Preliminary Findings

Infrastructure Working Group

of the GICC Technical Advisory Committee

December 2022

NCGICC

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Executive Summary

In 2019, the North Carolina Geographic Information Coordinating Council (NCGICC) noted that existing statewide infrastructure data layers were outdated or did not exist. The NCGICC began a preliminary investigation into the issues surrounding infrastructure data and quickly realized that infrastructure data sharing was a topic little understood by the community. Issues that were common statewide include: varying data sharing practices, the obligation of data providers to protect infrastructure through both data security and appropriate data sharing, lack of written data sharing policies, and lack of access to data.

The NCGICC tasked the Technical Advisory Committee (TAC) with reviewing data sharing security, policies, and best practices. Over the course of two years, the TAC Infrastructure Working Group researched these issues and met with industry specialists to document the ways in which infrastructure data are used, the ways it is shared, and the complexities surrounding infrastructure data. This report outlines the working group's preliminary findings and offers the GIS community samples and templates that they can use to better document data sharing policies as well as key findings regarding infrastructure data security.

Recommendations

The working group developed two sets of recommendations: one set for data providers and one set for the state GIS community. The working group was not able to fully explore all the questions that arose during the course of its investigations. Therefore, the recommendations for the state GIS community stem from new issues uncovered during the year long process as well as topics that the working group was not able to fully explore given limited participation from the wider set of utility industries.

Data Provider Recommendations

Recommendations for data providers surround a central theme, data security. Security in this context extends from physical infrastructure to the completeness and accuracy of the data to written, defensible internal policies regarding data sharing. The working group recommends that data providers begin with a risk assessment that includes an evaluation of existing:

- Written data sharing agreements
- Written internal data procedures
- Data disclaimers
- Geometric accuracy including completeness and positional accuracy
- Attribute accuracy
- Metadata completeness
- Need for regional municipal data sharing

These recommendations are best practices and are further described below. They should be revisited frequently, as data, technology, and physical infrastructure change and evolve.

Write a data sharing agreement.

For those organizations without a written data sharing agreement and who do not share data openly, the working group recommends reviewing the sample agreements in Appendix 2 and writing an agreement to protect your organization. Data sharing agreements offer a framework for proper use of the data, limits to sharing and use, and allow the data provider to formally document any disclaimers and limitations placed on the data. This kind of agreement allows the provider to have a conversation with the requestor about the data and its appropriate use.

Write internal data maintenance and sharing procedures.

Within organizations, different departments may be responsible for different aspects of data maintenance. Field workers may update service records, engineering staff may update geometry, and IT staff may handle web services. Each group is responsible for its own part of a collection of infrastructure information, and it is important to understand all the dependencies and responsible parties. Writing internal data maintenance and sharing procedures can allow an organization to protect data integrity and ensure it is not exposed unnecessarily. This process may also serve the benefit of revealing institutional silos, bottlenecks, or duplication of effort.

Write data disclaimers for webservices and metadata.

Data cannot be used to fit all applications. Disclaimers allow data producers to put limitations on the use of the data. Examples of disclaimers can be found in Appendix 2. These examples demonstrate two commonly used disclaimers: website and data disclaimers. Splash screens that prompt users to agree to proper use of data before entering a web application is one example of a website disclaimer. This type of disclaimer takes a form of the data disclaimer and brings it forth so that a user sees it before interacting with data. A data disclaimer is often found in metadata, so it is only viewed when a user takes the time to read the metadata.

Evaluate and update geometric accuracy and completeness.

Protecting infrastructure requires knowing its location. Older infrastructure is not uncommon, and the location of older pipes and other assets may not have been captured as accurately as it would be today. Data providers may be more hesitant to share data when older infrastructure is not accurately represented in the data out of concern for damage. Data accuracy affects many stakeholders. Inaccurate service area boundaries can lead to development decisions in an area where infrastructure capacity cannot support the new development. Discovery of unmapped infrastructure, or inaccurately mapped infrastructure, can delay transportation projects and increase project costs. Accurate geometry builds confidence. Data producers can be more confident in sharing data, and data users can be more confident that plans made from data will not result in damage or project delay.

Evaluate and update attribute accuracy and completeness.

Just as accurate geometry builds confidence, so too, does feature attribute accuracy. Ensure that attributes are complete, standardized, and accurate.

Complete metadata.

All GIS data should be protected with metadata. The survey conducted by the working group revealed a need for tools and resources to assist providers in completing metadata. Providers should review existing metadata to make sure it is current and create metadata where it does not exist. The Metadata

Working Group of the GICC has developed a State and Local Government Metadata Profile and provides tools for writing and understanding metadata. A series of videos and documents provide guidance on how to protect infrastructure data with metadata. CGIA and the Metadata Working Group can provide assistance in understanding and completing metadata.

Develop secure regional data sharing partnerships.

The inability to access current infrastructure data from neighboring jurisdictions was a recurring topic in working group interviews and discussions. Emergency response may be fastest from a neighboring jurisdiction, and access to accurate infrastructure information can reduce loss and damage. Frustration over obtaining data was voiced by municipal, county, and state parties. The working group found that regional data sharing is common, but certainly not the rule. Where data sharing partnerships exist, neighbors reported more coordinated planning, emergency response, and loss avoidance.

State Recommendations

These recommendations are heavily influenced by requests made by stakeholders and unanswered questions that the working group was unable to explore. The state recommendations are meant to offer avenues of additional research and opportunities for new projects.

Revisit this topic periodically.

Technology changes rapidly. New funding sources become available. Management changes perspective as organizations evolve. What the working group found during its investigation may not be the case in two years. The essential nature of infrastructure data to emergency response, development, and community services indicates that the NCGICC should periodically revisit this topic to assess changes in the availability of data layers, ways to share data securely, industry standards, and management risk tolerance. An initial goal of the working group was to provide examples of data sharing policies and industry best practices. These are made available to providers but should be expanded and updated as data producers write and update documents.

Engage industry professional and organizations.

The working group found engaging industry professionals to be difficult and did not feel that it was able to fully document the perspectives on this topic within the utility provider community. In particular, some providers were doubtful about the true purpose of the working group. The NCGICC should more fully engage industry professionals, correct misconceptions about the motives of the working group, and maintain a contact list for GIS data questions and periodic reviews of this topic. Gaining the trust of the community through outreach and education could lead to more assistance in obtaining standards, best practices, and guidance documents, as well as lead to a more open discussion of infrastructure data.

Task the GICC Metadata Working Group with creating an infrastructure template.

The working group survey revealed that metadata was not being fully implemented for all geospatial infrastructure data. The Metadata Working Group has templates for other initiatives such as orthophotography, parcels, and addresses. The working group recommends that the Metadata Working Group work with industry representatives to tailor a template for utilities. It also recommends an outreach effort in partnership with the Local Government Committee of the GICC to provide education and assistance in using the new template.

Monitor Funding Opportunities.

Funding opportunities exist from state and federal sources, and the Council could coordinate with those granting awards and those receiving them to support good spatial mapping practices. For data types such as service areas that would not likely pose a security risk, the Council could encourage funding partners to share contact information and data sharing policies for the provider.

Introduction

Infrastructure spatial data is important to many industries including economic development, emergency response, and transportation planning. In 2019, the North Carolina Geographic Information Coordinating Council (NCGICC) noted that existing statewide infrastructure data layers produced by the NC Rural Center were over 20 years old and what's more, there were no plans to update these data.

The Council recognized the importance of these data and decided to examine the issues, benefits, concerns, and feasibility of making updated infrastructure data available. During three quarterly meetings, the Council gathered information so that they could decide on a course of action. They heard from GICC legal counsel, Jessica Middlebrooks, regarding the Council's role, applicable laws, and existing case law. They also learned about the benefits and challenges from data producers and data consumers with presentations from Duke Energy, the N.C. Department of Transportation (NCDOT), and N.C. Emergency Management (NCEM). Finally, the Local Government Committee (LGC) of the NCGICC polled its members to assess the current practices of utility geospatial data distribution by local utilities as well as learn about the use of non-disclosure agreements. These conversations revealed the following key points regarding infrastructure data sharing:

- Data sharing practices vary widely across the state.
- Data providers have an obligation to protect their infrastructure and networks from intentional (e.g., bad actors) and unintentional damage (e.g., construction activities, digging, etc.).
- Many local governments lack written data sharing policies and could benefit from templates or examples of existing policies.
- Access to infrastructure data is critical to emergency response and transportation planning.

Based on these findings and Council discussions, the Council determined that additional investigation and documentation would assist both infrastructure data producers and consumers in understanding data sharing policies and best practices. The Technical Advisory Committee (TAC), acting through the NCGICC, chartered the Infrastructure Working Group (IWG) to undertake the task. It is important to note, to the best of our collective knowledge, no other State has endeavored to explore infrastructure within the context of GIS data sharing. Data providers have an obligation to protect their infrastructure and networks from bad actors as well as an obligation to share limited data to protect their infrastructure from unintentional damage from construction or digging and the manner in which they approach data sharing varies widely across the State.

Many local governments lacked written data sharing policies and could benefit from templates or examples of existing policies. The NCGICC tasked the IWG with producing a best practices document that outlines infrastructure data that can easily be shared, and what data cannot, or should not, be shared. In doing so, the IWG would consider data security, accuracy, and completeness as it relates to data sharing. IWG members were to research current industry standards along with existing guidance, best practices, and regulations as they relate to sharing and security of infrastructure data. This document will provide local governments and utilities with information needed to help protect themselves and their data while also offering options for sharing data in a manner that does not pose a security risk.

Working Group Members

The IWG began meeting in August 2020 and recruited membership to represent both data providers and data consumers. Members included representatives from local governments of varying size, private industry, utilities, and data consumers. The following members contributed to the work of the IWG.

Member	Member Organization	Title
Amy L. Barron	Duke Energy	Manager II - GIS, Centralized Design & Residential Development
Beth Canada	Orange Water and Sewer Authority	
Brooks Tate	N.C. Utilities Commission	Lead Pipeline Safety Engineer
Christopher Nida	N.C. League of Municipalities	Director of Research & Policy Analysis
David Baker	N.C. Association of County Commissioners	Director of Tax and Revenue Outreach
Dean Grantham	N.C. Department of Information Technology, N.C. Department of Environmental Quality	IT Project Manager
Greg Cox	Bissell Companies, Inc.	Senior Vice President
Joseph Ausby	City of Wilson	
Kristian Forslin	N.C. Railroad Company	GIS and Survey Manager
Leith Britt	Town of Cary	IT Platform Developer
Marcus Bryant	Durham City/County GIS	GIS Manager
Marlena Isley	Alamance County	GIS Director
Matthew Helms	Charlotte Water	Senior Business Analyst
Michael Mazanek	Town of Cary	
Sallie Vaughn	Person County	GIS Director
Stan Duncan	Private Citizen	(Retired) Former GICC Chair
Brett Spivey	CGIA	GIS Programmer/Analyst
Colleen Kiley	CGIA	GIS Coordination Program Manager

Approach

Project Scope

The IWG used information provided by the NCGICC to define the scope of the group's task and identified the following objectives for further meetings and research.

1. Document commonly produced infrastructure data layers for five infrastructure categories:


Electric


Water/Sewer


Stormwater

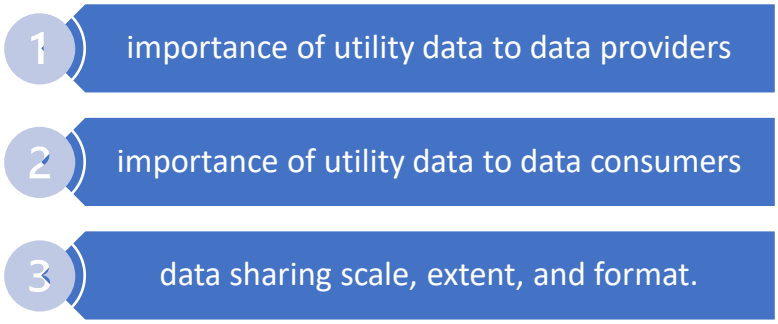

Natural Gas


Telecommunications

2. Document data layers that can and cannot be shared.

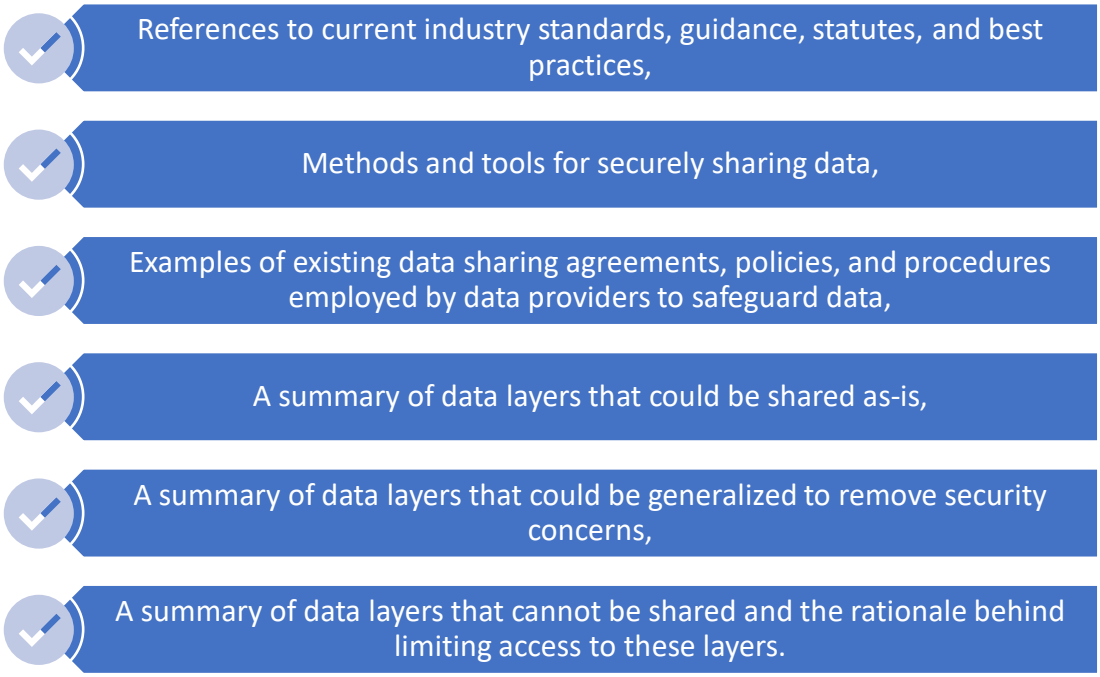
3. Investigate industry security concerns, regulations, policies, and best practices related to data sharing.

4. Collect use cases from data producers and data consumers to document:



5. Review existing data layer security practices and data consumer needs to identify potential layers that, if generalized, would address security concerns while still meeting consumer needs. (Ex. easements, buffers, service areas, etc.). If layers are identified, investigate and document the feasibility of producing these layers.

6. Create a best practices document that includes:



Infrastructure Categories

The IWG began its work by identifying infrastructure categories to research. The initial list included transportation, water/sewer, electric, gas, and telecommunications. As the working group reviewed these categories, it asked the following questions:

1) What types of infrastructure fall into this category?
2) Is there an existing statewide layer for this infrastructure type?
3) Who manages/produces this infrastructure type?
4) Who needs this infrastructure data? For what purposes?
5) Is this infrastructure data widely produced?
6) Is there associated infrastructure?

As the group evaluated the initial infrastructure categories, it became apparent that transportation infrastructure data is well developed and readily shared by NCDOT. Processes exist to maintain the data and other working groups under the NCGICC (i.e., Statewide Mapping Advisory Committee, Roads and Transportation Working Group) have produced standards and guidance for this category. Although the IWG did not investigate the transportation category, documented findings are included in this document for completeness. Conversations surrounding the water and sewer infrastructure types revealed the importance of the related category of stormwater. Stormwater infrastructure is important to many users, but especially in the field of flood management and public safety. As such, the IWG determined that this was worth investigating and thus, stormwater infrastructure was added as the fifth category.

The final list of infrastructure categories investigated by the IWG was determined to be electric, natural gas, stormwater, telecommunications, and water/sewer.

Data Inventory and Sharing

The working group members employed working knowledge of data from their respective organizations, as well as interviews conducted with industry representatives, to compile lists of data layers that could potentially be categorized. Data sharing methods were an important consideration for each infrastructure layer. Some types of data may be more readily shared than others. What one organization considers a security risk varies such that even more readily shared layers are not shared by organizations that keep tighter data sharing policies. The infrastructure layer lists were initially reviewed within the working group and categorized based on how members understood them to be shared based on their experience and that of those interviewed by the IWG. Categorization of data sharing revealed that even within a small working group, views of risk and data sharing policies varied greatly. *Appendix 1, Data Inventory* contains a list of the data layers discussed for each infrastructure category.

Upon completion of the data inventory, IWG members examined the many ways organizations share data, the reasons why the data is shared as it is, and the views of the various types of risk associated with data sharing. Currently, infrastructure data is either shared openly through websites or by requesting it directly from the data provider. During group discussions, the IWG felt that sharing data from a secured website could serve as a third option. However, the IWG is not aware of any data provider currently utilizing this method. IWG members sorted the infrastructure layers into one of these three data sharing methods while considering not only how they were currently shared, but also if they could securely be shared. The discussions around potential ways to share each data layer revealed that the word 'risk' has various interpretations depending on the data layer, the attributes of the layer, and the use of the layer.

Use Cases

IWG members represented a variety of user types and organizations. However, they readily acknowledged that they needed to obtain more information and perspectives from the larger community. Therefore, the group reached out to public and private utilities, local and state government agencies, and private industry for data sharing use cases. The purpose of the use cases was to inform the IWG relating to the following questions.

1. What projects or processes require information relating to infrastructure data?
2. How are these projects or processes important to organizations or the public?
3. What infrastructure data types are needed?
4. What data was made available and in what form?
5. Were there constraints placed on use of the data, and what steps were taken to secure the data that was provided?
6. What was the ideal format, extent, and accuracy needed?
7. How did the difference between the data obtained and the data you were seeking negatively impact business process timelines or budgets?

In addition to IWG members reaching out directly to industry representatives, the IWG leveraged the NCGICC organizational structure to collect use cases from its members and subcommittees including the State Government GIS Users Committee (SGUC), the Federal Interagency Committee (FIC), and the LGC. Although the IWG was able to obtain use cases from private utilities represented within the IWG, in general, the group was unable to gain the cooperation of industry representatives and thus, the ability

of the IWG to document the concerns and data sharing practices within utility industries was greatly limited.

Understanding Risk for Data Providers

The group discovered that the willingness, or reluctance, to share infrastructure data was based on the level of risk. In this context, risk can be represented by many different factors. Data being spatially inaccurate, lacking completeness and accuracy of features or attributes, or being misapplied (due to differences in scale) all present potential issues for data providers. Additionally, even when none of these issues exist, some types of seemingly benign data layers can be used to infer the location of other features thereby posing a risk to entire systems.

The IWG discussed these various types of risks and identified that the perception of risk is often the guiding factor with regards to data sharing and varies greatly amongst organizations. These differing interpretations of risk are a prime reason for the inconsistency in data sharing practices across the state**.** Also, the group recognized that organizations make decisions to share data based on other "non-data" factors. These may include things like the staff time and cost related to preparing data by request, the risk of losing an economic development opportunity to a locality where infrastructure data is more readily available, the reduction in emergency response time associated with a dangerous incident, or a desire to maintain open records as an organizational policy. Because of this, rather than recommending a single set of recommendations, the IWG will present examples of "openly available data" and "data by request only" to provide data providers with a holistic view of the options available, risk mitigation measures, and tools to support data sharing decisions.

Preliminary Findings

Due to the multiple challenges the group faced, additional research and documentation will be necessary to complete all the goals of the original task. One of the more unexpected challenges was the level of difficulty the group encountered when trying to obtain information from utility providers, especially in the private sector. When interacting with various industry representatives during this investigation, the IWG found difficulty in scheduling conversations with the appropriate contacts. Other industry representatives were reluctant or refused to have discussions. Thus, the working group was only able to achieve some of its objectives. More effort is required to convince industry experts that providing information requested by the IWG will better inform the group and therefore, assist the wider community by providing tools to safeguard data and support decisions around data sharing. When private utilities, such as Duke Energy, were involved with the working group, they were able to provide detailed insight and suggestions that the IWG would like to expand upon with a wider community.

Despite some difficulties, the group was able to accomplish much. This section is divided into two parts concentrating on the importance of infrastructure data and the myriad of issues surrounding the sharing of data. This report cannot possibly cover all the issues, risk evaluations, and opposing views concerning infrastructure data. We present here the major considerations conveyed to the working group through use cases, interviews, and discussions with participating industries and end users.

Risk Mitigation

As previously mentioned, the perception of risk is often found to be the guiding factor with regards to infrastructure data sharing. While risk cannot be eliminated, there are ways to mitigate it. Limiting access to data is only one of these options. Investment in accurate, complete, and well-maintained data can greatly mitigate risk related to poor spatial accuracy, incomplete networks, and outdated attributes. Well composed metadata and data disclaimers can mitigate the risk associated with use at improper scales and improper applications. The group recognizes that risk mitigation may be most successful when combining a suite of mitigation tactics.

Decisions regarding what data to share, how to share it, and how to communicate with those that need data are individual management decisions based on perceived risk, organizational risk tolerance, and an evaluation of other factors and circumstances that may outweigh risk factors. Every organization has unique factors that inform this decision.

