For example, the Netherlands is working to create virtual models of its entire road network, including traffic flow data. This work is being supported by BIM Loket – an independent nonprofit foundation for open BIM standards. The UK has required BIM on all public sector projects since 2016 and is working to extend these principles for life cycle performance management of the nation's strategic road network. Finland has established a national mandate to employ BIM across nearly its public infrastructure assets, including highways, bridges, railroads, and waterways. The Scandinavian nations of Norway, Sweden, and Denmark have also adopted policies requiring BIM for infrastructure to various degrees.

Adoption of BIM for infrastructure in the U.S. is complicated by the federalist system of governance and reliance on the private sector to provide many public services. However, there is a growing recognition that BIM for infrastructure provides cost, time, and safety benefits.

The American Association of State Highway Authorities (AASHTO) is actively pursuing expanded understanding and implementation of BIM. In 2019, AASHTO passed a resolution to adopt the Industry Foundation Classes (IFC) BIM schema developed by buildingSMART International as the standard data schema for exchanging electronic engineering data. Additionally, the Federal Highway Administration (FHWA) has published a National Strategic Roadmap for Advancing BIM for Infrastructure in 2021. Multiple states have begun evaluating BIM for infrastructure though project-level pilots, including Michigan.

It is inevitable that road agencies and other infrastructure owners increasingly adopt digital methods of project delivery and asset management, whether or not they recognize these as components of 'BIM.' Michigan has an opportunity to become a national leader by establishing a strategy to encourage, support, and guide the adoption of BIM within a coherent statewide framework.

This framework would utilize the data from SUE efforts and facilitate the pursuit of dig-once construction efforts. A BIM model could be used to develop a long-term plan for the ROW that guides project design by all ROW users within a common vision. For example, road reconstruction projects could include the installation of utility corridors or conduit banks so that electric power utilities could subsequently run their lines underground, on their own schedule, at minimal cost. This would benefit the public in general by making utility lines less subject to storm damage, reduce visual clutter in the environment, and allow for the unfettered growth of street trees. The same approach could be utilized by agencies with existing underground infrastructure. Rather than excavating under pavement to remove and replace assets that have reached their life-expectancy, the old lines can be abandoned-in-place, and new lines run through accessible utility runs.

A mature BIM ecosystem would allow for ROW design that allows utilities to service underground infrastructure without costly and damaging excavation methods.

Need for State Legislation

Public right-of-ways are a public resource. Yet management of the infrastructure within the ROWs is performed by a variety of public and private entities pursuing individual objectives with minimal coordination. The result is wasteful management of infrastructure with added costs to taxpayers, ratepayers, and the public in general.

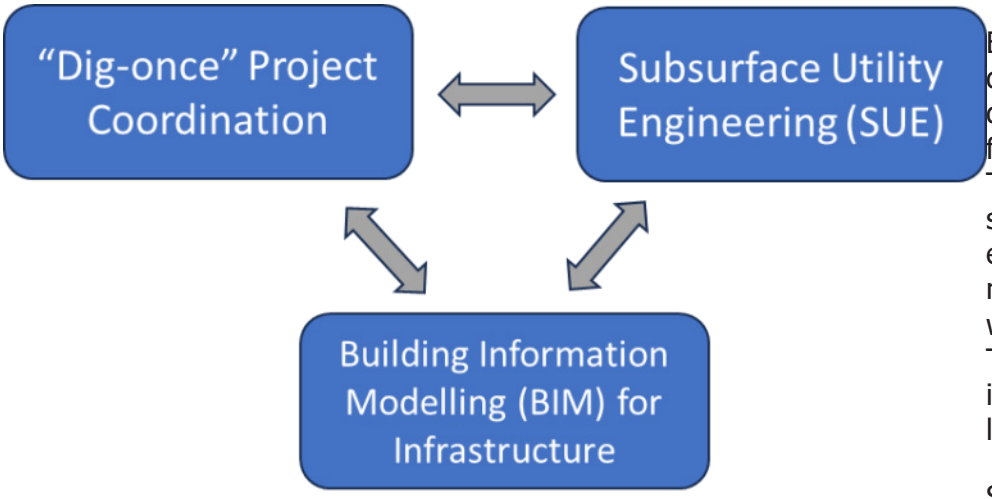
Many ROW users understand the potential gains achievable through collaborative approaches to infrastructure

management using BIM, SUE, and dig-once. For example, MDOT has published policies for the use of SUE, and MDOT's Metro Region has standards for utilities to submit 3D digital records as a condition of ROW work permitting. MISS DIG 811 maintains an ePlan program to allow agencies to share utility data during the project design and engineering. However, just because such policies exist does not mean that they are embraced. Agencies are often hesitant to make necessary investments in new tools and practices without a clear business case. Without top-level institutional support, innovative policies are often ignored. In practice, many aspects of infrastructure life-cycle management have remained unchanged for decades.