Infrastructure Data: Uses and Importance

The IWG concentrated much of its time to reviewing the uses of infrastructure data and its importance to end user business practices. To obtain information supporting this section, the IWG asked end users to complete a use case template and submit it to the working group. Additional interviews were conducted during IWG meetings with end users which provided more in-depth information and allowed the IWG to consider the decisions made by end uses when data is not readily available.

Transportation

The role of infrastructure data in transportation projects was well defined in the use cases submitted for the project. Highway realignment, lane additions or widening, and intersection upgrades all impact the area surround the transportation project. Often, this area is also the primary right of way for infrastructure facilities both above and below ground. For the engineer of the project, knowing where these assets are will help to plan and estimate costs much more effectively. The availability of this type of data could yield cost savings, schedule efficiency, and lessen the chance of service interruption. The following were quotes from the DOT's Case Project Delivery Use Case.

- *The Project Delivery process is an essential function of NCDOT which serves to bring new and upgraded facilities to the public at an appropriate cost. Delays in obtaining details about the existing or proposed Right of Way for Rail, Road or Aviation projects effects project budget and schedule*
- *More detail earlier in the project delivery process is better when it comes to the NCDOT project delivery process. Ideal data as soon as possible allows for better project planning and more effective communication in regard to the challenges any project will face. More detail will allow for better project budgeting and scheduling due to the ability to ascertain the level of effort required to complete any relocation work. Missing or inadequate data leads to budget, schedule and planning errors that could be avoided*

Another use of infrastructure data is ensuring the safety of workers in the Right-of-Way. Accidently cutting or damaging underground utilities can result in explosions or electrocution. This was cited by the DOT's Asset Management and Maintenance use case:

> *Each Program requires detailed utility information about what is contained within the NCDOT ROW for the benefit of worker safety (Water / Sewer, Gas, Electrical, Telecommunication, Stormwater), knowledge of contributing systems (stormwater), and maintenance project planning (Water / Sewer, Gas, Electrical, Telecommunication, Stormwater).*

Development

The role of infrastructure data in the development process is probably the most obvious and highest impact use of this data. Economic development in local government(s) are activities that provide job opportunities, increase the tax base, and become one of the building blocks for sustainability of these communities. Many of the use cases cited how this data may be used. Person County commented regarding the impact of infrastructure data to economic development:

> *This process is very important to our work because we always need to be prepared to develop new sites for when existing sites become developed. It takes time and money to expand infrastructure, so if we do not evaluate this routinely, we will find ourselves in a situation where we may not be able to develop new sites to attract new industry because we are years away from being able to build new infrastructure. If we do not have available sites, we will not attract new projects to bring jobs and investment for the community.*

Having access to this type of data allows prospective developers to assess the viability of a site for development in an efficient and effective way. Their use case documents the use of this data toward marketing the county to new businesses looking to relocate. Currently they utilize both public and internal web applications to communicate this information to the development community.

Development processes may require building a model of a parcel's viability including not only physical infrastructure (water, sewer, stormwater, electrical, and gas) but also traffic counts, highway capacity information and future development projects as well. Among these, it is important to note that this physical infrastructure information is still the least documented and the most important initial decision point for developers. The Town of Cary is one example of an organization that provides infrastructure data. They cited several comments in their use cases:

> *Developer/Engineering Firm is looking to develop a parcel of land. Prior to developing plans for the site, they wish to obtain GIS data that includes existing infrastructure (Water, Sewer, Reclaimed Water and Stormwater).*
>
> *For our organization, can existing infrastructure support the intended future development? For the developer knowing the existing infrastructure can reduce construction costs and provide construction timeline efficiency.*

Emergency Response

The role of geospatial representations of infrastructure data for the purposes of emergency response is an emerging use of this data and was mentioned in several submitted use case. Specifically, NCDOT is required to respond to emergencies within their Right-of-Way. Knowing what types and specifically where these assets are would ensure worker safety during these responses. They comment that in many cases reliable data is unavailable, but the ideal data they would require to respond to these emergencies may be:

> *Ideal infrastructure datasets would take the form of a secure or publicly available web service in the format of an ArcGIS Feature Service. These endpoints would represent utility locations within the 5 categories of data, at a mapping scale of 1"=40' that would meet national map accuracy standards for that scale. Due to the spatial extent of NCDOT project locations, essentially our ideal datasets would amount to a service area wide coverage of all utility data for each utility provider. Ideal attribute data would include material types, ages, sizes, owners, and include Z value for depth where possible.*

Another use case, submitted by the Department of Insurance, cited a need for accurate location of Fire Hydrants. Knowing these locations helps with not only emergency response but also insurance adjustment and potentially capital improvement projects to install hydrants in underserved areas. Adding this capability increases the efficiency or fire response while lowering the insurance rates to the landowners of the area. These improvement activities can also spur development into these communities as well.

Environment

Many of the use cases pointed out how infrastructure data could be used with efforts to protect or better understand the environment around us. When spills of contaminants occur, knowing the stormwater drainage network can aid in mitigating adverse effects of these incidents. Others cited the relationship between impervious surfaces and their impact on stormwater flow volume and direction. Attaching stormwater infrastructure to natural headwater stream drainages can provide insight into flood probability during high intensity rainfall events, as well as stream reach mapping. The Division of Water Resources within NCDEQ commented:

Ideally Stormwater Infrastructure (SWI) data would include accurate (mapping grade) locations of inlets outfalls and connecting pipes as well as channels. City of Raleigh is a good example dataset. But anything is better than nothing. Attribution for SWI may include sizes of various components, condition, and if the SWI is conveying waters of the state as well as stormwater. Useful would be actual upstream/street impervious cover for each inlet to help prioritize where to focus restoration efforts and flood mitigation.

Data Sharing Options

The working group identified two major data sharing options that were commonly employed and a third that could be pursued if the industries were willing to consider it as a safe option. The two common sharing practices were "open sharing" and "by request." "Open sharing" is employed through open data websites that allow users free access to view, download, and analyze infrastructure data. "By request" sharing practices require a data user to explicitly request the data directly from the provider. The data provided varies in scope, scale, and format, but the commonality is a requirement for a direct request. The third option proposed by the working group was a hybrid of these two options and is not currently in practice to the working group's knowledge, a secured website. This kind of approach would make maps and data available on demand only to those who have been approved to view it. The following sections review the benefits and drawbacks of the "open data" and "by request" sharing practices and will present the secure website as a potential option for consideration.

Open Data Sharing

Open data sharing is typically achieved through web services or websites that allow users to view a map or download the data. Data providers that employ this method of sharing note that this generally cuts down on questions that would be directed to staff during situations such as preliminary re-zoning hearings or economic development activities of developers or private citizen inquiries.

By Request Data Sharing

Many municipal organizations consider spatial data depicting various types of infrastructure and its associated attributes to be sensitive data as described by the Department of Homeland Security (Homeland Security Act of 2002 [Public Law 107-296]. Despite its sensitive designation, the data is still considered public information. Rather than making it available through an open data platform as described above, these organizations employ policies that can both protect access to the data and adhere to public records laws by controlling its release through the request process. These policies protect the organization by providing the ability to verify that those seeking detailed information about the utility are legitimate and do not pose a risk to the public. However, staff time and effort are required to fulfill requests and vet requestors. These policies, in many cases, also introduce potentially unnecessary steps that slow access and frustrate members of the contractor, engineering, and development communities.

Considerations and Issues Surrounding Data Layers and Sharing

Location Display

Various options exist for sharing the location of infrastructure data. The IWG reviewed the benefits of sharing location data, the concerns and limitations, the proper use of data, the types of data requested, and the sectors requesting the data. Showing the location of pipes, transmission lines, etc. benefits the public, developers, and others. Among the members of the IWG and those interviewed, opinions differed greatly about how to share feature locations. While all agreed that many circumstances required sharing of infrastructure locations, the main difference in opinion was how to share the data in such a way as to minimize risk.

There is a valid need to be informed of the locations of existing infrastructure to plan for development, avoid damage, and respond to emergencies. Sharing feature locations helps with preliminary planning of projects, understanding what areas are serviceable, and cost analysis. However, there are also valid concerns including maintaining the security of critical infrastructure, providing inaccurate location or attributes, misrepresenting the capacity of infrastructure (i.e., they are/may be serviceable, but there is no capacity), and misusing the data (e.g., using the location data rather than calling NC811).

Ideally, the proper use of location data would be limited to the initial planning or analysis of areas of interest. Location data should not be used for design work or proceeding with projects without checking with infrastructure data owners. Data should not be used for location of assets before digging. Once initial planning deems a project feasible, other more detailed data may be requested. This information could indicate the capacity of a system, provide more granular details of individual assets including dimensions, material, age, maintenance, and depths.

Generalizing Data and Service Areas

Maps for utility service areas are an extremely important asset to consumers, utility service providers, and all levels of government. The most basic function of service area maps is to easily connect consumers to providers. Publicly available service area maps empower consumers, or potential consumers, to make informed decisions about specific locations. Providers of those utilities also benefit from this direct connection to the consumer. The frequency and duration of staff time required to answer basic service area questions is decreased. Other utility providers also benefit by being able to easily determine service areas for competitors or potential conflicts of utility co-location during construction projects. Developers also benefit from having service area information prior to the selection of a site for a specific type of development.

Service areas, however, can have numerous limitations. The definition of a service area, or how service areas are modeled or rendered, is likely to vary across different utility providers. Some providers may lack the software or skillsets to generate and distribute high quality service areas. As with all GIS data, service area information is subject to issues of scale, statistical aggregation, update frequency, and overall data quality. Lastly, the data origin and intent of the service provider must be taken into consideration when viewing service areas.

Providing service areas also has its limitations. Service area maps will always be subject to misinterpretation by the customer and/or misrepresentation by the provider. Without a set of utility-specific standards for the creation and maintenance of service areas, the output will vary widely and cannot be compared between and across providers. In addition, basic service areas do not provide information about capacity, reliability, and affordability at a specific location, which are logical follow up questions once service providers have been identified.

The following paragraphs summarize themes common to utility service areas amongst various public and private agencies including both service area consumers and service area providers.

In general, utility service areas are needed across the many sectors of the economy and throughout all levels of government. Perhaps the most tangible use case of utility service areas lies in the decisions we all make about where we live. Citizens, realtors, and home builders/developers often need to know which entities provide specific utilities in an area. Typically, utilities are a mix of public and private ownership and often there is no single source of service area information forcing the customer to contact multiple providers to identify which power company covers their proposed home location, for example.

Some individuals prefer the comfort of municipal water and wastewater systems and rely on service area information when relocating. Increasingly, the presence of high-speed internet is a deciding factor during the due diligence process of home buying. When private utility service area information is available, those areas can be over exaggerated or misleading. Often, when citizens encounter a deficiency in service area information, they contact their local government for answers. Unfortunately, local governments encounter the same obstacles in obtaining that information and/or providing those services in direct competition with private providers.

The presence or absence of utilities also influences the assessed value of homes and buildings in a given area, which is a fundamental component of the County tax base and heavily influences market prices. Residential developers may choose one area of a city over another due to the presence or absence of available water, gas, or telecommunication utilities. Localities without adequate public and private utility service area information may be at a disadvantage and be overlooked by these sorts of developments.

Local and State governments find themselves in the unique situation that they both provide and consume utility service area information. On the local level, most governments typically maintain a GIS inventory of their own assets. Some smaller entities, however, may not have adequate or accurate inventories. Conversely, larger entities may have teams of individuals who maintain asset inventories for each type of utility. In these situations, the data standards can differ across departments within the same agency. To add to the complexity, most public utility infrastructure was constructed over many decades and asset information may not have been retained to current standards.

The presence of an asset inventory does not necessarily translate to the availability of service areas. Some jurisdictions may not have mapping expertise on site to create and maintain this information. Neighboring jurisdictions may define service areas differently causing overlaps or gaps in service areas, which does not reflect ground conditions. Many jurisdictions are experiencing development at such a rapid pace that GIS asset inventories and service areas cannot be kept up to date.

As data consumers, local and state governments have no greater ability than most citizens do to obtain private utility service areas. Citizens are often disappointed when their government neither has, nor can obtain, information about private utility service areas. Due to a lack of available information from private utility providers, some governments have commissioned asset inventories or "windshield surveys" of private utility assets and service areas.

Larger government entities, such as those housed by the State, are faced with the challenge of accumulating service area information from multiple smaller entities. For example, NCDOT highway construction and expansion projects often span multiple jurisdictions. In these instances, they are faced with combining disparate service area information which was developed locally for different purposes, on different scales, and with a different set of standards, if any at all.

Outside of NCDOT, other large State agencies would benefit from utility service areas, especially for public utilities. When a public water supply system becomes contaminated, water service areas would help direct efforts to locate potable drinking water. The lack of readily available and high-quality service area information can cause significant delays for standard workflows as well as during an emergency response.

Economic development, whether public or private, is heavily impacted by the presence of utilities. The convergence of utilities in a concentrated area is often a driver for investment and development. In these cases, overlapping utility service areas identify locations ripe for specific types of development. Conversely, a lack of service area *or service area data* can put an area at a disadvantage and prevent those locations from scoring highly during site selection. High quality service area information would be a valuable asset in these situations.

In the fields of agriculture, horticulture, and forestry, quite often the presence of reliable high-speed internet is mandatory for crop maintenance and soil health. In order to properly assist during an emergency, first responders may need to quickly determine the owner of certain assets such as utility poles or substations. Emergency managers need service area information to create response plans in fair weather scenarios prior to actual events.

Utility service areas are also critical to private utility providers. Public utility service area information is likely to be available in some areas but is not readily or easily available from multiple jurisdictions at a single source. Also, this information may not be developed to a standard that the private utility finds beneficial. Private utility providers benefit from service area information from other private utilities as well. For example, it is beneficial for energy companies to have access to service area information from competitors to identify locations for market expansion, possible or network connections, or partnerships. Utility companies also need to be aware of public and private utility service areas for planning, development, and risk mitigation.

Telecommunications funding and incentives are often provided based on maps of areas which are unserved by broadband. In order for an area to be considered served, or within the service area, broadband must be available to at least one household. Whether or not the broadband service is affordable or stable is not taken into consideration.

Served households are then aggregated to Census Blocks to create service area maps. Telecommunications companies applied for funding and focused their efforts on flipping Census Blocks

from unserved to served. While many Census Blocks across the State are now classified as being within broadband service areas, the actual number of newly served households can be quite low and varies from provider to provider.

Broadband has evolved into an essential utility and demand has dramatically increased. What was once considered adequate broadband speed has also increased to reflect the needs of today's work and education environments. Once again, funding and incentives are available for unserved Census Blocks. However, due to the prior focus on flipping Census Blocks to served areas, many Census Blocks in the State are not eligible for the funding and incentives. With flawed service area maps, private telecommunications providers have essentially pushed themselves out of their own potential market areas.

While service areas may not be spatially as accurate today as required by our use case research, the use of generalized service areas could provide beneficial information if they were to be shared as a statewide coverage that contains utility contacts and information on how to request data, data restrictions, and the formats available. Rather than serving as a layer used to determine if service is currently available in a specific parcel, the layer could be developed as a resource that allows data users to more quickly contact data providers for verification of service or data about a project site.

Availability and Capacity

Availability of infrastructure data indicating service to a potential project site is not all the information that may be needed by developers. A project planner may be able to obtain information indicating that electrical or water service is available for a parcel of interest, but large manufacturing facilities may need to consider the capacity of the existing infrastructure and whether the consumption needs of the planned project exceed the existing capacity. In this case, knowing the location of infrastructure servicing the site may be inadequate, and the developer may need capacity attribute information and may need to speak directly with utilities managers to verify that their project can be supported by the existing infrastructure.

Data Confidence and Surveys

Surveys concerning utilities or easements delivered by a surveyor need to conform to the North Carolina Board of Examiners for Engineers and Surveyors (NCBEES) rules and laws section .1600 (21 NCAC 56.1600). A delivered survey of utilities and or easements should be signed/sealed but also contain a certificate statement based on section .1600. In some cases, there will be multiple certificate statements based on the type of survey, what is presented in the survey map and accuracy of the survey. The NCBEES deemed certain types of GIS data creation falls under their jurisdiction, and in partnership with the GICC developed a set of use cases to define data as survey data or GIS data. Because easements and utilities were identified as requiring a Professional Licensed Surveyor (PLS) for mapping, GIS professionals must become a registered PLS in mapping science if practicing outside of a municipality. If employed by a municipality the PLS requirement is waived.

Data entry today may be digitized into GIS at a higher level of scrutiny as compared to early data entry. GIS data concerning utilities and easements should come from a documented and legal source, since this gives the data further value and moves away from data being institutional knowledge rather than concrete viewable data. Once longtime employees, who remember every construction detail retire, the source/information is gone. In the case of early GIS data, there may be no authority (legal documents)

behind it. Not all organizations required as built/survey documentation in the early days. This early data exists in many jurisdictions in combination with newer surveyed data with complete documentation, and poses a problem for accuracy across an entire network.

Costs Related to Staff Loss and Retirement

Request for local infrastructure data in N.C. are likely to be made to local governments. Cities and counties are providers of numerous utility services, primarily water and sewer but also including stormwater, electricity, and natural gas. Wide variation exists in the workforce experience and capacity of these local governments, and as experienced employees retire, institutional knowledge of how to best respond to infrastructure data requests is likely to decrease.

Local governments vary significantly across the 100 counties and 551 incorporated municipalities in N.C. For instance, of those 551 municipalities, three-quarters have a population less than 5,000. Nearly 40 percent of municipalities have a population of less than 1,000. (https://www.osbm.nc.gov/facts-figures/population-demographics/state-demographer/municipal-population-estimates). Limited tax bases impact the services these governments are able to provide and the associated workforce to provide them. As an example, many smaller municipalities do not have dedicated GIS employees themselves, instead relying on partners at the county level to provide such services. Decentralization of this function presents an additional layer of challenges when infrastructure data is requested.

Similar differences are seen in these local governments that are providers of water and wastewater services. In the most recent water and wastewater rates survey conducted by the Environmental Finance Center (EFC) at the University of North Carolina Chapel Hill (https://efc.sog.unc.edu/resource/tables-water-and-wastewater-bills-and-rate-structures-north-carolina-january-2020), of the 472 utility providers with available data on service connections, 180 had 1,000 or fewer water customers. Compared to the largest utilities in the state that serve tens or hundreds of thousands of customers, resources available to respond to infrastructure requests among smaller utilities are much more limited.

These challenges could be exacerbated in the years to come due to the nature of the industry's workforce. The looming retirement of experienced employees is a challenge across all sectors of government and the broader workforce as well. This risk may be particularly true in the case of utility providers. The N.C. Chamber's recent Framework for North Carolina Water Policy report (https://ncchamber.com/wp-content/uploads/Framework-for-NC-Water-Policy-FINAL.pdf) stated, "North Carolina also faces challenges related to an aging workforce as well as data management." Statistics from the Bureau of Labor Statistics cited in this blog post from an author at the EFC indicate that, nationally, more than 50 percent of water and wastewater operators are age 45 or older, with nearly 30 percent of them over age 55. Less than 20 percent of operators are younger than 35, with only 1 percent aged 24 or younger.

Many smaller utilities in the State serve a limited customer base and maintain a limited staff with which to do so (at least in comparison to the state's larger utilities). In many cases, these utilities are served by key experienced staff members who may be approaching retirement age. As these workers prepare to leave the workforce, institutional knowledge such as the existence of key data, how to access it, and how to respond to requests for it, could be departing these utilities as well. For utilities that serve areas that have experienced less economic development in recent years, it could be that procedures for

providing data have been rarely utilized, if ever at all. Existing data may or may not be in readily accessible formats and may not be well documented. These potential challenges are hurdles for smaller utilities to overcome that could be made more difficult through the loss of experienced employees. Standards for data sharing among N.C. utility providers should recognize these challenges and how they apply to all utility providers in the state.

Variance in Data Availability, Resiliency, and Documentation by Industry Providers

North Carolina's utility customers are served by large and small private companies, small towns and large cities. Large private companies or populous cities with a tax base that can support dedicated and specialized utility staff have more resources to devote to data development, documentation, and sharing than smaller communities or private companies. This disparity leads to a difference in data availability and documentation that places smaller utilities at a higher risk than those with more resources. Risks can come in many forms. Small communities that need the boost that new development can bring can be at a disadvantage when a larger competing community can more quickly and easily share basic infrastructure data developers need to decide on project sites. Several communities in North Carolina have been victims of ransomware attacks. Larger utilities may take advantage of cloud-based data storage that allows them to recover more quickly from a ransomware attack and may limit the interruption in public data access. Regional projects may be slowed by the fact that each utility provider may have a different process for requesting data and may provide data in a different format. Some layers needed for the project may not be available from some providers at all either because they were not documented or because they are withheld for security reasons. The use of service area maps to indicate what kind of data is available as well as point to utility contacts for data requests could alleviate some problems data users encounter when seeking regional data. However, recent attempts by two state agencies to produce service provider maps have encountered difficulties in obtaining service areas and basic information that could populate such a map. Better industry relationships, training, and industry liaisons could alleviate this issue.