The state government is positioned to establish a framework by which infrastructure with public ROWs is planned, designed, constructed, and managed as a coherent engineered system. Such a framework would reduce costs for all ROW users and improve the condition and performance of infrastructure. This would be a paradigm shift in infrastructure management, but a necessary investment to obtain a fiscally sustainable program of infrastructure management.

Efficient coordination requires that all ROW users have a shared vision for how the ROW could be managed as a coherent engineered system; this is the function of BIM. Obtaining that information requires establishing and recording where underground utilities are located; this is the function of SUE. Once ROW users obtain a shared vision and accurate data, they will be better enabled to share resources and reduce costs through collaborative construction projects; this is the objective of dig-once construction.

Dig-once, SUE, and BIM can improve management of infrastructure assets.



Broad adoption of BIM, SUE, and dig-once would be a significant departure from 'business-as-usual' for all of the agencies involved. The amount of work required by stakeholders to adopt such practices is significant and would require meaningful short-term investments with an uncertain payback period. Thus, embrace of these principles is unlikely without new state legislation and corresponding oversight.

Such legislation would impact numerous stakeholders and citizens. The drafting of such legislation must be deliberate and inclusive to assure broad buy-in and avoid unintended consequences.

Dig-once Legislation

The current uncoordinated approach to infrastructure management often leads to redundant and wasteful construction projects. State policymakers should create and fund a statewide framework that enables, supports, and encourages collaborative dig-once construction that includes the following:

- Rationalize existing dig-once initiatives across the state to avoid duplicative efforts and facilitate participation by covered entities. The statewide platform would be available to approved ROW users. This could be coordinated by a state agency such as the MIC, likely with technology support from the state Department of Technology, Management, & Budget (DTMB). An additional option is to expand the scope of the MISS DIG 811 system by amending its enabling legislation, PA 174 of 2013, the "MISS DIG underground facility damage prevention and safety act".

- Establish a role for state-level infrastructure coordination and management of the dig-once platform. Provide the infrastructure coordinator with sufficient resources and regulatory authority to identify dig-once projects that are not proposed through voluntary efforts, adjudicate disagreements between ROW users,

and allocate funding as appropriate.

- Provide the infrastructure coordinator with enforcement mechanisms to ensure earnest participation in the program from all required entities. For road agencies and other owners of public infrastructure such as water and sewer systems, compliance may be required as a condition to receive ACT 51 or state revenue sharing. For utility companies, compliance may be best enforced through the Michigan Public Service Commission (MPSC).

- Provide dedicated dig-once project funding to public agencies and utilities to enable compliance with participation requirements. The benefits of dig-once coordination will accrue to the general public, as thus the costs of coordination should not be borne solely by project budgets. The dispersion of dig-once funding should be a role of the state infrastructure coordinator, who will be in the best position to understand project details and provide equitable distribution.

- Recognize that while short-term benefits are achievable through a dedicated dig-once platform, the long-term vision should be integration with a statewide building information modeling (BIM) for infrastructure framework.

Subsurface Utility Engineering (SUE) Legislation

Many utility conflicts could be prevented by state legislation that facilitates the creation and availability of standardized SUE utility data that would be available during the design and engineering of infrastructure projects. Legislative efforts should consider the following:

- Establish a statewide framework that would require the use of SUE for all public projects that meet certain requirements (e.g., a project cost threshold). Management of this system should fall under the purview of the statewide infrastructure coordinator that oversees the dig-once platform, as SUE data would inform the viability of dig-once efforts. This role could be assigned to an existing agency such as MIC or MISS DIG. MPSC would also need to be involved as the enforcement authority over power and telecommunication utility companies. The platform should use a central database that is accessible to approved ROW users. It is likely that DTMB is in the best position to provide technology support.

- Require standardized SUE approaches and data requirements (i.e., as described in standards documents ASCE 75 and ASCE 38). This will establish clear expectations for data exchange and facilitate interoperability between agencies.