Potential Threats to Infrastructure

On the forefront of concerns for energy infrastructure is the threat of attack, by either physical means or digital access. Infrastructure security is an important consideration and well covered in industry recommendations. The IWG did not concentrate on the subject of cybersecurity because the mechanisms currently utilized for sharing geospatial data do not provide a direct avenue for cyberattacks on utility networks and computer system. However, the IWG did consider the relationship between cyberattacks and spatial data. The IWG also realizes that this geospatial data shows a physical location that can be accessed if someone plans an attack. Should infrastructure data be made available, potential attackers might be better able to target attacks in areas that would devastate the ability to provide utility service to customers. For example, if an above ground natural gas regulator station's location is public knowledge, one could view the data superimposed on satellite imagery and determine if that facility feeds a power plant. The natural gas regulator station information could also be used to see which towns are fed, if the town is duel fed, and which stations could be manipulated to turn off just a section of a town or the entire town. This could be disastrous to a small town in the middle of winter. It is important to note that hackers would need both access to a utility network and the mapping data to determine a target. Given that this geospatial data can be overlayed with any other map and that the infrastructures are physical objects; it stands to reason that anyone wanting to do harm to any grid can physically break into strategic locations shown on a map. Thus, industries stress the importance of

maintaining secure networks and protecting networks from outside attacks, along with physical barriers to prevent entry.

Potential federal laws are unclear if GIS data will be considered a "critical" asset that requires protection. As of now, the U.S. Transportation Security Administration (TSA) only provides guidance on how to protect their infrastructure, both physical and digital data. With additional scrutiny and increased concern over cyber security, laws and guidance may change. Some utilities navigate this uncertain landscape of federal laws by restricting spatial data access, as once the data is made available it will be difficult to recall it.

Industry Policies and Procedures

Policies and practices regarding data sharing vary by industry and by provider. While industries have many resources devoted to assisting providers in evaluating physical and cybersecurity risk, in general, most industries do not provide explicit policies or recommendations on how to share spatial data representations of infrastructure. The IWG contacted various industry representatives to request policies or best practices and received minimal response. The water industry provided a variety of documents specific to water and wastewater. It is possible that additional guidance for other industries exists, but the working group had limited success in obtaining information.

The American Water Works Association's (AWWA) 2020 report "Protecting the Water Sector's Critical Infrastructure Information" includes the following regarding water and wastewater security.

> *The term critical infrastructure is defined in §1016(e) of the Patriot Act of 2001 (42 U.S.C. 5195c(e)) as "systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters". This is the legal definition from which federal and state laws derive their characterization of critical infrastructure. Under this definition, water and wastewater systems are designated as critical infrastructure per Presidential Policy Directive 21: Critical Infrastructure Security and Resilience.*
>
> *At the federal level, the Freedom of Information Act (FOIA) provides a mechanism to request and/or share government information with the public. While an informed citizenry is crucial to a thriving democracy, the wide release of security sensitive information related to critical infrastructure systems, such as water and wastewater systems, can create a public safety and security risk.*

The AWWA Research Foundation (AwwaRF) report entitled "Critical Information Policies for Water Utilities" (2008) was intended to serve as a guide to the practice of protecting water utility information. The report contains valuable information about spatial data the USEPA considers sensitive and subject to restriction, decision trees for sharing data, and descriptions of many of the issues discussed by the IWG. For instance, the AwwaRF found that many utilities do not have formal policies for secure data sharing.

> *"In roughly half of the utilities interviewed for this study, sensitive information identification and management is conducted based on the case-by-case exercise of*

managerial and/or executive judgement. In other cases, an individual employee has taken on the responsibility for information disclosure decisions (or recommendations)."

From this excerpt, we can infer that North Carolina is not unique in its approach to data sharing policies and procedures, and the need for more formalized processes and documentation is universal.

The AwwaRF report does not recommend restricting all access to utility information, but rather, recommends a balanced approach.

> "To be overly restrictive with respect to information withholding may tend to trivialize the importance of the overall information protection process, and may damage the utility's credibility with the public and partners."

Regarding writing policies, the AwwaRF recommends reviewing of the uses of the data and providing a policy to address each level of use. The use cases found in Appendix 3 should provide a minimal set of examples for consideration when drafting a policy.

> "A water utility's information management policy should be flexible enough to address three basic types of information access needs: (a) access to information by customers and the general public; (b) access to data and information by utility partners, such as consultants, contractors, and vendors; and (c) access to data, records, and information by regulatory agencies and oversight bodies."

The AwwaRF report contains valuable information to assist water utilities in determining which of their data should be shared with restriction and offers guidance on drafting internal policies. While it is dated, much of the information is still relevant to water utilities, and in the case of general guidance on policies and evaluating risk, is applicable to all utilities.

Natural gas pipeline operators are required to transmit pipeline location data to the National Pipeline Mapping System (NPMS) under the jurisdiction of the Pipeline and Hazardous Materials Safety Administration (PHMSA) on an annual basis and includes a requirement for geospatial data, metadata, and attributes. Distribution and gathering lines are exempt. The system contains data for gas transmission and hazardous liquid pipelines, liquified natural gas plants, and breakout tanks. From this data, there are two systems that allow users to view pipeline maps, the NPMS and the Pipeline Information Management and Mapping Application (PIMMA). The NPMS public viewer allows users to view pipeline location for a single county and limits zoom function beyond to 1:24,000. The PIMMA is a password protected system that allows pipeline operators to view their own data, county and local officials to view their county data, and state government users to view their state.

Broadband service providers submit data to the Federal Communications Commission (FCC) by census tract. Maps are available showing providers that service each tract as well as information about reported download and upload speeds. There is a known limitation to this data representation, as it is an example of service area reporting that may show service for an entire tract when only a single neighborhood is served within the tract. The FCC is currently pursuing an effort to create a Broadband Serviceable Location Fabric that would link service to buildings rather than tracts in an effort to provide more accurate service information.

The Common Ground Alliance (CGA) is a member-driven nonprofit organization focused on preventing damage to underground infrastructure and promoting effective damage prevention practices. The CGA has a set of Best Practices that include sections on mapping. The CGA best practices for mapping provide best practice descriptions for mapping collected by One Call Centers and produced by facility owners. Included in the best practices are recommendations to provide accurate and timely data to call centers. For facility owners, the best practices include recommendations to utilize electronic databases to capture physical characteristics of the active system including feature type and attributes such as size, material, product, and pressure as well as the location of abandoned or sold facilities.

North Carolina Applicable Statutes

The NCGICC's legal counsel provided an overview of applicable laws during the early stages of the NCGICC's discussions of infrastructure data sharing. Case law was minimal. North Carolina's public records laws provide some exceptions for excluding critical infrastructure data from public requests. However, in the case of the IWG investigations, the IWG found no case where data was completely denied when requested. Often some portion of the overall system is shared with the requestor to either facilitate development or protect existing infrastructure from construction damage. While providers do limit data release to protect infrastructure, they also understand that there is a risk to not releasing any data. In fact, a second statute focuses on the need to provide developers with drawings and records necessary to design facilities on a tract of land.

N.C. General. Statute Chapter 132 Public Records: NCGS §132-1.7 Sensitive public security information

(a) Public records, as defined in G.S. 132-1, shall not include information containing specific details of public security plans and arrangements or the detailed plans and drawings of public buildings and infrastructure facilities or plans, schedules, or other documents that include information regarding patterns or practices associated with executive protection and security.

(b) Public records as defined in G.S. 132-1 do not include plans to prevent or respond to terrorist activity, to the extent such records set forth vulnerability and risk assessments, potential targets, specific tactics, or specific security or emergency procedures, the disclosure of which would jeopardize the safety of governmental personnel or the general public or the security of any governmental facility, building, structure, or information storage system.

(c) Information relating to the general adoption of public security plans and arrangements, and budgetary information concerning the authorization or expenditure of public funds to implement public security plans and arrangements, or for the construction, renovation, or repair of public buildings and infrastructure facilities shall be public records.

N.C. General. Statute Chapter 87 Article 8A Underground Utility Safety and Damage Prevention Act: NCGS § 87-127. Design notices.

(a) A designer may submit a design notice to the Notification Center. The design notice shall describe the tract or parcel of land for which the design notice has been submitted with sufficient particularity, as defined by policies and procedures adopted by the

Notification Center, to allow the operator to ascertain the precise tract or parcel of land involved.

(b) Within 10 working days, not including the day the notice was given, after a design notice for a proposed project has been submitted to the Notification Center, the operator shall respond in one of the following manners:

(1) By designating the location of all facilities owned by the operator within the area designated by the design notice as provided in G.S. 87-121(a).

(2) By providing to the person submitting the design notice the best available description of all facilities in the area designated by the design notice, which may include drawings marked with a scale, dimensions, and reference points for underground utilities already built in the area or other facility records that are maintained by the operator.

(3) Allowing the person submitting the design notice or any other authorized person to inspect the drawings or other records for all facilities within the area designated by the design notice at a location that is acceptable to the operator.

(c) An operator may reject a design notice based upon homeland security considerations pending the operator obtaining additional information confirming the legitimacy of the notice. The operator shall notify the person making the request through a design notice of the denial and may request additional information through the positive response system. (2013-407, s. 2; 2019-189, s. 1.)

The N.C. Underground Utility Safety and Damage Prevention Act covers the duties of both the Notification Center (commonly referred to as NC 811), excavators, and designers. For instances of excavation, the excavator must call NC 811 at least 3 days prior to digging, and the notification center will transmit the information to individual providers with utilities on the site to physically mark the property. When a company needs design drawings for site planning, it may use the statute above to acquire the necessary information directly from the utility provider by requesting it through NC 811. In this way, there are two options in N.C. Statute to allow those who need utility information to obtain it directly from utilities themselves. This system benefits the utilities by protecting their investments from damage, and the construction and development community by creating a formal process for them to acquire the data necessary to conduct business. In addition, many providers across the state have chosen to provide open data access to some of their utility location data through web maps and services as a way of alleviating the work required to fill data requests.

Damage Reporting Research

While the NC 811 system provides for proper notice, marking, and when applicable, access to maps, it is not without problems that are common nationwide. According to the CGA 2020 Damage Information Reporting Tool 2020 Analysis and Recommendations (2020 DIRT Report), damages to buried utilities cost the U.S. approximately $30 billion annually. Included in this damage estimate is direct cost to repair facilities as well as indirect costs of property damage, medical expenses, and business closures. An interview with NC 811 staff revealed that poor quality mapping and unmapped abandoned facilities contribute to at least one third of damage incidents yearly. Nationally, this root cause group was reported as the cause of 32% of reported damages in the 2020 DIRT Report. The DIRT Report breaks

down damage incidents into root cause groups that include excavation practices (30%), invalid use of request by excavator (6%), no locate request (32%) and locating practices (32%).

The CGA reports that abandoned lines present a persistent problem because they are missing from maps, and excavators and locators can damage a live utility due to confusion between abandoned and live lines. Excavators can follow proper procedures of digging a test hole to locate utilities yet still damage a live line because their test hole reveals an abandoned line that they mistake for the live one. Believing they have all live utilities located, they may begin excavation only to discover through damage that the live line they thought they'd already located was still buried. In this way, unmapped abandoned lines contribute to 26% of the locating practices root cause group and incorrect maps or records account for an additional 11% of this group.

Due to the impact of abandoned facilities on damages, an opportunity may exist to work with the NC 811 board to determine if better mapping of these facilities if feasible. It is unclear whether the location of these facilities would be considered a security risk, especially since the original owner may have sold or abandoned them. Facilities that have been abandoned may have no owner to map them, and the work to map these facilities would have to be directed to a third party.

Recommendations

The working group has developed two sets of recommendations: one set for data producers, and one set for the state GIS community. The working group was not able to fully explore all the questions that arose during the course of its investigations. Therefore, the recommendations for the state GIS community stem from new issues uncovered during the year long process as well as topics that the working group was not able to fully explore given limited participation from the wider utility industries.

Provider Recommendations

Recommendations for data providers surround a central theme, data security. Security in this context extends from physical infrastructure to the completeness and accuracy of the data to written, defensible internal policies regarding data sharing. The working group recommends that data providers begin with a risk assessment that includes an evaluation of existing:

- Written data sharing agreements
- Written internal data procedures
- Data disclaimers
- Geometric accuracy including completeness and positional accuracy
- Attribute accuracy
- Metadata completeness
- Need for regional municipal data sharing

These recommendations are best practices that should be revisited frequently, as data, technology, and physical infrastructure change and evolve.

Write a data sharing agreement.

For those organizations without a written data sharing agreement and who do not share data openly, the working group recommends reviewing the sample agreements in Appendix 2 and writing an agreement to protect your organization. Data sharing agreements offer a framework for proper use of the data, limits to sharing and use, and allow the data provider to formally document any disclaimers and limitations placed on the data. This kind of agreement allows the provider to have a conversation with the requestor about the data and its appropriate use.

Write internal data maintenance and sharing procedures.

Within organizations, different departments may be responsible for different aspects of data maintenance. Field workers may update service records, engineering staff may update geometry, and IT staff may handle web services. Each group is responsible for its own part of a collection of infrastructure information, and it is important to understand all the dependencies and responsible parties. Writing internal data maintenance and sharing procedures can allow an organization to protect data integrity and ensure it is not exposed unnecessarily. This process may also serve the benefit of revealing institutional silos, bottlenecks, or duplication of effort.

Write data disclaimers for webservices and metadata.

Data cannot be used to fit all applications. Disclaimers allow data producers to put limitations on the use of the data. Examples of disclaimers can be found in Appendix 2. These examples demonstrate two

commonly used disclaimers: website and data disclaimers. Splash screens that prompt users to agree to proper use of data before entering a web application is one example of a website disclaimer. This type of disclaimer takes a form of the data disclaimer and brings it forth so that a user sees it before interacting with data. A data disclaimer is often found in metadata, so it is only viewed when a user takes the time to read the metadata.

Evaluate and update geometric accuracy and completeness.

Protecting infrastructure requires knowing its location. Older infrastructure is not uncommon, and the location of older pipes and other assets may not have been captured as accurately as it would be today. Data providers may be more hesitant to share data when older infrastructure is not accurately represented in the data out of concern for damage. Data accuracy affects many stakeholders.

Inaccurate service area boundaries can lead to development decisions in an area where infrastructure capacity cannot support the new development. Discovery of unmapped infrastructure, or inaccurately mapped infrastructure, can delay transportation projects and increase project costs. Accurate geometry builds confidence. Data producers can be more confident in sharing data, and data users can be more confident that plans made from data will not result in damage or project delay.

Evaluate and update attribute accuracy and completeness.

Just as accurate geometry builds confidence, so too, does feature attribute accuracy. Ensure that attributes are complete, standardized, and accurate.

Complete metadata.

All GIS data should be protected with metadata. The IWG survey revealed a need for tools and resources to assist providers in completing metadata. Providers should review existing metadata to make sure it is current and create metadata where it does not exist. The Metadata Working Group of the GICC has developed a State and Local Government Metadata Profile and provides tools for writing and understanding metadata. A series of videos and documents provide guidance on how to protect infrastructure data with metadata. CGIA and the Metadata Working Group can provide assistance in understanding and completing metadata.

Develop secure regional data sharing partnerships.

The inability to access current infrastructure data from neighboring jurisdictions was a recurring topic in IWG interviews and discussions. Emergency response may be fastest from a neighboring jurisdiction, and access to accurate infrastructure information can reduce loss and damage. Frustration over obtaining data was voiced by municipal, county, and state parties. The IWG found that regional data sharing is common, but certainly not the rule. Where data sharing partnerships exist, neighbors reported more coordinated planning, emergency response, and loss avoidance.

State Recommendations

These recommendations are heavily influenced by requests made by stakeholders and unanswered questions that the IWG was unable to explore. The IWG state recommendations are meant to offer avenues of additional research and opportunities for new projects.

Revisit this topic periodically.

Technology changes rapidly. New funding sources become available. Management changes perspective as organizations evolve. What the IWG found during its investigation may not be the case in two years. The essential nature of infrastructure data to emergency response, development, and community services indicates that the NCGICC should periodically revisit this topic to assess changes in the availability of data layers, ways to share data securely, industry standards, and management risk tolerance. An initial goal of the IWG was to provide examples of data sharing policies and industry best practices. These are made available to providers but should be expanded and updated as data producers write and update documents.

Engage industry professional and organizations.

The IWG found engaging industry professionals to be difficult and did not feel that it was able to fully document the perspectives on this topic within the utility provider community. In particular, some providers were doubtful about the true purpose of the working group. The NCGICC should more fully engage industry professionals, correct misconceptions about the motives of the IWG, and maintain a contact list for GIS data questions and periodic reviews of this topic. Gaining the trust of the community through outreach and education could lead to more assistance in obtaining standards, best practices, and guidance documents, as well as lead to a more open discussion of infrastructure data.

Task the GICC Metadata Working Group with creating an infrastructure template.

The IWG survey revealed that metadata was not being fully implemented for all geospatial infrastructure data. The Metadata Working Group has templates for other initiatives such as orthophotography, parcels, and addresses. The IWG recommends that the Metadata Working Group work with industry representatives to tailor a template for utilities. The IWG also recommends an outreach effort in partnership with the Local Government Committee of the GICC to provide education and assistance in using the new template.

Monitor Funding Opportunities.

Funding opportunities exist from state and federal sources, and the Council could coordinate with those granting awards and those receiving them to support good spatial mapping practices. For data types such as service areas that would not likely pose a security risk, the Council could encourage funding partners to share contact information and data sharing policies for the provider.

Appendices

Appendix 1: Data Inventory

Electric Infrastructure Inventory
Electric Line Easements
Electric Service Areas
Meters
Power Generation Stations
Substations
Switches
Towers/Poles
Transmission Lines

Natural Gas Infrastructure Inventory
Natural Gas Line Easements
Natural Gas Service Areas
Natural Gas Pipelines
Natural Gas Regulator Stations
Natural Gas Valves

Telecommunications Infrastructure Inventory
Telecom Service Areas
Telecom Line Easements
Fiber Lines
Poles
Distribution Points (Antennas, Towers, etc.)
Access Point
Risers
Service Drops
Splice Points

Stormwater Infrastructure Inventory
Stormwater Controls (Wetlands, dry detention, filtration, flood controls)
Inlet/Discharge Points
Manholes
Ponds
Catch Basins
Channels
Culverts
Pipes

Wastewater/Sewer Infrastructure Inventory
Sewer Service Areas
Sewer Line Easements
Sewer Basins
Sewer Lines
Sewer Clean Outs
Sewer Force Mains
Sewer Gravity Mains
Sewer Meters
Sewer Pump Stations
Sewer Valves
Wastewater Treatment Plants

Water Infrastructure Inventory
Water Service Areas
Water Line Easements
Water Lines
Water Pressure Zones
Manholes
Hydrants
Water Tanks
Water intakes/wells
Water Treatment Plants
Water System Valves
Water Service Connections
Water meters

Appendix 2: Written Policy Examples and Disclaimers

Data Disclaimers

The following examples were provided through the Local Government Infrastructure Survey as examples of data disclaimers. These disclaimers are provided as reference examples and may not have been reviewed by legal counsel. Map disclaimers may be general disclaimers that cover layers other than infrastructure data. The IWG strongly recommends adding disclaimers to metadata and web pages.

City of Raleigh Stormwater Disclaimer Example

"The purpose of this Stormwater data is to meet the City of Raleigh's goal to locate and map drainage systems as part of its NPDES (National Pollutant Discharge Elimination System) permit. The City of Raleigh makes no representation about the suitability of the information contained in this data and related graphics. This data and related graphics are provided "as is" without warranty of any kind. The City of Raleigh hereby disclaims all warranties and conditions with regard to this information, including all implied warranties and conditions of merchantability, fitness for a particular purpose, title and non-infringement. In no event shall the City of Raleigh be liable for any special, indirect or consequential damages or damages whatsoever resulting from loss of use, data or profits, whether in action of contract, negligence or other tortuous action, arising out of or in connection with the use or performance of information in this data. To confirm these drainage structures or if more detailed drainage information is needed; it is recommended a North Carolina Licensed Professional Engineer or Land Surveyor is consulted."

Town of Clayton Disclaimer Example

"All data is provided by the Town of Clayton "as is" and the Town of Clayton makes no warranty, representation, or guarantee as to the accuracy or currency of the data presented whether express or implied, in fact or in law, and the Town of Clayton assumes no liability for any errors or omissions. Therefore, in no event shall the Town of Clayton be liable for any special, indirect, or consequential damages or any damages whatsoever resulting from loss of use, data, or profits, whether in an action of contract, negligence, or other action, arising out of or in connection with the use of the information herein provided. All data is subject to modification. You assume full responsibility for your use of the data. A review of GIS data does not take the place of primary source review and independent verification of information. Primary sources from which the data have been compiled should be consulted for verification of the information contained in this data."

Town of Cary Map Disclaimer Example

"The information contained on this page is NOT to be construed or used as a "legal description". Map information is believed to be accurate, but accuracy is not guaranteed. Any errors or omissions should be reported to the Town of Cary Geographic Information Systems Division. In no event will the Town of Cary be liable for any damages, including loss of data, lost profits, business interruption, loss of business information or other pecuniary loss that might arise from the use of these maps or the information they contain."

Person County Disclaimers

The Person County GIS department distributes confidential information about the location of County-owned fiber optic internet networks and facilities. This information is password protected and they preface the application with the following disclaimer which was adapted from a federal disclaimer for critical infrastructure data:

THIS MAP CONTAINS RESTRICTED PROPRIETARY INFORMATION.

By continuing, I understand that since September 11, 2001, location data of critical utility structures is considered sensitive information for reasons of homeland security.

I will not publish this data or maps made using this data on a World Wide Web site with public access. I will include a statement on or with any map (digital or paper) made with the data to the effect that this data is considered sensitive information for reasons of homeland security and its distribution and use is restricted.

I will not redistribute this data to others, but shall refer requests by others for such information to the originator.

Finally, I will take reasonable steps to safeguard the information against any use inconsistent with this agreement and against any further disclosure or dissemination.

Person County public parcel mapping website contains the following disclaimers:

"Maps and tabular data are develop form public records and data sources including recorded deeds, plats, and other public records. Users are hereby notified that the aforementioned public primary information sources should be consulted for verification of the information contained on this website. While efforts have been made to use the most current and accurate data, Person County assumes no legal responsibility for the information contained herein. Concerning the utility data, the data provider requests we post this disclaimer: Presence of water/sewer assets on the map is not a guarantee of service. Please call Roxboro Public Works at 336-504-9638 for questions."

Brunswick County Map Disclaimer

"Brunswick County assumes no legal responsibility or the nature of, contents of or accuracy of any information contained on this map. This map may not be accurate or up-to-date. All map information must be verified by recipient. Grid based on NC State Plane Coordinates, NAD 83 Datum, Feet."

City of Goldsboro Map Disclaimer

"The data represented on this map has been compiled by the best methods available. Accuracy is contingent upon the source information as compiled by various agencies and departments both internal and external to the City of Goldsboro, NC. Users of the data represented on this map are hereby notified that the primary information sources should be consulted for verification of the information contained herein. The City Of Goldsboro and the companies contracted to develop these data assume no legal responsibilities for the information or accuracy contained on this map. It is strictly forbidden to sell or reproduce these maps or data for any reason without the written consent of the City of Goldsboro."

City of Durham Map Disclaimer

Clicking an application on this page indicates your UNDERSTANDING and ACCEPTANCE of the limits to data accuracy as stated Below

Please Note: Maps and tabular data presented on the Interactive Maps page are developed from public records and data sources including recorded deeds, plats, and other public records. Users of these mapping applications are hereby notified that the aforementioned public primary information sources

should be consulted for verification of the information contained on this website. While efforts have been made to use the most current and accurate data, The City of Durham, Durham County, NC and the mapping and software companies assume no legal responsibility for the information contained in the Interactive Map Webpages.

Confidentiality and Non-Disclosure Forms

Person County Example

CONFIDENTIALITY AND NON-DISCLOSURE AGREEMENT

This Confidentiality and Non-disclosure Agreement (the "Agreement") is made and entered into this _____ day of _____, 2021 (the "Effective Date"), between PERSON COUNTY GOVERNMENT, as the disclosing party (the "**Owner**"), and _____, as the recipient of confidential information (the "**Recipient**"**).**

RECITALS:

WHEREAS, Person County Government owns fiber which is considered critical infrastructure protected by Homeland Security and details about said infrastructure should remain confidential; and

WHEREAS, the Owner has requested and the Recipient agrees that the Recipient will protect the confidential material and information that is to be disclosed by Owner to Recipient.

NOW, THEREFORE, for and in consideration of the foregoing Recitals, and of the mutual covenants, conditions and agreements contained herein, and for other good and valuable consideration, the Owner and Recipient do contract and agree as follows:

1. **CONFIDENTIAL INFORMATION.** The term "Confidential Information" means any information disclosed by Owner to Recipient, including any information disclosed before the Effective Date, either directly or indirectly, in writing or orally, whether or not designated by Recipient as "confidential" at the time of disclosure. "Confidential Information" specifically includes the details of fiber installation locations, handholes, distance from centerline, depth of installation, and other specific details related to the fiber infrastructure.

2. **TERM OF THE AGREEMENT.** This agreement continues in effect from the Effective Date to the date that Owner releases Recipient from the obligation of confidentiality under this Agreement, in writing.

3. **RECIPIENT OBLIGATIONS, BREACH.** Recipient agrees not to disclose any Confidential Information to anyone, for any reason or by any means, without the express written consent of Owner. Any unauthorized disclosure of Confidential Information by Recipient is an event of default in violation of Recipient's obligations, and a breach of contract.

4. **OWNER REMEDIES.** If Recipient discloses Confidential Information in violation of this Agreement, Owner may file suit in Person County Superior Court seeking injunctive relief (a court order to stop violating the Agreement) or monetary damages. Failure of

Owner to exercise rights under this Agreement or similar agreements with others does not waive any rights of Owner under this Agreement.

5. **AMENDMENT.** No purported amendment to this Agreement shall become effective unless it is in writing and signed by the parties to this Agreement.

6. **SUCCESSORS AND ASSIGNS.** This Agreement is binding upon the parties and their successors, assigns and heirs.

7. **APPLICABLE LAW.** This Agreement and the rights and obligations of the parties hereunder shall be governed by and interpreted in accordance with North Carolina law.

IN WITNESS WHEREOF, this parties have caused the duly authorized execution hereof, in duplicate originals, as of the Effective Date.

Brunswick County Example

Spatial Data Request and Confidentiality Agreement

I understand that Brunswick County Public Utilities (BCPU) location data is considered sensitive information for reasons of Homeland Security. I will not copy or distribute this data without the express written consent of Brunswick County or Brunswick County Public Utilities. I will not publish this data, or maps using this data, on a World Wide Web site with public access. I will only use the information for the legitimate government function for which the information was requested and provided.

I agree to the following BCPU data disclaimer: **Brunswick County Public Utilities' critical utility structures of water and sewer geographic data is provided for general information purposes only and is considered sensitive information for reasons of Homeland Security. While Brunswick County Public Utilities makes every effort to confirm the accuracy of this information, it does not warrant or guarantee information provided is accurate, current, or complete, and will not be held liable for problems that arise based upon the reliance of this information. Brunswick County and Brunswick County Public Utilities assumes no responsibility for the consequences of inappropriate uses or interpretations of the data.**

Any BCPU data that provides location of underground utilities will never be used as a substitute for contacting a locating agency, such as NC811, prior to excavation activities. I will not redistribute this data to others and will refer requests for such data by others to Brunswick County Public Utilities. I agree to indemnify, defend and hold harmless Brunswick County and Brunswick County Public Utilities, its officers, and employees from and against any, and all, claims, suits, losses, damages or costs incurred from using the data as received or as modified after receipt.

I acknowledge that failing to comply with BCPU's *Confidentiality Agreement* may result in cancellation of this agreement and other actions which may include, contract termination, limits upon future work, and payment of damages, if any. Finally, I will take reasonable steps to safeguard the information against any use inconsistent with the *Confidentiality Agreement* and against any disclosure or dissemination.

Name: _____ Date: _____

Company Name: _____ Phone: _____

Address: _____

City: _____ State: _____ Zip: _____

Email Address: _____ Signature: _____

Data Format Requested: Print ☐ Size: _____ PDF ☐ GIS/Electronic ☐

Description of information requested:

Intended use of data:

For BCPU use: Date: _____

Approved by: _____ Assisted by: _____

Data Distribution Agreements

Charlotte Water and Sewer Data Limitation Agreement

By opening this file the User agrees that under no circumstances will it provide to ANY third party, copies of or access to this data. The User agrees to destroy all versions of the data in their possession and any delivery media immediately upon completion of the specified authorized use or upon direction from authorized CPW manager(s) to do so. CPW makes no warranties, guarantees or representations as to the accuracy of its data, and assumes no liability or responsibility for any errors or omissions in its data. Under no circumstances will CPW be held liable to any party who relies on information derived from its data, and anyone relying on its data does so at his/her own risk. The User agrees to indemnify CPW, including court costs and reasonable attorney fees, for any claims filed against CPW involving any errors or omissions in CPW data as it related to the User's purpose.

Moore County Data Distribution Agreement

Moore County Geographic Information Systems (GIS) & Public Works - Data Distribution Agreement

Document Revision Date: 04/20/21

Purpose

This agreement was created in support of the creation of the Department of Homeland Security, Congress and the North Carolina General Assembly amended the Freedom of Information-Privacy Acts (FOIPA) and North Carolina General Statutes Chapter 132, Public Records to exclude information about sensitive infrastructure from the general public. This agreement will specifically control and protect the water and sewer infrastructure of Moore County and all jurisdictions with which we do business.

Conditions

Special Condition for Security Sensitive Public Security Information (NC GS Ch. 132-1.7) Requests:
Some security sensitive GIS data sets are not public record. However, in the spirit of public service, Moore County may choose to provide non-security-elements of these GIS data sets as deemed appropriate by its authorized managers. If DATA REQUESTER has requested security sensitive GIS data, then DATA REQUESTER must comply with the following conditions to receive distribution.

DATA REQUESTER understands that the security sensitive GIS data is not public record, and that this data is provided at the sole discretion of authorized Moore County management for the sole purpose(s) specified below. DATA REQUESTER agrees that under no circumstances will it provide to any third party copies of or access to this GIS data. DATA REQUESTER agrees to destroy all versions of the data in DATA REQUESTER'S possession and any delivered media immediately upon completion of the specified authorized use or upon direction from authorized Moore County management to do so.

Notice

All hard copy maps documents must have notice.
Sensitive information not to be copied or distributed without the express written consent of Moore County. In compliance with - North Carolina Public Records Law All information provided was created for the County's internal use.

Moore County GIS Disclaimer: All the information contained on this media is prepared for the inventory of real property found within Moore County. All data is compiled from recorded deeds, plats, and other public records and data. Users of this data are hereby notified that the aforementioned public primary information sources should be consulted for verification of the information. All information contained herein was created for the County's internal use. MOORE COUNTY, ITS OFFICIALS, AGENTS AND EMPLOYEES MAKE NO WARRANTY AS TO THE CORRECTNESS OR ACCURACY OF THE INFORMATION SET FORTH ON THIS MEDIA WHETHER EXPRESS OR IMPLIED, IN FACT OR IN LAW, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR USE. Any resale of this data is strictly prohibited in accordance with North Carolina General Statutes 132-10. Grid is based on North Carolina State Plane Coordinate System NAD83 (feet).

Data Requestor Information	
Date	
Items requested	
Desired Use(s)	
DATA REQUESTER	
Contact Person *I am an agent / employee with permission to act of behalf of the Data Requester*	By signing this agreement, I understand and agree to the conditions for receiving and / or accessing GIS data provided by the Moore County GIS Department and Public Works: *Print* *Sign* *Title* Email Phone
Address	

Return Completed Form to:	
Preferred Methods	Brian Patnode, PE, County Engineer Email: cpatnode@moorecountync.gov Phone: 910-947-6315
Alternative Methods	Mail: PO Box 1927, Carthage, NC 28327 Fax: (910) 947-1992

Data Sharing Policy Examples

The IWG recommends that each organization write a data sharing policy. The policy should address internal, external, and web-based data sharing. Written policies promote a consistent data sharing experience, help data users understand how to obtain data, and describe what data and data format they may obtain. Data sharing policies should be reviewed periodically and updated as appropriate.

Orange Water and Sewer Authority Data Sharing Policy

ORANGE WATER AND SEWER AUTHORITY
ADMINISTRATIVE GUIDE
PROTECTION OF SENSITIVE INFRASTRUCTURE INFORMATION

PURPOSE

To outline the procedures necessary to ensure adequate protection of sensitive information relating to OWASA's water and wastewater systems infrastructure information, including plans, design drawings, aerial photography, security assessments and Geographic Information System (GIS) data.

This Administrative Guide is intended to assist OWASA employees in determining what information may be disclosed to non-employees and in those cases where it is prudent to release certain information, the procedures that are to be utilized to ensure the information is protected and only used for its intended purpose.

BACKGROUND

OWASA's Administrative Guide, PUBLIC INFORMATION, dated June 11, 2003, promotes open, accurate and timely communication with the public. It also directs OWASA staff to maintain confidentiality of certain information that is not a public record under State law.

North Carolina General Statute 132-1.7, Sensitive Public Security Information, states that Public records, as defined in G.S. 132-1, shall not include information containing specific details of public security plans and arrangements or the detailed plans and drawings of public buildings and infrastructure facilities.

GENERAL PRINCIPLES

No plans, drawings, documentation or aerial photography that details OWASA's water and sewer infrastructure shall be made available to the general public except upon a demonstrated need and as provided herein. However, because information on OWASA's existing infrastructure is essential to the maintenance, repair, improvement and expansion of OWASA's water and wastewater utility systems, it may be prudent to release certain elements of information to facilitate this work. In those cases, OWASA employees will protect the public infrastructure by restricting access to the infrastructure plans by monitoring and tracking the names of people requesting infrastructure information and how the information will be used.

Individuals and/or organizations requesting information relating to OWASA's water and wastewater infrastructure will only be provided with the specific information required for a particular project or particular interest area. No individuals and/or organizations will be given full access to information on OWASA's entire water and wastewater infrastructure unless that level of information is required for a particular project or study, while under contract with OWASA.

Any person or firm receiving information is prohibited from copying or distributing the information to anyone outside of his/her immediate business concerns and/or using the information for anything not

directly related to the project for which the information was obtained. After the person or firm has completed their use of the information provided by OWASA for a particular project or other item of intere

Any OWASA employee who routinely handles or otherwise has access to information covered under this guide will be required to be familiar with the guide. Any employee who acts in violation of this policy shall be subject to disciplinary action, up to and including dismissal.

Any OWASA employee who encounters requests for information that they believe may compromise the security or operation of the facility or plan being communicated shall immediately contact and relate the specific circumstances to a supervisor or an appropriate law enforcement agency.

ADMINISTRATIVE PROCEDURES

OWASA shall administer this program as follows:

Individuals or organizations who request plans, drawings, documentation or aerial photography that details OWASA's water and sewer infrastructure shall be required to register with OWASA (form is attached). Registered individuals or organizations and their designees will have access to certain elements of information as deemed necessary and appropriate by OWASA staff. Application for registration may be made at the time that information is requested or at any time in advance of such request. Registration shall be valid for a period of three years from the date of registration and may be automatically renewed and/or updated at OWASA's discretion provided there have been no substantive changes to the applicant's registration information.

The application form to be completed by individuals and organizations is provided in the attachment. At the time the form is submitted for approval, OWASA will request a picture identification (such as a valid NC driver's license) to confirm the individual's identity.

Individuals or organizations who wish to view information on-site only (in the presence of an OWASA employee) and who will not be acquiring a copy or photographing the information will not be required to apply for registration. However, the details surrounding the request for information will be entered in the OWASA tracking log.

Any request for highly sensitive information can only be provided with the specific approval of OWASA's Executive Director. Information that falls into this category includes, but is not limited to, information relating to past security assessments and information relating to individual customer billing records.

Requests for information from law enforcement or other governmental agencies will be handled on a case-by-case basis and typically will involve requiring that the individual requesting the information present some form of identification confirming that they are an employee of the governmental agency requiring the information. Generally, once it has been confirmed that the individual is an employee of the requesting governmental organization, no other actions will be required.

A database of all registered applicants will be maintained by the Engineering and Planning Department for a period of not less than three years. The database is accessible through the web link here.

This database will identify the individual's or organization's name, telephone number and address, N.C. Professional License Number (if applicable), authorized individuals (who may also receive information), driver's license number (or other acceptable ID), signature of applicant, and approval and signature of an OWASA employee.

The Engineering and Planning Department will maintain a tracking log detailing each instance where an organization or individual receives information (electronic or paper) under this guide. The tracking log is accessible through the web link here.

This log will include the name of the individual, the date that the information was requested, the date of the information release, a brief description of the data released, an explanation of the need for the information, and the OWASA employee providing the information. The tracking form will be available online at our intranet site.

All printed copies of detailed plans, drawings or documentation provided to individuals or firms under this policy must include a statement that reads: ***"This map contains sensitive information, not to be copied or distributed without the express written permission of OWASA. This data is being provided as a visual representation and at no time should the data be considered exact. The data is not guaranteed to be accurate and is not intended as a substitute for a field survey. OWASA assumes no legal liability or responsibility for this data."***

All digital copies of detailed plans, drawings or documentation provided to individuals or firms under this policy must include a companion digital file that also contains the aforementioned statement.

This guide does not preclude the non-Internet display or distribution by OWASA of generalized information such as aerial photography, maps, site plans and similar information to the general public or property-specific locational information to individual property owners. Nor does this guide preclude the distribution of aerial photography, maps, or site plans to property owners and residents when OWASA provides site-specific notifications of pending work in particular areas and neighborhoods of its service area. The term "property-specific" refers to information about OWASA facilities (such as a water meter, water main or sewer) that are located on or near the property of the individual asking for information about the location of our facilities.

This Administrative Guide is effective July 31, 2014 and supersedes the Administrative Guide dated April 23, 2013.

Ed Kerwin
Executive Director

Application for Registration to Obtain Sensitive Infrastructure Information

In accordance with OWASA's Administrative Guide titled *PROTECTION OF SENSITIVE INFRASTRUCTURE INFORMATION*, I hereby provide the following information necessary to obtain sensitive maps, plans, data or other engineering information pertaining to OWASA's water and wastewater infrastructure. I further understand that registration is valid for a period of three years from date of registration and may be automatically renewed and/or updated at OWASA's discretion provided there have been no substantive changes to registration information noted below.

I further agree and understand that both I and/or my organization is prohibited from otherwise copying or distributing the information to anyone outside of my immediate business concerns for any purposes not directly related to the projects for which the information was obtained.

Organizations Only:

I hereby designate the following individuals as agents of our organization and request they be allowed to obtain information as described above. As a condition of any approval granted, we will immediately notify OWASA in writing upon termination of employment of any employees listed below. We also request to be allowed to add employees in a similar manner.

Authorized Individuals:

_____ _____

_____ _____

_____ _____

Printed Name: _____

Address: _____

Phone Number: _____

Email Address: _____

Professional License Type and Number (if applicable): _____

Signature: _____

Date: _____

OWASA Office Use Only:

OWASA Approval: _____ _____

Signature Date

Appendix 3: Use Cases

Use Case provided by Department of Environmental Quality, Division of Water Resources

Business Process, Process Justification, Data Required

Public Water Supply Lines:

Occasionally water systems have issues with bacteria or other contaminates getting into the water supply or the lines. Knowing where the closest connection is to another working system during these emergency times would be helpful to get clean water to the public much faster when needed. Would also help to know who to contact for emergency connections. Along with knowing location of connections, knowing where the line valves are located would greatly help turn contaminated lines off faster. (Byron Burrell)

Could be used for permitting wells. See more below (from Ed Watson) about knowing the distance from where the applicant is hoping to install a well or if a variance can be issued for a well construction. (Ed Watson)

When spills occur or other environmental issues occur that contaminate drinking wells, it would greatly help to know where the public water supply lines are located. Staff would then be able to determine the distance of those private properties with contaminated well to the public supply lines. (Sean McGuire)

We'll need Distribution lines for identifying water systems interconnections and to help systems find emergency interconnection opportunities, PWS Service Area boundary polygons, PWS intake point data, wastewater returns (discharge) point data for Local Water Supply Plans and planning efforts in general. Withdrawal and return point data are also helpful for designing hydrological models and studying IBT requests. (Charley Theobald)

Wastewater Collection System Lines:

When looking at permitting a new well, knowing where the wastewater collection system lines are located, would make this permitting process much faster. It also helps with variance approvals and speed at which that gets done. Having this information in a GIS format would also save resources and time in researching and waiting on communications about if lines are there and general locations of those lines. Significant amount of time is spent on this information searching by staff. (Ed Watson)

Stormwater Network

Having knowledge of where existing stormwater networks are located will help refine and clean up hydrography layers. (Andy Kiley)

The headwater stream modeling group (HSSD) had asked for stormwater infrastructure data from a few municipalities in certain pilot watersheds in order to help sketch out "urban" boundaries using outfall locations, etc. Our usual method of stream modeling (using LiDAR and elevation derivatives) doesn't work too well on flat paved over areas and gets confused with culverts, bridges, and underground pipes. In addition, the modeling effort might also use the location of culverts (perhaps including smaller driveway pipes) to improve our computer generated "streams". (Ernest Hahn)

Infrastructure Data Format, Scale, Accuracy, and Extent

For all data listed above, DWR would love to have the data in shapefiles, hosted feature services, or any other format that can be easily imported or used in an ESRI ArcGIS Online format. Scale and extent completely depend on the provider and what they are willing to share. The division would like to know what the accuracy level is but would not require a specific accuracy.

Data Security

DWR is willing to develop a data use agreement or review one provided by the data provider. Once confirmed by council that the division would be able to do so, the division would keep all data internal unless otherwise agreed upon by both parties.

Project Impact / Data Impact

Having access to this infrastructure data would save DWR staff significant amounts of time in a variety of ways across several sections of the division. Majority of the need for this data is for spatial awareness. Most of the time, our staff must reach out to various utilities to inquire about locations of lines, valves, etc., which can slow down turn-around times for permit processing and emergency responses. The extent of this slow down could be very impactful during emergency situation.

Use Case provided by Person County NC Economic Development

Business Process:

Inventory Survey – As a government economic development organization, we utilize the infrastructure data to analyze where and how many viable sites we may have for new industry.

Business Process Justification:

This process is very important to our work because we always need to be prepared to develop new sites for when existing sites become developed. It takes time and money to expand infrastructure, so if we do not evaluate this routinely, we will find ourselves in a situation where we may not be able to develop new sites to attract new industry because we are years away from being able to build new infrastructure. If we do not have available sites, we will not attract new projects to bring jobs and investment for the community.

Infrastructure Data Required:

For our inventory survey, we use all the data types in the above bulleted list as well as transportation corridors, such as roads and rail.

Infrastructure Data Obtained:

We utilize our local public GIS web application, as well as an internally developed private web application. We also use the NCDOT interactive map. With the public application, roads and streams, ponds, and wetlands are available, as are traffic counts on the NCDOT tool. On the internal, private application, we can access publicly-owned telcom data as well as water and sewer, which was recently added to the public application. With aerial imagery sometimes we can tell where electric transmission lines are, but not extensively and not at what capacity. None of the public utilities data provides capacity information except traffic counts on some roads. We also know that some of the data is missing with the systems that we do have and may be inaccurate. The data is available on interactive online maps and is printable to PDF. For the most part, what we have is county-wide. The most current water, sewer, telecom and all electric and gas is unavailable except what may be discerned from satellite images, i.e., visible transmission lines and natural gas equipment.