- Provide a funding mechanism to subsidize SUE efforts, along with regulatory authority to distribute funds and ensure compliance of deliverables. For utility providers, the default approach to paying for this additional work would pass the costs along to ratepayers. However, obtaining accurate data on the location and condition of utilities within the ROW is an investment that will benefit the public in many ways in the long-term, and the funding source should recognize this, such as by designating a budget from the state general fund.

- Consider amending PA 174 to recognize that if excavation work proceeds with reliable data for the location of underground utilities, it may not be necessary to require excavators to hand dig or "soft dig" within four feet of a marked utility.

- Provide for long-term integration of SUE data into a statewide BIM framework.

Building Information Modeling (BIM) for Infrastructure Legislation

It must be recognized that widespread adoption of BIM for infrastructure would represent a paradigm shift in infrastructure management in Michigan (and the U.S. in general). There will be agencies that do not understand the value proposition and will resist any establishment of BIM standards.

Initial legislative efforts must be unobtrusive and deliberate. Specifically, the legislature should establish a statement of principles that Michigan wishes to pursue a statewide BIM for infrastructure strategy, and create a commission or working group to study the issue and report back with recommendations to the legislature. The commission should be directed to:

- Ensure that all relevant parties are involved in discussions.
- Benchmark national BIM platforms outside of the U.S. and glean best-practices and lessons-learned.
- Evaluate the successes and lessons learned from the implementation of PA 174 and MDOT's GUIDE Pilot.
- Establish required elements of an interoperable statewide BIM platform.
- Catalog current practices and relevant digital tools used by stakeholders within a potential statewide BIM ecosystem to better understand the costs of conversion to a common BIM platform.
- Identify costs and benefits of BIM applications, with near-, mid-, and long-term implementation timelines.
- Identify workforce training and educational needs.
- Draft a conceptual statewide roadmap for implementation of BIM for infrastructure.
- Report findings and recommendations to the legislature within a reasonable timeline.

Summary

Michigan's statewide infrastructure is a complicated collection of assets owned and operated by hundreds of individual public agencies and utility providers. Infrastructure assets are typically managed independently from each other, often with conflicting goals. This uncoordinated approach to infrastructure management increases inefficiencies and costs for all ROW users. These costs are then passed along to the general public.

Michigan could become a national leader in infrastructure management by adopting legislation that envisions infrastructure assets within public ROWs as a coherent engineered system within a statewide framework. Legislative directives should include three interrelated concepts:

1. **Dig-once** legislation that enables, supports, and coordinates multi-agency construction projects.
2. **Subsurface Utility Engineering (SUE)** legislation that establishes standards and expectations for data-sharing by owners of underground infrastructure within the public ROW.
3. **Building Information Modeling (BIM) for infrastructure** legislation that establishes a goal to adopt a statewide BIM for infrastructure framework, and establishes an official commission tasked with further advising the legislature on how to achieve that goal.

ABOUT THE AUTHOR

Eric Paul Dennis, PE - Research Associate, Infrastructure & Environment

Eric joined the Citizens Research Council in 2022 as an expert in civil infrastructure policy. Previous to his position with the Research Council, Eric spent nearly ten years as a transportation systems analyst, focusing on the policy implications of emerging technologies such as autonomous vehicles, connected vehicles, and intelligent transportation systems. Eric has been a Michigan-licensed professional engineer (PE) since 2012. As a practicing engineer, Eric has design and project experience across multiple domains, including highways, airfields, telecommunications, and watershed management. Eric received his Bachelor's degree in civil engineering from Michigan State University in 2006. Eric also holds Masters degrees in environmental engineering and urban/regional planning, both from the University of Michigan.

Founded in 1916, the Citizens Research Council of Michigan works to improve government in Michigan. The organization provides factual, unbiased, independent information concerning significant issues of state and local government organization, policy, and finance. By delivery of this information to policymakers and citizens, the Citizens Research Council aims to ensure sound and rational public policy formation in Michigan. For more information, visit www.crcmich.org.

Southeast Michigan
38777 Six Mile Rd. Suite 208, Livonia, MI 48152
(734) 542-8001
Mid Michigan
115 W Allegan St. Suite 480, Lansing, MI 48933
(517) 485-9444
Detroit (313) 572-1840
West Michigan (616) 294-8359

A Fact Tank Cannot Run on Fumes

Do you want to ensure better policy decisions and better government in Michigan? A donation to support our organization will help us to continue providing the trusted, unbiased, high-quality public policy research Michigan needs. We also accept charitable bequests. Click the gas tank to donate or learn more about planned giving.