Note from the GIS Manager: We have some extremely basic privately owned telcom data. It is not spatially accurate or complete and has no indication of capacity.

Data Security:

For some evaluations we were able to see snapshots of gas and electric after contacting the utility companies. The imaging was so narrow in scope that it was not a confidentiality issue. When we were able to see the water and sewer on our internal application only, it was password-protected and only used for internal use.

Note from the GIS Manager: We password protect web applications which feature sensitive utility information, however, the REST services themselves are open and could be exploited. The City of Roxboro just allowed us to publish their water and sewer data on a public facing application. The locations of system features are provided, but there is no attribution. We

provide copies of water/sewer data by request only, and I typically ask the City/let them know when those requests come in and honor their wishes to share or not share or share only a portion. We have data for some privately owned telcom networks and data for networks built by the County or MCNC. None of that data is shared with the public and viewing that information in Desktop/Pro is limited by user.

Ideal Infrastructure Data:

It would be helpful to know the location of all infrastructure and to know that it was updated when the system was expanded or reduced. It would be helpful to know the capacity of what is available. It would be helpful to have this information be available on an interactive map and to be available on one tool that is not county specific. It is difficult to know what our specific resources are and how we compare to other areas to best plan and develop as a region.

Project Impact:

By understanding the constraints and being a public body, we know to reach out to our service providers to confirm what we see on a map that may or may not have the most accurate data. To have a comprehensive and reliable tool would be the most helpful when we are working with projects to provide site selection services. Some of this information is not readily available even through service providers, such as telecom, yet it is a critical part of site development. Having the data more readily accessible could help prevent time wasted when moving advancing a site in a selection process that may have inaccurate or incomplete information displayed.

Use Case provided by Person County Geographic Information Systems Department

Business Process:

Citizens relocating to the area often want to know what utilities are available and where, especially telecommunications.

Business Process Justification:

I work in the same office with our building inspections department and issue addresses as people applying for permits. We often get asked which power company services a particular piece of property, and we cannot answer that question. The same goes for telcom/internet providers. We typically tell the citizens to ask a neighbor or look at the utility poles on their property for a metal placard with the name of the utility owner. There are telcom maps online, but we have found them to be unreliable as they tend to overstate coverage and speed. It just seems like this is not a sufficient answer for people who are interested in investing in a home in Person County; we can't answer the most basic of questions for them.

Infrastructure Data Required:

Service areas for power, water, sewer, telcom, and natural gas. In the case of telcom, speeds would be nice (dial-up, broadband, etc.).

Infrastructure Data Obtained:

As a GIS Manager, I have access to water and sewer data provided from the City of Roxboro via shapefile. It's fairly spatially accurate, represents the majority of their systems, but has next to zero attribution. I am able to tell a citizen that they have water and sewer lines that either cross their property or are nearby (in the street for example). That information is also publicly available on our primary GIS application and we supply a disclaimer that presence of a water/sewer utility is not a guarantee of service.

For power and natural gas I have no reference material. Duke and Piedmont EMC both service this area and have websites where you can type in addresses to determine if an address is covered by the company. However, because we are the addressing authority and the citizen is in the early stages of building, quite often their addresses don't register in the respective systems.

For telcom, I have an extremely low quality dataset that was generated via windshield survey and hand drawn on a map. The data is of such poor spatial precision and accuracy that we can't rely on it at all. Communication tower information is available from the FCC. However, several companies may have equipment hung on the same tower. The FCC data lists each of those companies as a separate facility with different lat/long (even though it's the same tower). It's a manual process to get that information from the FCC into a format I can make sense of. Also, since the cell sectors are dynamic, I'm unable to capture that information in my static databases.

I have GIS data for the County-owned fiber network and the MCNC line running through the County. They are of higher spatial quality with very little attribution.

Data Security:

I am allowed to share water and sewer data for emergency purposes (CAD, fire departments, etc.). I cannot share that data beyond those purposes and refer those requests to the data owners (City). We have data for some privately owned telcom networks and data for networks built by the County or MCNC. None of that data is shared with the public and viewing that information in Desktop/Pro is limited by user.

Ideal Infrastructure Data:

Ideally, we'd be able to model the real world in GIS. Utility networks and locations of sensitive structures would be an ideal outcome of this data as would service areas which we could make available to the public.

Project Impact:

When we cannot answer basic utility questions for the public we lose credibility, which is hard to come by in the first place. It causes a lot of frustration on the part of someone who is doing their due diligence on a piece of property before they seek to buy it.

Use Case provided by Department of Insurance

Business Process:

Insurance companies need to know the distance to the closest fire hydrant for underwriting purposes.

Business Process Justification:

Insurance adjusters and underwriters need a way to determine distance to the closest fire hydrant. If fire hydrant locations are not made publicly available via web application, then they have to call GIS and/or City staff to get them to measure in ArcGIS while on the phone.

Infrastructure Data Required:

Spatially accurate fire hydrant locations. Attribution not required.

Infrastructure Data Obtained:

Partially due to the volume of calls from insurance companies, the City (water GIS data owners) allowed us to put this information on our primary GIS website which provides a measuring tool. They provided shapefiles which I put into a geodatabase and published as a REST service. No attribution is provided to the public via this method.

Data Security:

There's a disclaimer on our website that presence of a water/sewer utility is not a guarantee of service.

Ideal Infrastructure Data:

In allowing the County to publish the fire hydrant locations publicly, our needs were met as well as those needs of the insurance companies.

Project Impact:

The primary impact of having the fire hydrant data on a public GIS portal is that we receive fewer phone calls asking us for distance to a fire hydrant. In the past, we could always tell when someone was shopping for insurance because we'd get the fire hydrant distance question for the same house from 3 insurance agents within an hour to two. Each call was maybe only a few minutes, but the reduction in interruptions has been a massive improvement. Now, if we do receive a call, it's usually stepping someone through how to use the measuring tool on the website instead of us doing the measuring for them.

Use Case provided by Person County, Highway Project

Business Process:

NCDOT plans major road improvements and wishes to mitigate and/or understand the challenges with utility information.

Business Process Justification:

NCDOT contacted the Person County GIS department to obtain utility information surrounding a project on the main thoroughfare through Roxboro. Some utilities will need to be relocated permanently or on a temporary basis during the project. Others will likely need to be replaced due to condition or age and the age of a utility might factor into who is responsible for the funding. NCDOT also needed us to supply facilities that might require no interruptions of service such as water to dialysis centers or electricity to telcom facilities.

Infrastructure Data Required:

Locations and decent attribution for water, sewer, stormwater, telcom, electricity, and natural gas lines, facilities, etc.

Infrastructure Data Obtained:

Initially, NCDOT asked for the GIS data for the project area. I received approval from the City to distribute the water and sewer information to NCDOT as well as approval from our IT department to distribute the location of county-owned Fiber Optic network information. Along with that info comes the locations of poles for aboveground fiber lines; those poles are not owned by the County and tend to carry multiple utilities. We do not have electricity, natural gas, or stormwater information that can be shared. I gathered the GIS data and clipped it all to the study area provided on project drawings from NCDOT, zipped up the data, and e-mailed it out. A few days later, the person who had made the request couldn't understand why he couldn't open a .shp in Adobe; what they actually needed was maps, not data, so I turned around and made maps instead.

Data Security:

We did disclose that the data should not be shared beyond the scope of the NCDOT project. However, there's no metadata stating that. Also, the data shared was for a small area and not the whole system which may provide a little security.

Ideal Infrastructure Data:

Ideally, we would have accurate water, sewer, and stormwater data from the City as well as from private companies (telcom, electric, and natural gas). Pipe materials, age/date installed, diameter/capacity, etc., information would be available on the wet utilities. For the dry utilities, it's a little different for this project area. The majority of those utilities are above ground and hung on poles. What we would need is the pole locations tagged with the utilities hung on the pole. We'd also need locations of dips into the ground or buildings as

well as switches and transformers for electric along with number of phases and KVA. For natural gas, line locations and connections to service lines/meters would be ideal

Project Impact:

Project planning is crucial for NCDOT – it helps them plan both physically and financially for a difficult project such as the one being proposed. For the City and County, it would be beneficial to have GIS data of high enough quality to model the utility networks such that when a facility is impacted, we could quickly identify the source of the problem. Also, there's a stormwater issue located near this project that would need to be monitored so good GIS data would help with that as well.

Use Case provided by Department of Transportation, Asset Management and Maintenance

Business Process:

NCDOT Asset Management Program, Roadway Maintenance Program and Pavement Management Program.

Business Process Justification:

The 3 programs mentioned above support the daily maintenance activities that provide safe and operational roadway facilities to the citizens of North Carolina. Each Program requires detailed utility information about what is contained within the NCDOT ROW for the benefit of worker safety (all 5), knowledge of contributing systems (stormwater), and maintenance project planning (all 5).

Infrastructure Data Required:

All available including but not limited to Water/sewer, Electrical, Natural gas, Telecommunications and Stormwater maintained by Federal, State, Local and Private entities.

Infrastructure Data Obtained:

Generally good data is unavailable. To date the only data NCDOT has been able to obtain is through historical records created or maintained in-house as part of the project delivery process, freely available data via download or web service from federal state or local municipalities, and older paper or scanned digital plans acquired from other sources. The only major power provider to knowingly contribute some level of data to date is Duke Power which has provided its ROW polygons.

Data Security:

Currently NCDOT has no agreements with any utility provider for routine delivery or secure data access to utility data as part of the support for the project delivery process.

Ideal Infrastructure Data:

Ideal infrastructure datasets would take the form of a secure or publicly available web service in the format of an ArcGIS Feature Service. These endpoints would represent utility locations within the 5 categories of data, at a mapping scale of 1”=40’ that would meet national map accuracy standards for that scale. Due to the spatial extent of NCDOT project locations, essentially our ideal datasets would amount to a service area wide coverage of all utility data for each utility provider. Ideal attribute data would include material types, ages, sizes, owners, and include Z value for depth where possible.

Project Impact:

More detail is better when it comes to the NCDOT Maintenance Programs. Ideal data as soon as possible allows for better worker safety, better project planning and an overall better product for the citizens of the state. Missing or inadequate data can lead to worker safety issues, and as with project delivery, budget, schedule and planning errors that could be avoided.

Use Case provided by Department of Transportation, Emergency Response

Business Process:

NCDOT Emergency Response Support.

Business Process Justification:

The various divisions within NCDOT are required to respond to varying emergency situations occurring within the NCDOT ROW. Better knowledge of what is contained within the NCDOT ROW will allow for better worker safety and more effective communication in emergency situations.

Infrastructure Data Required:

All available including but not limited to Water/sewer, Electrical, Natural gas, Telecommunications and Stormwater maintained by Federal, State, Local and Private entities.

Infrastructure Data Obtained:

Generally good data is unavailable. To date the only data NCDOT has been able to obtain is through historical records created or maintained in-house as part of the project delivery process, freely available data via download or web service from federal state or local municipalities, and older paper or scanned digital plans acquired from other sources. The only major power provider to knowingly contribute some level of data to date is Duke Power which has provided its ROW polygons.

Data Security:

Currently NCDOT has no agreements with any utility provider for routine delivery or secure data access to utility data as part of the support for the project delivery process.

Ideal Infrastructure Data:

Ideal infrastructure datasets would take the form of a secure or publicly available web service in the format of an ArcGIS Feature Service. These endpoints would represent utility locations within the 5 categories of data, at a mapping scale of 1”=40’ that would meet national map accuracy standards for that scale. Due to the spatial extent of NCDOT project locations, essentially our ideal datasets would amount to a service area wide coverage of all utility data for each utility provider. Ideal attribute data would include material types, ages, sizes, owners, and include Z value for depth where possible.

Project Impact:

Better data will allow better response times for emergency situations and a safer response for all involved. More detail will allow for better response planning and effective communication.

Use Case provided by Department of Transportation, Hydraulics Unit

Business Process:

NCDOT Hydraulics Program. This program is responsible for managing stormwater runoff from NCDOT maintained facilities.

Business Process Justification:

The Hydraulics program requires as much detail as possible in regard to stormwater facilities either in the NCDOT ROW, contributing drainage to the NCDOT ROW or taking drainage away from the NCDOT ROW. This knowledge allows for better planning for stormwater facilities that manage runoff from NCDOT facilities. Some of these activities involve rapid responses that fall outside the normal project delivery process.

Infrastructure Data Required:

All available Stormwater data maintained by Federal, State, Local and Private entities.

Infrastructure Data Obtained:

Some stormwater data is available from some municipal resources but in most cases, metadata is lacking and thus the data cannot be verified for quality. To date the only data NCDOT has been able to obtain is through historical records created or maintained in-house as part of the project delivery process, freely available data via download or web service from federal state or local municipalities, and older paper or scanned digital plans acquired from other sources. The only major power provider to knowingly contribute some level of data to date is Duke Power which has provided its ROW polygons.

Data Security:

Currently NCDOT has no agreements with any utility provider for routine delivery or secure data access to utility data as part of the support for the project delivery process.

Ideal Infrastructure Data:

Ideal infrastructure datasets would take the form of a secure or publicly available web service in the format of an ArcGIS Feature Service. These endpoints would represent utility locations within the stormwater category of data, at a mapping scale of 1”=40’ that would meet national map accuracy standards for that scale. Due to the spatial extent of NCDOT project locations, essentially our ideal datasets would amount to a service area wide coverage of all utility data for each utility provider. Ideal attribute data would include material types, ages, sizes, owners, and include Z value for depth where possible.

Project Impact:

More detail is better when it comes to the NCDOT Hydraulics Program. Ideal data as soon as possible allows for better Hydraulic design, better project planning and an overall better product for the citizens of the state. Missing or inadequate data can lead to poor design and as with project delivery, budget, schedule and planning errors that could be avoided.

Use Case provided by Department of Transportation, Case Project Delivery

Business Process:

NCDOT Project Delivery (Roadway, Rail, Aviation). Each of the above 5 listed data categories are currently evaluated for their respective locations as part of the project delivery process for NCDOT Roadway, Rail, and Aviation projects. This process is a major effort involving multiple NCDOT divisions and spans the project timeline from initial project concept all the way to project letting, just prior to construction and includes encroachment permits. These activities generally span a time frame of multiple years as the facility is planned and designed. Any evaluation and negotiations related to utilities usually occurs late in the project delivery process due to stipulations from the utility owners that the project design must be in its final design stages before they will begin planning to adjust the location of their facilities. It is at this time the full scope of what is in the ground and what must be done is tackled.

Business Process Justification:

The Project Delivery process is an essential function of NCDOT which serves to bring new and upgraded facilities to the public at an appropriate cost. Delays in obtaining details about the existing or proposed Right of Way for Rail, Road or Aviation projects effects project budget and schedule

Infrastructure Data Required:

All available including but not limited to Water/sewer, Electrical, Natural gas, Telecommunications and Stormwater maintained by Federal, State, Local and Private entities.

Infrastructure Data Obtained:

Generally good data is unavailable. To date the only data NCDOT has been able to obtain is through historical records created or maintained in-house as part of the project delivery process, freely available data via download or web service from federal state or local municipalities, and older paper or scanned digital plans acquired from other sources. The only major power provider to knowingly contribute some level of data to date is Duke Power which has provided its ROW polygons.

Data Security:

Currently NCDOT has no agreements with any utility provider for routine delivery or secure data access to utility data as part of the support for the project delivery process.

Ideal Infrastructure Data:

Ideal infrastructure datasets would take the form of a secure or publicly available web service in the format of an ArcGIS Feature Service. These endpoints would represent

utility locations within the 5 categories of data, at a mapping scale of 1”=40’ that would meet national map accuracy standards for that scale. Due to the spatial extent of NCDOT project locations, essentially our ideal datasets would amount to a service area wide coverage of all utility data for each utility provider. Ideal attribute data would include material types, ages, sizes, owners, and include Z value for depth where possible.

Project Impact:

More detail earlier in the project delivery process is better when it comes to the NCDOT project delivery process. Ideal data as soon as possible allows for better project planning and more effective communication in regard to the challenges any project will face. More detail will allow for better project budgeting and scheduling due to the ability to ascertain the level of effort required to complete any relocation work. Missing or inadequate data leads to budget, schedule and planning errors that could be avoided

Use Case General Observation, Aging Workforce

Business Process:

Request for local infrastructure data in N.C. are likely to be made to local governments. Cities and counties are providers of numerous utility services, primarily water and sewer but also including stormwater, electricity, and natural gas. Wide variation exists in the workforce experience and capacity of these local governments, and as experienced employees retire, institutional knowledge of how to best respond to infrastructure data requests is likely to decrease.

Local governments vary significantly across the 100 counties and 551 incorporated municipalities in N.C. For instance, of those 551 municipalities, three-quarters have a population less than 5,000. Nearly 40 percent of municipalities have a population of less than 1,000. (https://www.osbm.nc.gov/facts-figures/population-demographics/state-demographer/municipal-population-estimates). This impacts the services these governments are able to provide and the associated workforce to provide them. As an example, many smaller municipalities do not have dedicated GIS employees themselves, instead relying on partners at the county level to provide such services. Decentralization of this function presents an additional layer of challenges when infrastructure data is requested.

Similar differences are seen in these local governments that are providers of water and wastewater services. In the most recent water and wastewater rates survey conducted by the Environmental Finance Center at the University of North Carolina Chapel Hill (https://efc.sog.unc.edu/resource/tables-water-and-wastewater-bills-and-rate-structures-north-carolina-january-2020), of the 472 utility providers with available data on service connections, 180 had 1,000 or fewer water customers. Compared to the largest utilities in the state that serve tens or hundreds of thousands of customers, resources available to respond to infrastructure requests among smaller utilities are much more limited.

These challenges could be exacerbated in the years to come due to the nature of the industry's workforce. The looming retirement of experienced employees is a challenge across all sectors of government and the broader workforce as well. This may be particularly true in the case of utility providers. The N.C. Chamber's recent Framework for North Carolina Water Policy report (https://ncchamber.com/wp-content/uploads/Framework-for-NC-Water-Policy-FINAL.pdf) stated, "North Carolina also faces challenges related to an aging workforce as well as data management." Statistics from the Bureau of Labor Statistics cited in this blog post (https://efcnetwork.org/operating-at-a-deficit-solutions-to-a-water-and-wastewater-operator-shortage/) from an author at the EFC indicate that, nationally, more than 50

percent of water and wastewater operators are age 45 or older, with nearly 30 percent of them over age 55. Less than 20 percent of operators are younger than 35, with 1 percent age 24 or younger.

Project Impact:

There are a number of smaller utilities in the state that serve a limited amount of customers and maintain a limited staff with which to do so (at least in comparison to the state's larger utilities). In many cases, these utilities are served by key experienced staff members who may be approaching retirement age. As these workers prepare to leave the workforce, institutional knowledge such as the existence of key data, how to access it, how to respond to requests for it, etc., could be departing these utilities as well. For utilities that serve areas that have experienced less economic development in recent years, it could be that procedures for providing data have been little utilized, if they have ever been utilized at all. Existing data may or may not be in readily accessible formats. These potential challenges are hurdles for smaller utilities to overcome that could be made more difficult through the loss of experienced employees. Standards for data sharing among N.C. utility providers should recognize these challenges and how they apply to all utility providers in the state.

USE CASE PROVIDED BY DEPARTMENT OF ENVIRONMENTAL QUALITY, DIVISION OF WATER INFRASTRUCTURE PREPARED BY JON RISGAARD NC DEQ DWI

Business Process:

The Division of Water Infrastructure (DWI) does not use water and sewer infrastructure data directly, but the Division recognizes that the availability of infrastructure data is critical for local utilities in their continued viability. In supporting viable water and wastewater utilities the DWI offers local governments loans and grants to conduct asset inventory and assessment studies that may include mapping of the local infrastructure and condition assessment, and creation of GIS data layers to help them manage their systems. The maps and associated data are typically housed by the utility, or with support from the county. NC rural communities face many challenges in managing a viable water and sewer utilities and having reliable and up to date infrastructure data is a fundamental need for all of them. Any steps that would help relieve the financial burden of managing and maintaining infrastructure data would be helpful.

Business Process Justification:

Accurate and up to date water and sewer infrastructure data is key in developing long-term financial plan, capital improvement plans, and accurate rate setting for water and sewer utilities.

Infrastructure Data Required:

Local government need water lines and sanitary sewer lines locations and service areas. Component age, condition, and design attributes are also essential for developing asset management and capital improvement plans.

Infrastructure Data Obtained:

Water and sewer infrastructure data is available for many communities but not all. Formats are variable as well as accuracy.

Data Security:

Local governments would need to make the data available.

Ideal Infrastructure Data:

Ideally water and sewer infrastructure data would include accurate (mapping grade) locations of pipes, manholes, pump stations, etc, including age and condition assessment, but the Division recognizes that location data and size of pipe data would be a great initial step. Attribution for infrastructure may include sizes of various components, condition, and age, materials.

Project Impact:

Impacts will be highly variable for different utilities. Some have very robust data sets and mapping tools designed for their system. It is unlikely that they would benefit for a state-wide tool. Others have very limited resources and would benefit greatly.

USE CASE PROVIDED BY DEPARTMENT OF ENVIRONMENTAL QUALITY, DIVISION OF WATER RESOURCES PREPARED BY CAM MCNUTT NC DEQ DWR

Business Process:

- Stream mapping. Stormwater Infrastructure (SWI) is closely related to intermittent and perennial streams. In many cases the stormwater infrastructure includes these waters of the state.
- Stream restoration. Stormwater infrastructure is perhaps the best opportunity to address impaired waters in urban areas.
- Flood mitigation. Through implementation of practices upstream/street of stormwater infrastructure can help to reduce downstream/street flooding.
- Service area identification. Water and sewer infrastructure can help in prioritizing areas for septic system removal and in estimating contributions of on-site versus sanitary sewer.

Business Process Justification:

Having stormwater infrastructure included or associated with the stream network will allow for spill tracking from streets to creeks.

This information is also very important in stream restoration to identify and prioritize retrofits and to implement practices to reduce stormwater flow into the swi prior to reaching surface waters.

SWI information will also help in greening of watersheds providing climate resiliency as well as mitigation for flooding.

The SWI dataset would also be very important and pollution prevention and in flood mitigation.

Infrastructure Data Required:

Stormwater infrastructure, Water lines and sanitary sewer lines and service areas.

Infrastructure Data Obtained:

SWI is available for many communities but not all. Formats are variable as well as accuracy.

Data Security:

So far local governments have made these data available.

Ideal Infrastructure Data:

Ideally SWI would include accurate (mapping grade) locations of inlets outfalls and connecting pipes as well as channels. City of Raleigh is a good example dataset. But anything is better than nothing. Attribution for SWI may include sizes of various

components, condition, and if the SWI is conveying waters of the state as well as stormwater. Useful would be actual upstream/street impervious cover for each inlet to help prioritize where to focus restoration efforts and flood mitigation.

Project Impact:

Community scientist and others would benefit from being able to be directly involved in urban areas in the restoration programs as it would allow them to connect runoff from home to street to creek. Hopefully this association will increase willingness to implement practices on private property to help restore local water quality and reduce/prevent flood events.

Potential case studies can be developed with dollar amounts on a case by case basis using a DWR Project Economic Evaluation Tool.

Use Case provided by United States Marine Corps, GEOfideleis Utilities Viewer

Business Process:

Enterprise level Internet GEO*Fidelis* Utilities Viewer provides communication; electrical; natural gas; petroleum, oils, and lubricants (POL); thermal; storm water; wastewater; and water data in a secured web application. Utilities are controlled on the DoD "Critical Infrastructure List," therefore additional security measures are required for this service.

Business Process Justification:

The GEO*Fidelis* Utilities Viewer provides facility managers, planners, maintenance workers, emergency operations personnel and responders, environmental staff, telecommunication personnel, and other installation staff with communication and utility network. It also provides the same information to Marine Corps Installation Command (MCICOM), Washington, DC and its subordinate regional commands for a common framework and understanding of where to focus resources to improve infrastructure. The GEO*Fidelis* Utilities Viewer is also assisting the Marine Corps with the Department of Defense's Financial Improvement and Audit Readiness (FIAR) audit to identify and locate linear real property assets that cannot be visually located by the audit team.

Infrastructure Data Required:

Data nomenclature based on the Department of Defense Spatial Data Standard for Facilities, Infrastructure, and Environment (SDSFIE) 3.0 and GEO*Fidelis* Data Model 3.0.0.2.

Communication: CommUtilityNode; CommUtilitySegment

Electric: ElecUtilNode, ElecUtilNode_eCapacitorBank; ElecUtilNode_eDynaProtectDevic; ElecUtilNode_eExteriorLight; ElecUtilNode_eFuse; ElecUtilNode_eGenerator; ElecUtilNode_eGroundingPoint; ElecUtilNode_eMeterPoint; ElecUtilNode_eMiscNetworkFeatu; ElecUtilNode_eOpenPoint; ElecUtilNode_eSwitch; ElecUtilNode_eTransformer; ElecUtilNode_eVoltageRegulator; ElecUtilSegment

Gas: GasUtilNode; GasUtilNode_gControlFitting; GasUtilNode_gDrip; GasUtilNode_gGasLamp; GasUtilNode_gMeterPoint; GasUtilNode_gNonContrFitting; GasUtilNode_gOdorizer; GasUtilNode_gPressMonitorDevic; GasUtilNode_gRegulator; GasUtilNode_gRegulatorStation; GasUtilNode_gReliefValve; GasUtilNode_gRuralTap; GasUtilNode_gTownBorderStation; GasUtilNode_gValve; GasUtilSegment

POL: POLUtilNode; POLUtilNode_oDispenser; POLUtilNode_oFillStand; POLUtilNode_oFilterSeparator; POLUtilNode_oHydrantOutlet; POLUtilNode_oInjector;

POLUtilNode_oLoadingArm; POLUtilNode_oMeter; POLUtilNode_oPump; POLUtilNode_oRelaxationTank; POLUtilNode_oStrainer; POLUtilNode_oTank; POLUtilNode_oValve; POLUtilSegment

Thermal: TherUtilNode; TherUtilNode_tAquastat; TherUtilNode_tCondensateCollec; TherUtilNode_tControlValve; TherUtilNode_tExpansionJoint; TherUtilNode_tExpansionLoop; TherUtilNode_tExpansionTank; TherUtilNode_tFitting; TherUtilNode_tMeterPoint; TherUtilNode_tProdStruc; TherUtilNode_tPump; TherUtilNode_tReliefValve; TherUtilNode_tStrainer; TherUtilNode_tSystemValve; TherUtilNode_tTrap; TherUtilSegment

Storm water: StormwaterUtilityNode; StormwaterUtilityNode_swCleanOut; StormwaterUtilityNode_swDownSpout StormwaterUtilityNode_swFitting; StormwaterUtilityNode_swGate; StormwaterUtilityNode_swInlet; StormwaterUtilityNode_swManhole; StormwaterUtilityNode_swMeterPoint; StormwaterUtilityNode_OilWateSepa; StormwaterUtilityNode_swPump; StormwaterUtilityNode_swPumpSta; StormwaterUtilityNode_swReleaseValve; StormwaterUtilityNode_swSystemValve; StormwaterUtilityNode_swTreaPlan; UndefinedStormwaterUtilityNode; StormwaterUtilitySegment; StormwaterUtilityBasin; Impoundment_Stormwater

Wastewater: WastUtilNode; WastUtilNode_sCleanOut; WastUtilNode_sFitting; WastUtilNode_sManhole; WastUtilNode_sMeterPoint; WastUtilNode_sPump; WastUtilNode_sPumpStation; WastUtilNode_sReleaseValve; WastUtilNode_sSystemValve; WastUtilNode_sTreatmentPlant; WastUtilSegment

Water: WateUtilNode; WateUtilNode_wBackflwPrvDevice; WateUtilNode_wControlValve; WateUtilNode_wFitting; WateUtilNode_wHydrant; WateUtilNode_wMeterPoint; WateUtilNode_wPressReduStation; WateUtilNode_wProdStructure; WateUtilNode_wPump; WateUtilNode_wReliefValve; WateUtilNode_wStorageStructure; WateUtilNode_wSystemValve; WateUtilSegment; Well

Infrastructure Data Obtained:

Data are maintained by each Marine Corps installation using their local projection, scale, and accuracy requirements based on the State or country geodetics. The 17 installation geodatabases are “rolled up” into a single geodatabase using WGS 1984 Web Mercator (Axillary Sphere). Data gaps may occur due to resource constrains or other local factors.

Data Security:

All GEO*Fidelis* data is considered Controlled Unclassified Data (CUI) and must follow DoDI 5200.48 and other guidelines. The local Installation Geospatial Information and Services (IGI&S) Managers vets all requests for access to utilities data. Non-disclosure

and authorization letters are standard operating procedures when releasing data to outside organizations (e.g., DoD-affiliated contractors). Internal access the GEO*Fidelis* Utilities Viewer requires Common Access Control (CAC) authentication and an Active Directory entry. Remote desktop access is control through the ArcSDE roles and permissions security.

Ideal Infrastructure Data:

The Marine Corps is moving to a Federated SDE environment which should reduce the requirement to "roll up" the individual installation geodatabases into the single Portal geodatabase. The Federated environment should also allow on-line editing to improve data quality. The Federated environment requires all Marine Corps installation migrate their data to SDSFIE 4.0.

Marine Corps wants to implement network analyst to simulate impacts to utilities systems.

Currently implementing tracking usage over time to estimate future utilities cost through operational dashboards and other linkages to utilities viewers and systems.

Incorporating smart sensors and control systems to preemptively maintain facilities and utility systems using targeted maintenance on equipment and systems to reduce costs and ensure installation resilience.

Project Impact:

The Marine Corps' SDSFIE 4.0 migration and ArcGIS 10.8.1 upgrade should be completed by Sep 2021. Disruption to installation management and the associated cost has not been calculated since the migration is a DoD mandated requirement.

Use Case provided by Town of Cary

Business Process:

Cary provides 911 services for our Municipality and two adjoining Municipalities, Apex and Morrisville. Collectively it is called CAM 911 for short. We also provide utilities to Morrisville, but not Apex. As part of our standard Map within our CAD system and MDCs (Mobile Data Computers) we include Hydrants.

We will need hydrant information from Apex and Holly Springs in the areas where Apex provides Mutual Aid into Holly Springs.

Business Process Justification:

By including the hydrants, we allow dispatchers to show if a hydrant is out of service and allow fire personnel on fire calls to preplan where they can drop hoses to set up to fight a fire.

Infrastructure Data Required:

Hydrants

Infrastructure Data Obtained:

I was able to obtain the data from Apex using a web service. Scale and accuracy were good. To my knowledge their data is map grade GPS. I was able to get data for the entire municipality.

Data from Holly Springs was received by email upon asking. I am not sure of the accuracy of their data. I was able to get data for the entire municipality.

Data Security:

There were no constraints placed on the data. I do not share the data outside of our CAD system. Our 911 center is in a secure area with restricted access. MDCs (Mobile Data Computer) are password protected.

Ideal Infrastructure Data:

Ideally receiving the data as supplied by Apex would be optimal. I like working with web services. It allows me to automate processes to pull the data for at-will updates to the CAD system.

Project Impact:

The time and effort it takes to reach out to Holly Springs to get a new file.

Use Case provided by Town of Cary, Infrastructure Data Provider

Business Process:

Developer/Engineering Firm is looking to develop a parcel of land. Prior to developing plans for the site, they wish to obtain GIS data that includes existing infrastructure (Water, Sewer, Reclaimed Water and Stormwater).

Business Process Justification:

For our organization, can existing infrastructure support the intended future development? For the developer knowing the existing infrastructure can reduce construction costs and provide construction timeline efficiency.

Infrastructure Data Required:

Water, Sewer, Reclaimed Water and Stormwater for the area surrounding the proposed development area.

Infrastructure Data Obtained:

We ask the requestor for a shapefile that contains a polygon outlining the area of interest. We deliver the data in either a shapefile or file geodatabase format. Accuracy is relative to the source documentation of the data.

Data Security:

No constraints are placed on the data provided.

Ideal Infrastructure Data:

Provide the data in a File Geodatabase where the data is supported by accurate source documentation (Signed Sealed As-builts, Signed Sealed and Classified Surveyed Documents).

Project Impact:

Level of confidence in the data provided.

Use Case provided by North Carolina Railroad, Data Provider

Business Process:

The North Carolina Railroad Company owns a 317-mile railroad corridor from Charlotte to Morehead City and manages encroachments along that corridor to protect this valuable asset. Encroachments can come in the form of utilities, structures, property conflicts, or unauthorized access. If encroachments along a rail corridor are not managed, they can impact the railroad's ability to operate safely and preserve the corridor for future rail uses. NCRR employs a strategy to manage encroachments which includes a proactive approach to sharing corridor boundary data in order to assist others in understanding exactly where the corridor boundary is located.

Business Process Justification:

NCRR is a private business corporation, with one hundred percent of stock owned by the state of North Carolina. The railroad corridor is a rich asset, which is protected and managed for the good of North Carolina's citizens. It reaches from the State Port at Morehead city through the interior of the state to Charlotte and is a major part of the overall rail system in the North Carolina. Rail corridors obstructed by encroachment operate less safely and efficiently and do not have room for expansion, which may lead to loss of economic growth opportunities for the state. The data sharing component to corridor management assists local governments and real estate professionals (surveyors, engineers, developers, etc.) understand where the corridor boundary is located in order to effectively make, or avoid, decisions that may lead to adverse impact on the railroad corridor or their constituents (general public or clients).

Infrastructure Data Required:

The data needed to achieve the goal of protecting the railroad corridor is not infrastructure, specifically. It is the boundary in which the infrastructure is contained. Data shared with those who need it consists of railroad corridor boundary information which is available in several different formats depending on the application of the data (survey quality, GIS quality, etc.). NCRR may share surveyed corridor centerline data from which a 200-foot-wide boundary can be extrapolated or non-surveyed data of irregularly shaped areas of the corridor in a GIS format. In any case, NCRR strives to continually improve the accuracy of the data and share the most applicable data on a case by case basis.

Infrastructure Data Obtained:

NCRR shares corridor centerline and/or boundary data in either CAD or shapefile format. The extent of the data shared depends on what the requestor requires and how it is being applied. It is either project specific for surveyor and engineers, or county-wide for local governments. Accuracy and scale depend on the specific application of the data.

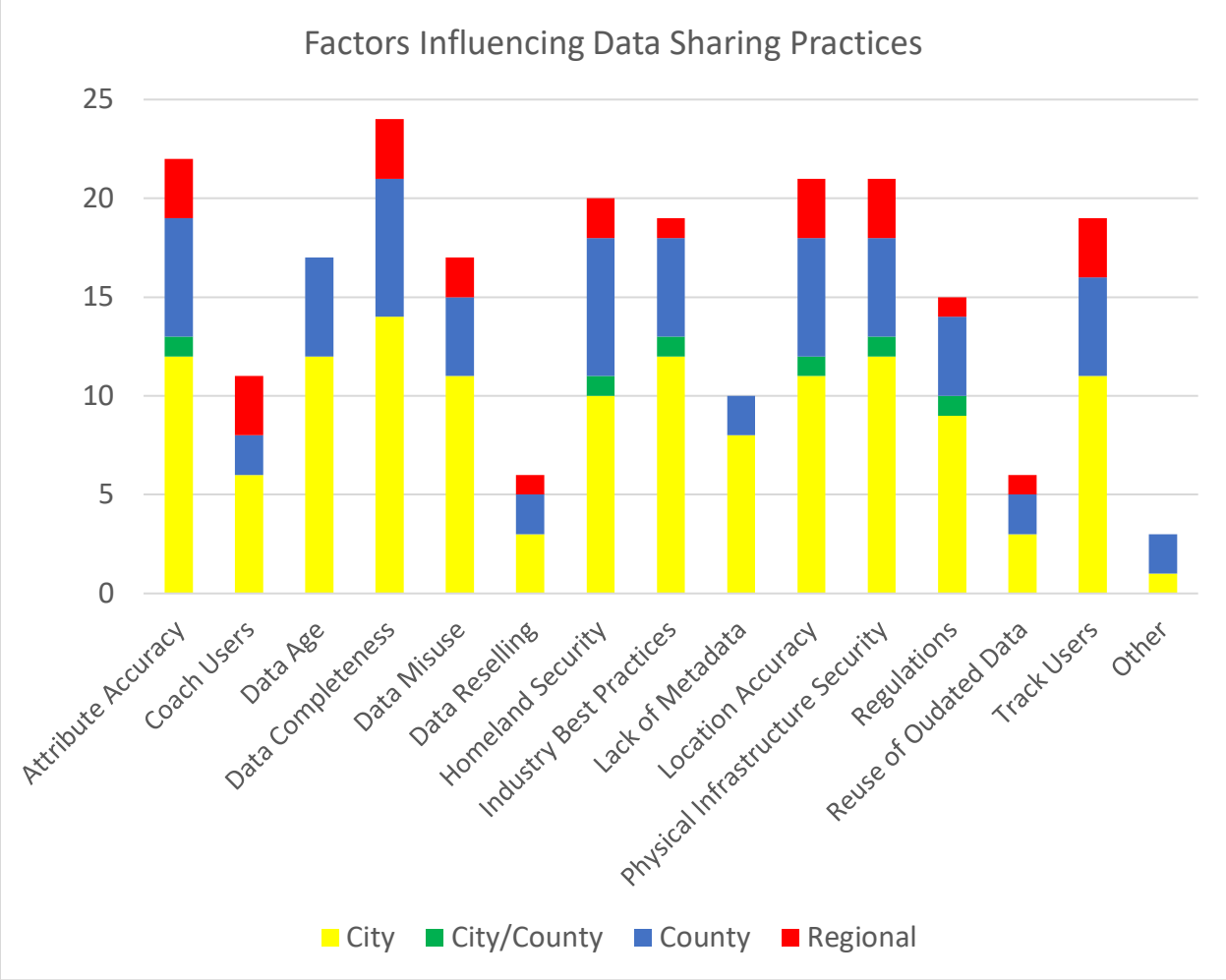
Data Security:

NCRR requires any recipient of the data to sign a data sharing license agreement. Separate forms are used for private and public sector as the data is often applied at a project specific level in the private sector and much more broadly in the public sector. Each have different risks for NCRR and limitations for the end user. Basic constraints include the inability to sub-license the data with third parties, acknowledgement of accuracy limitations, acceptance of risk in using the data, release NCRR from having to update the data, etc. Additionally, the local government agreement provides and pathway to display or use the NCRR data in a manner that benefits the public without being considered a third party sub-license.

Appendix 4: Infrastructure Survey Results

Survey Results: Factors Influencing Data Sharing Methods

Q: Please select all that influence your data sharing practices:

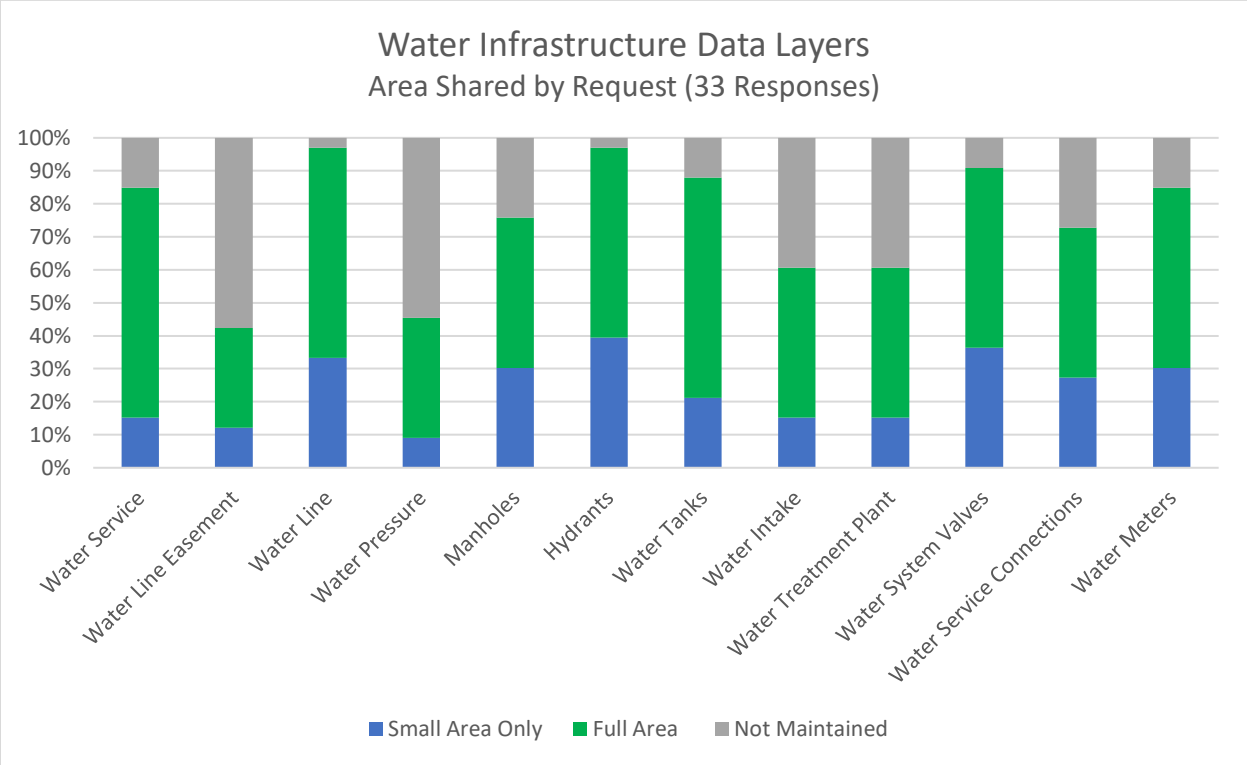


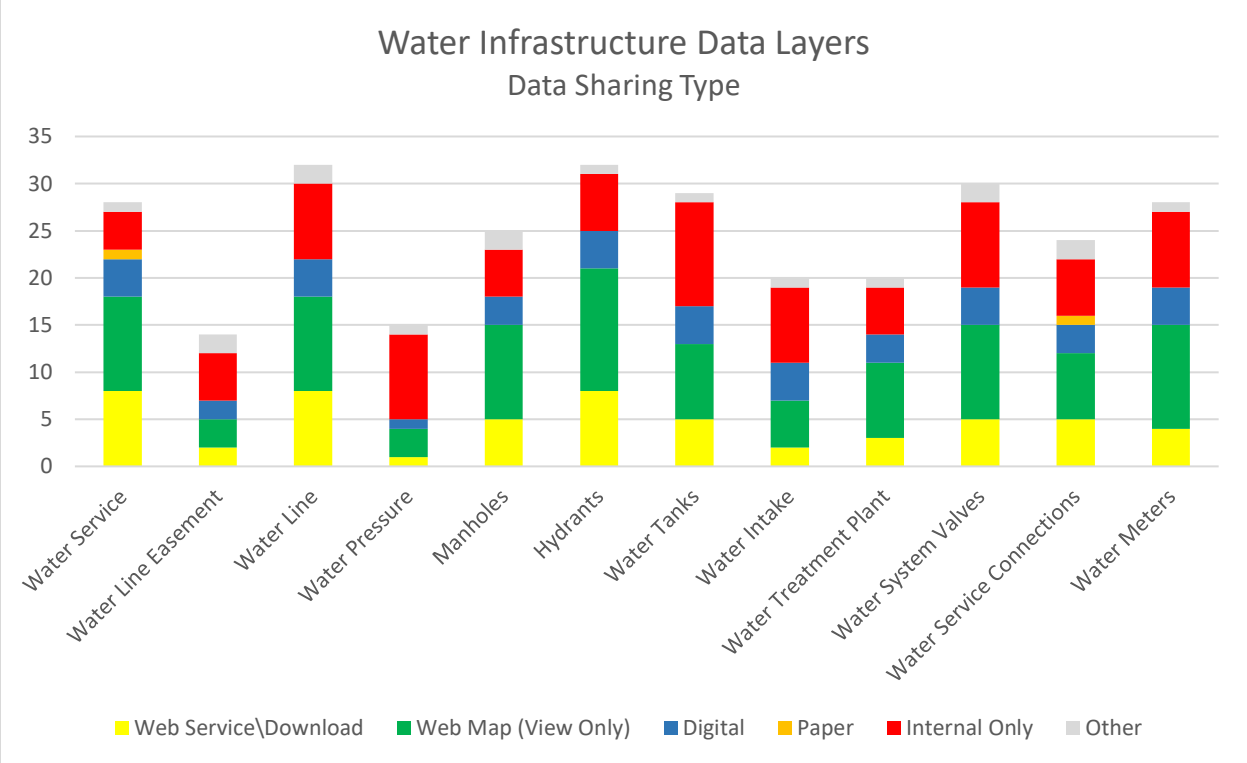
For the following sections, respondents indicated the ways they share infrastructure data. The survey allowed multiple answers. For instance, a city could answer that they share data internally, through a view only webmap, and through a downloadable service. The second graph in each series shows a tally of the most open method indicated on each survey. Options included, in order of most open to least:

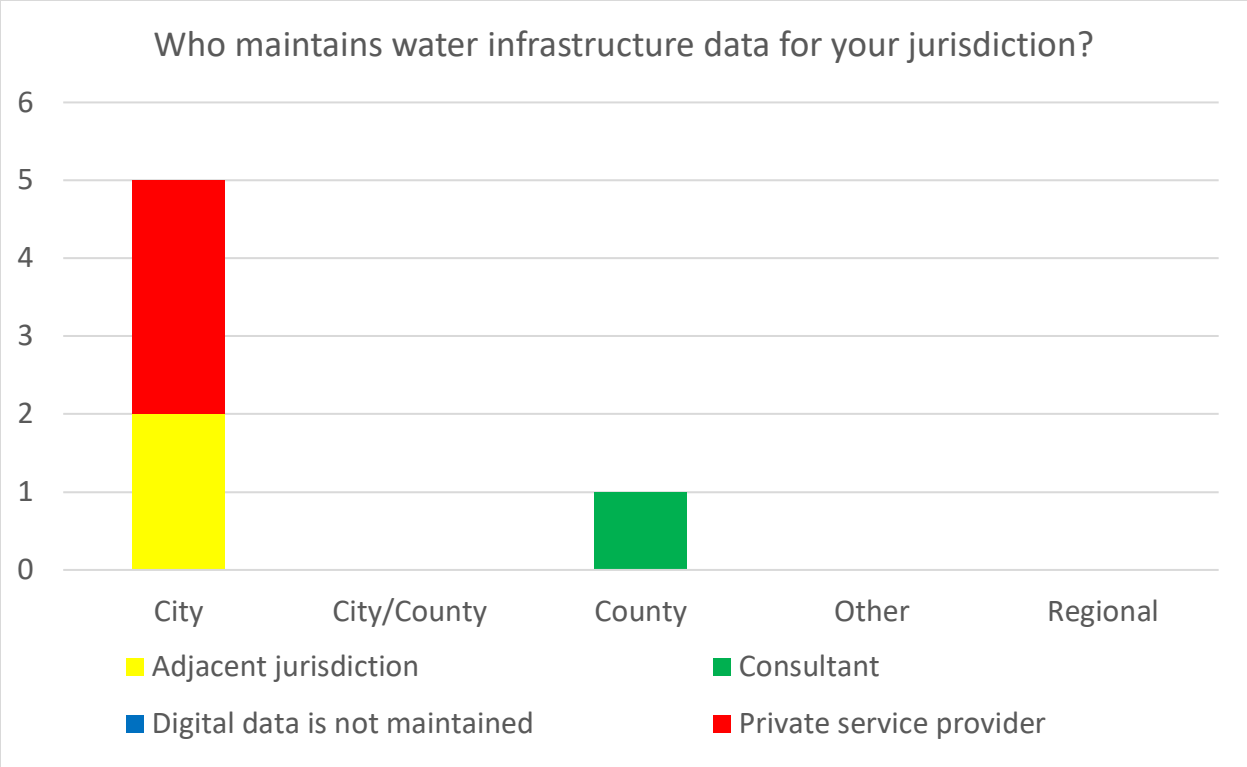
- Web service/download – an open data format that allows users to have full access to data and use it in various software.
- Web map – a view only map that allows the public to see infrastructure location in relation to other features
- Digital – a survey file or digital drawing of an area such as a .pdf file.
- Paper – a photocopy of the infrastructure plan of the area requested in paper form.
- Internal Only – various methods of sharing infrastructure data within the organization. This may include secured services, web maps, digital files, or paper.

Survey Results: Water

Q. Please tell us the ways you share the following data layers.





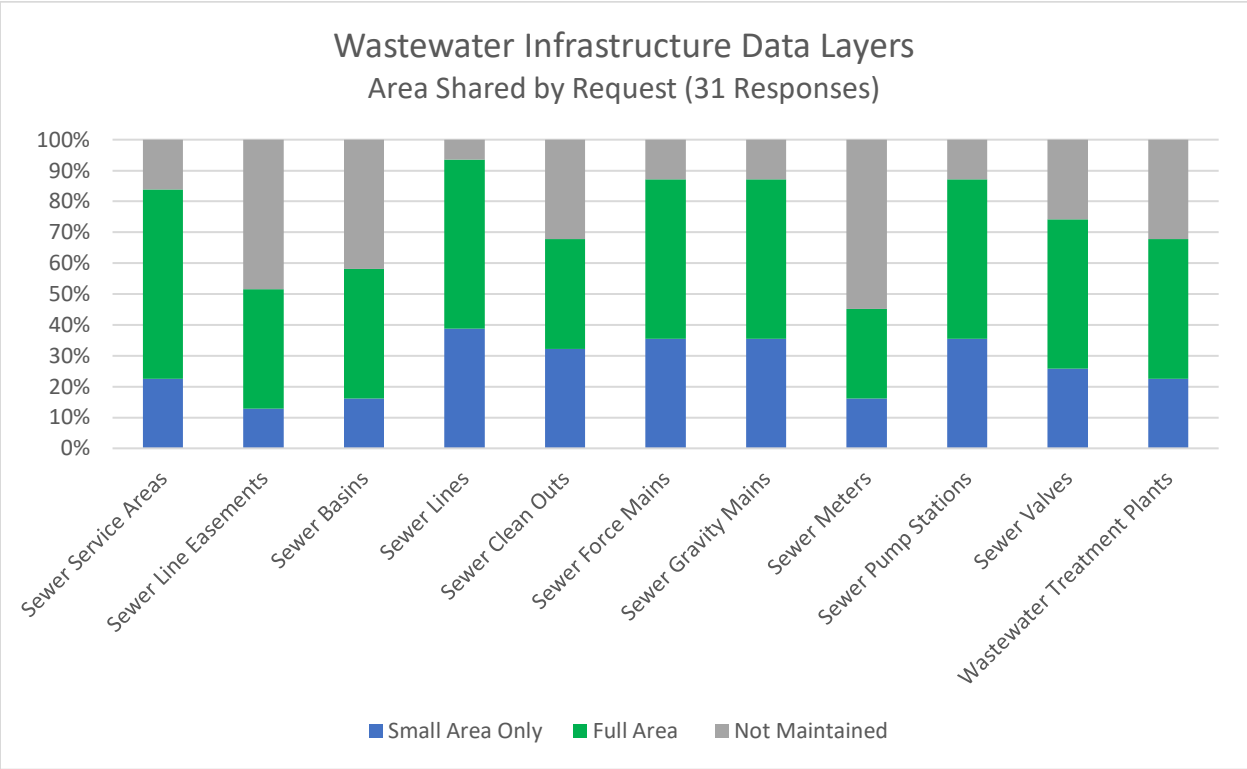


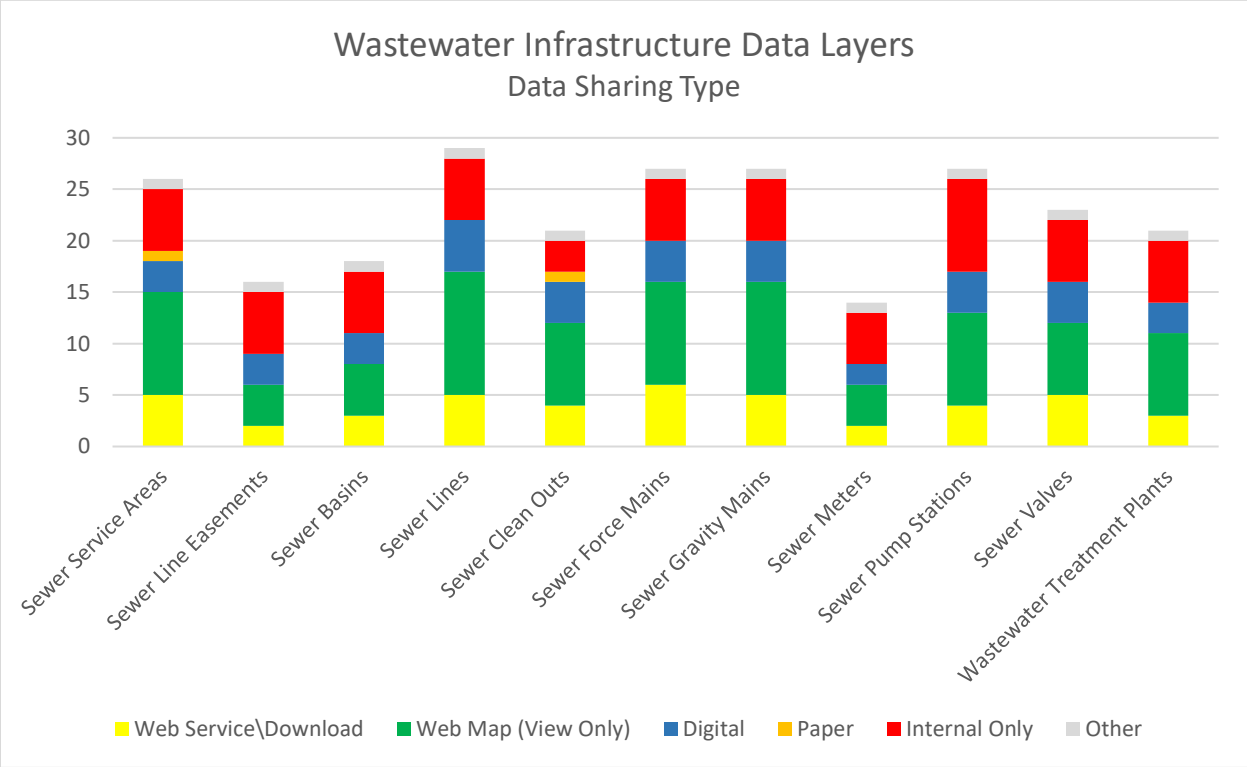
Is there anything you would like to clarify or explain about your water infrastructure data?
City
All data is sensitive and internal only, released publicly by special request for small areas only. Webmap sharing is internal only to the City, users must be on the City's network to access this data. Full water network is also shared with contracted third party vendors.
Everything we share we requires an individual or organization to fill out a Tier 1 (Licensed Professionals) or Tier II I(Individuals) Sensitive Data Request form that requires Name of Organization, Professional License Number, Date and Signature. All Tier I's and Tier II's are logged into a database. If the an organization requests an EDAR (Electronic Data Access Request) through our web viewer then we require 3 or more forms of of ID. The EDAR is only good for a year and is password protected that can be revoked at anytime.
We generally share all utility infrastructure data to public aside from water line break information
We have publicly available web mapping applications that show limited layers and attributes. For data request we do small area request for anyone and system wide request on for contractors working with the Town. We are in the process of setting up an Open Data site but have not decided what water layers will be available.
We have recently begun a full scale utility infrastructure inventory, scheduled to be complete in 3 - 5 years. The end result will have all utility infrastructure available on ArcGIS Online, with field workers able to view and edit utility data in the field on mobile devices.

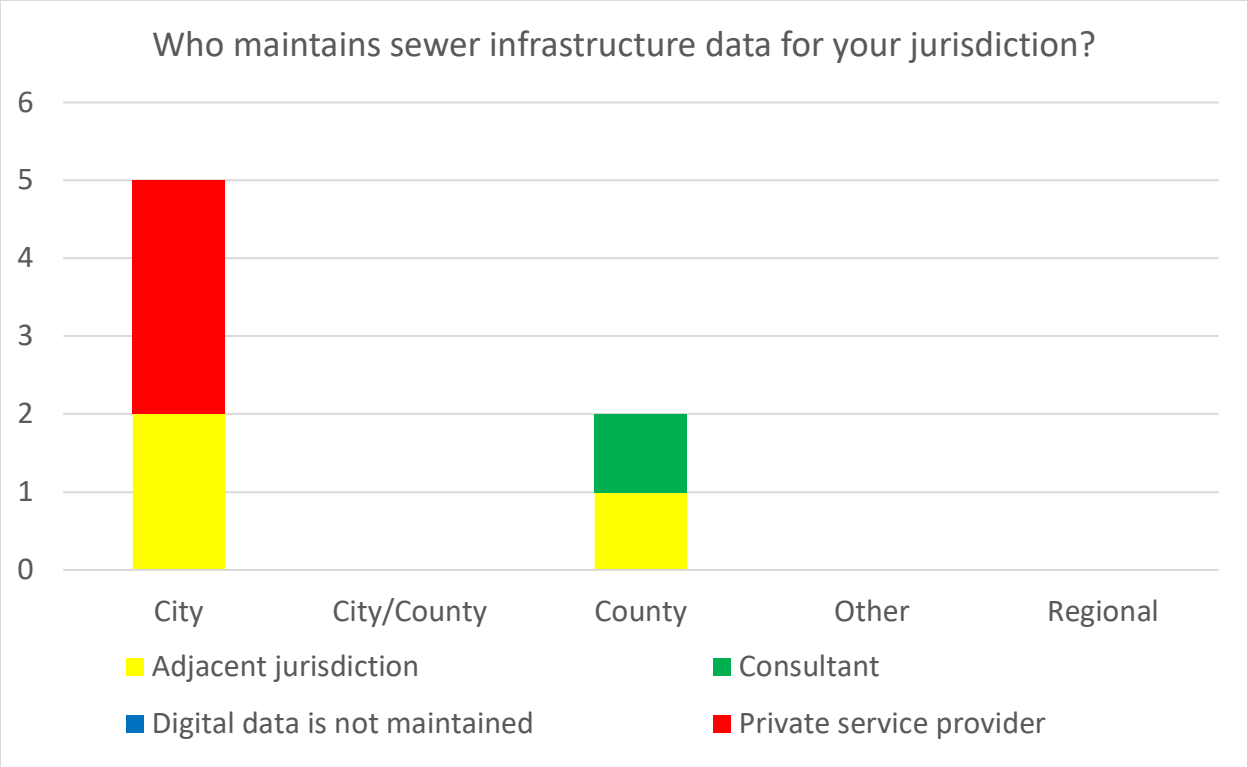
County
All of our water data used to be available to the public. At some point in the past, we were asked to keep it internally as it was a direct target for domestic terrorism. I have to get permission from the Water Department prior to sharing any data other than hydrant data with both public or private requests.
Many of these layers are still in development. We also share jurisdiction with the City.
Small area requests only/not full network are typically provided in PDF/paper format; however, if work or services are being performed for County, they can submit a request for spatial data of a larger area or the full network
To date we have always hared basic water asset locations for hydrants and mains.
Utility data is considered sensitive under Homeland Security rules and is not to be shared outside the organization.
We collect water and sewer information from various sources for internal county operations. We do not share or distribute this data because we can verify the completeness or accuracy of the data.
We share all sewer and water information internally. We do not share anything on a public website. If contractors or citizen needs information they have to call public works, the information has to be approved by the engineer or public works director and then we send out the information digitally. We are still working under the homeland security idea of not having that public information.
Other
Have water system infrastructure in GIS, but have not maintained over time. Future updates planned in next 12 months
We work closely with OWASA on coordinating our respective asset information. They generally own up to the meter on water & non-potable, and from first manhole serving 2 or more buildings and downhill on the sewer system.
Regional
Data is shared with consultants and contractors working directly with and for the Airport Authority. Our utility data is shared internally via web maps/apps.
We maintain water data layers for the City of Southport
We share data via electronic map for water availability in a defined area to support our New Development group. If an engineering firm wants GIS data, we have them sign a data distribution agreement, and only share data for a defined area of interest. We typically do not share our entire water or sewer network with anyone. We have MOUAs established with the counties, municipalities, and other utilities in our service area. We also share our entire network with consultants under contract with CWS. They must sign a NDA to receive and use the data, and only for the purposes of the defined project.

Survey Results: Wastewater

Q. Please tell us the ways you share the following data layers.



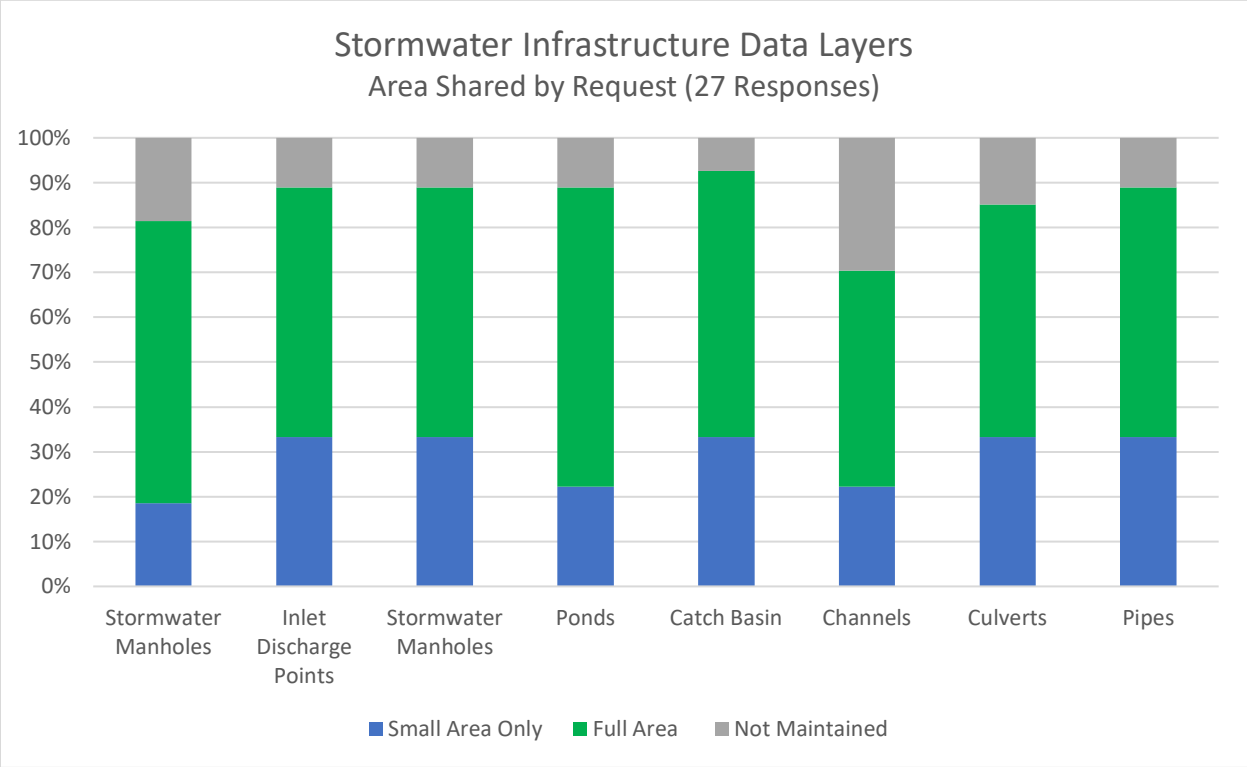


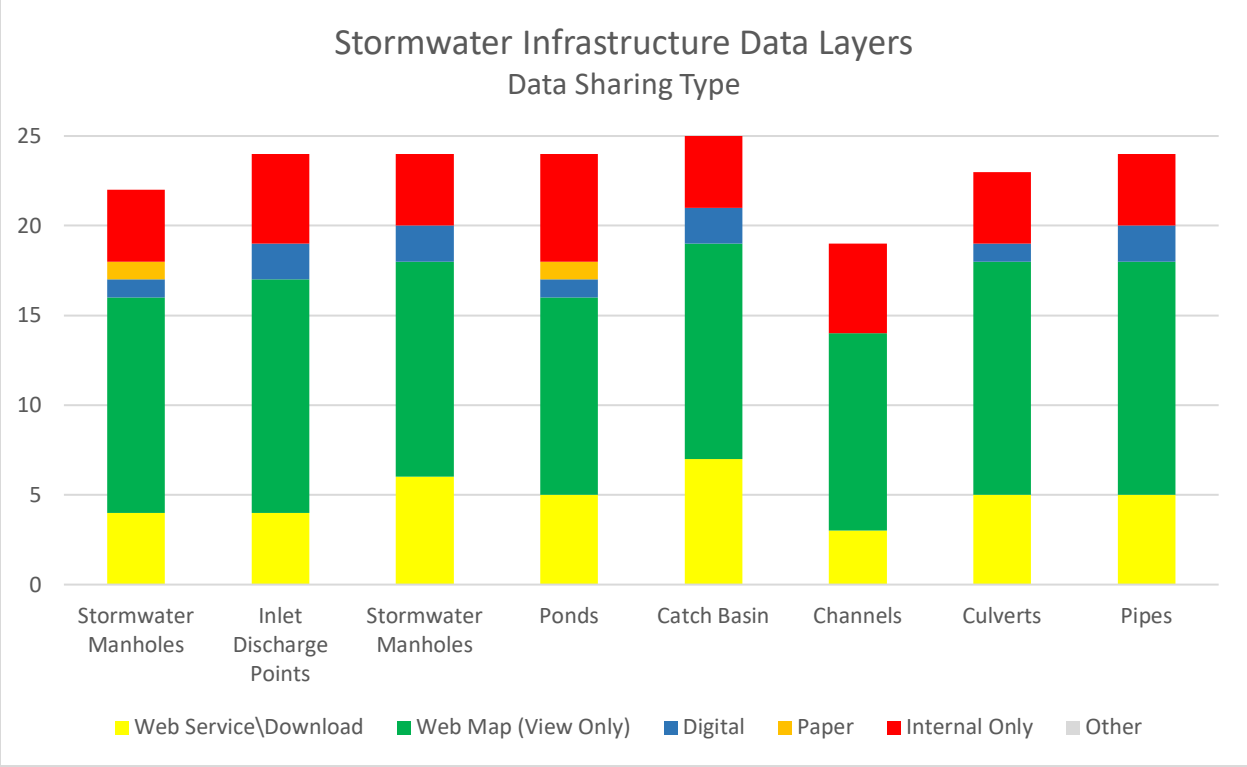

Who maintains sewer infrastructure data for your jurisdiction?
6
5
4
3
2
1
0
City
City/County
County
Other
Regional
Adjacent jurisdiction
Consultant
Digital data is not maintained
Private service provider

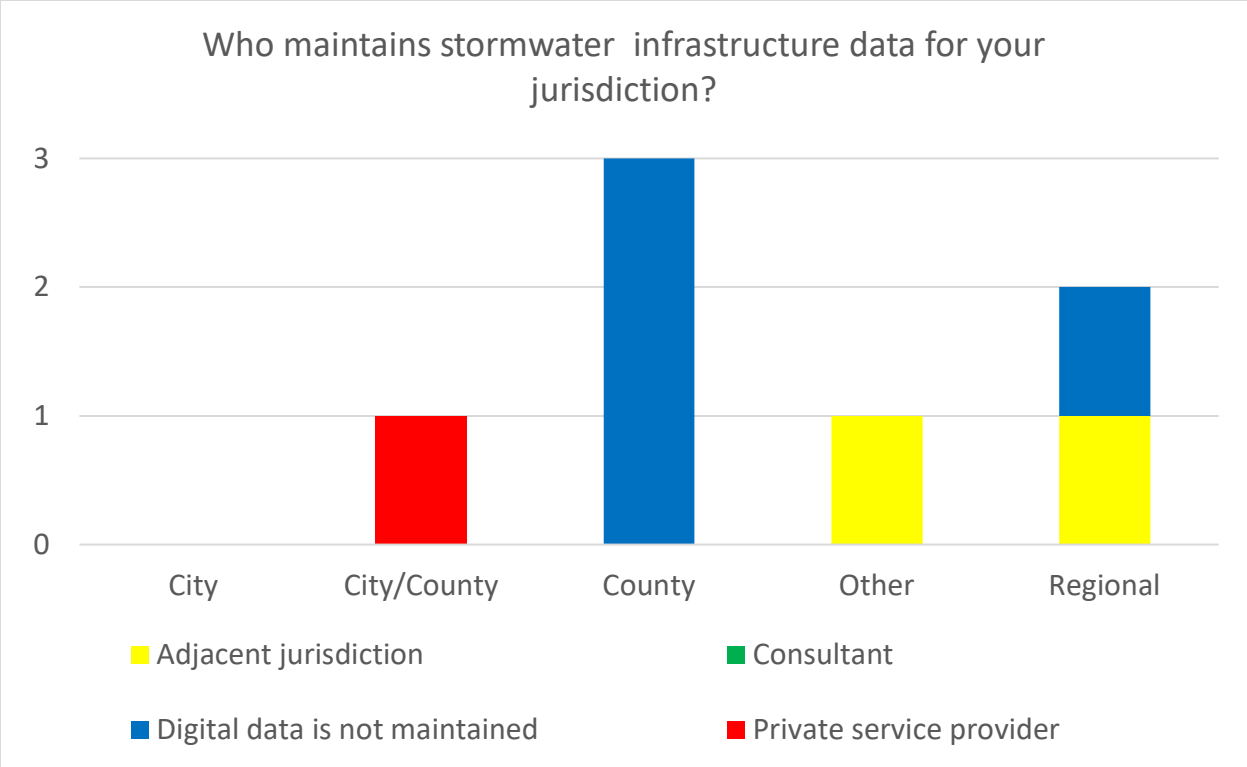
Is there anything you would like to clarify or explain about your wastewater infrastructure data?
City
Datasets are maintained by Raleigh Water. Contact Andrew Hayes for more information. andrew.hayes@raleighnc.gov
Same as water
We generally share all sewer utility infrastructure data with the public aside from some internal layers about condition scoring
We have recently begun a full scale utility infrastructure inventory, scheduled to be complete in 3 - 5 years. The end result will have all utility infrastructure available on ArcGIS Online, with field workers able to view and edit utility data in the field on mobile devices.
County
Homeland Security classifies utility data as sensitive and not to be shared outside of the organization.
Most of these layers are still in development. Layers available to the public are not comprehensive.
Small area requests only/not full network are typically provided in PDF/paper format; however, if work or services are being performed for County, they can submit a request for spatial data of a larger area or the full network
We gather sewer lines from several entities and only use this data internally because we can not verify the completeness or accuracy of the data.
We only have one very new, very small sewage district. We are in the process of getting it mapped now.
Regional
Data is shared with consultants and contractors working directly with and for the Airport Authority. Our utility data is shared internally via web maps/app.
Same comments and procedure as water data.
We maintain sewer data layers for the City of Southport, the Town of Fair Bluff, and the Town of Lake Waccamaw

Survey Results: Stormwater

Q. Please tell us the ways you share the following data layers.



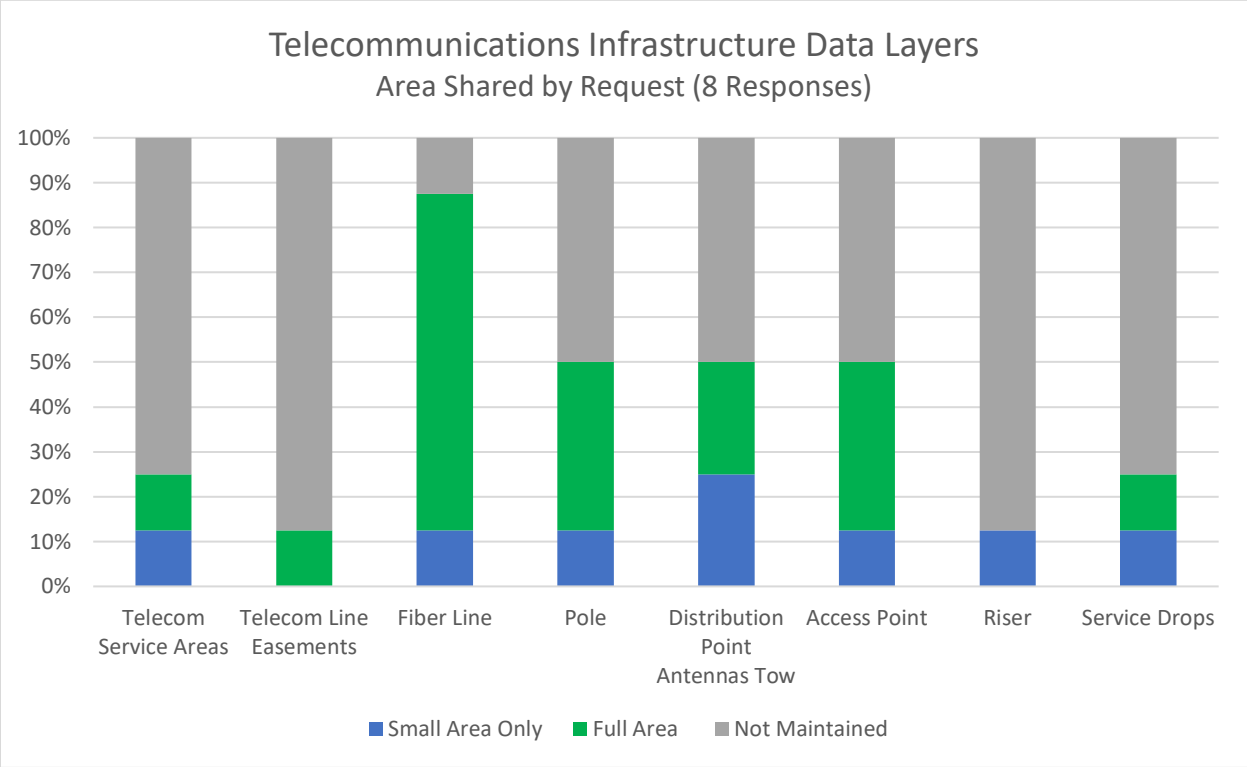


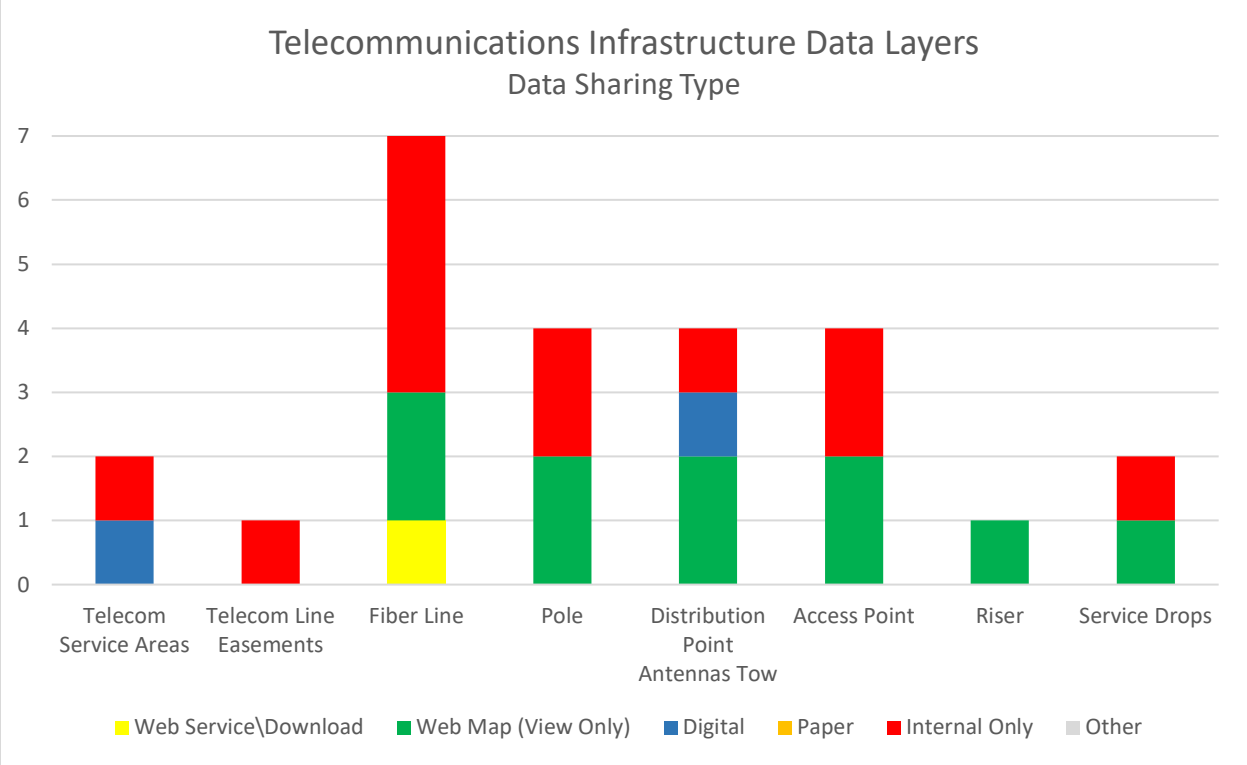

Who maintains stormwater infrastructure data for your jurisdiction?
3
2
1
0
City
City/County
County
Other
Regional
Adjacent jurisdiction
Consultant
Digital data is not maintained
Private service provider

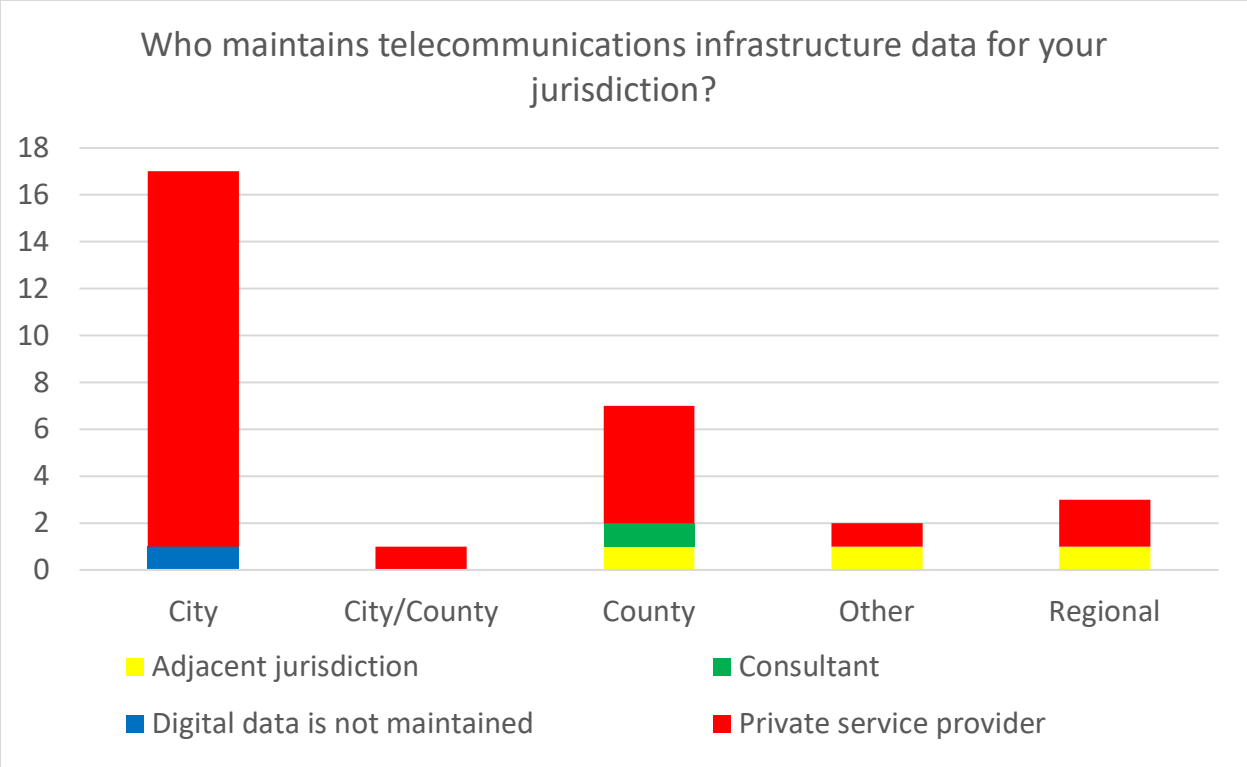
Is there anything you would like to clarify or explain about your stormwater infrastructure data?
City
Currently being restructured as part of a Watershed Master Plan using new field survey, and historical data to form a functioning database that connects an asset dataset and a modeling dataset. Desired end goal is to link the data between our Cityworks AMS, Open data portal for digital sharing, and web maps for display and sharing. Complete analysis will result in being able to view secondary system in reference to system and asset level of service.
Data is not downloadable.
Our stormwater infrastructure dataset was first created in 2004. It has been a work in progress since then, with distributed staff responsibility for which this is not a primary or mandatory responsibility. We created a Stormwater Utility in 2017 and have been incrementally working on improving the data. We are not sharing it more widely at this point mainly because of the need to improve and field verify the data. We hope to be able to do so in the relatively near future.
This data is being re-collected at the moment as part of a Stormwater Master Plan. Once entirety is collected this information will be incorporated into Asset Management Program. Stormwater modeling will be used to assess current asset structure and determine level of service. Then information will be shared via WebMaps & Apps for viewing and data sharing as necessary.
We have recently begun a full scale utility infrastructure inventory, scheduled to be complete in 3 - 5 years. The end result will have all utility infrastructure available on ArcGIS Online, with field workers able to view and edit utility data in the field on mobile devices.
We need to eventually map ditches and create a complete utility network but at the moment we have a mix of confidently surveyed data from new-ish as-built information, but a lot of old data is inherited from unknown times and sources and is is incomplete or suspect.
County
The storm water data is maintained and used by the Engineering Department for use in annual inspections
Other
The stormwater infrastructure GIS data is located within the public areas but not on private residential or commercial properties
Regional
Data is shared with consultants and contractors working directly with and for the Airport Authority. Our utility data is shared internally via web maps/apps. Wetlands and Hydrological features (ponds, streams, lakes, etc) are also sourced from other authoritative data sources, ie: USGS and state level organizations

Survey Results: Telecommunications

Q. Please tell us the ways you share the following data layers.



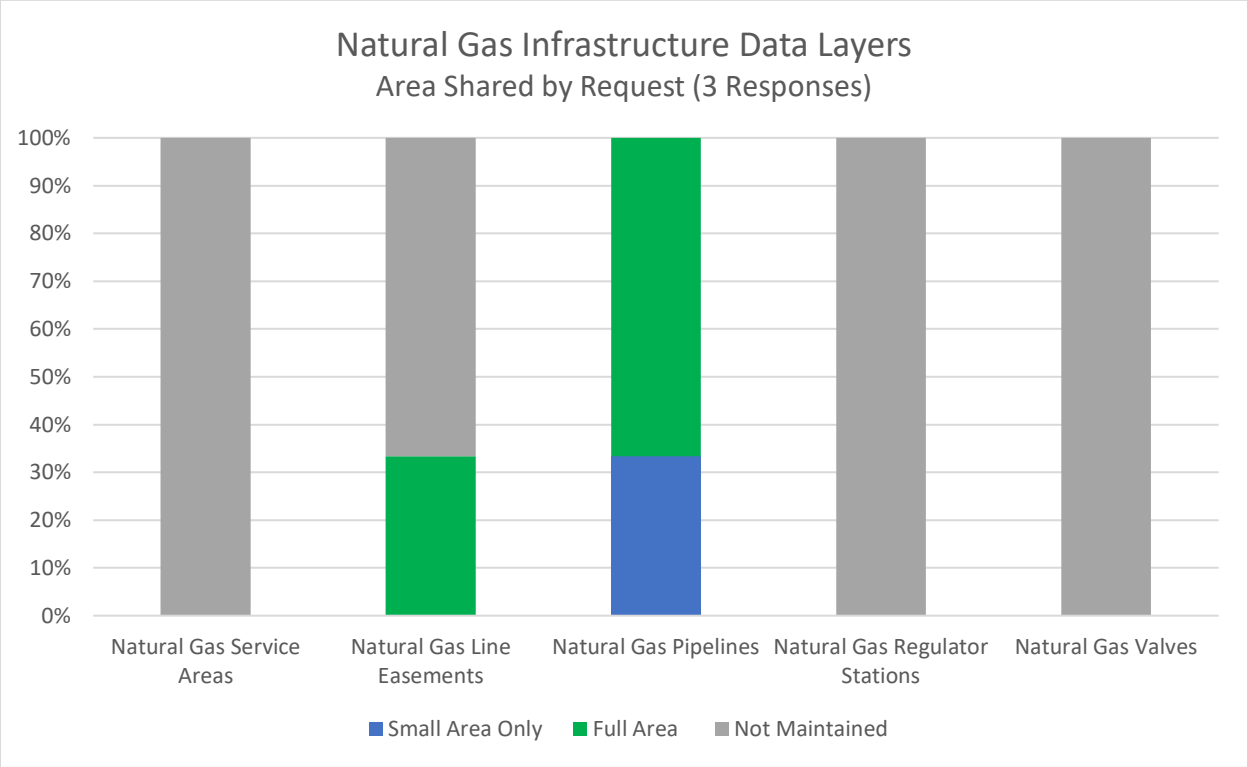


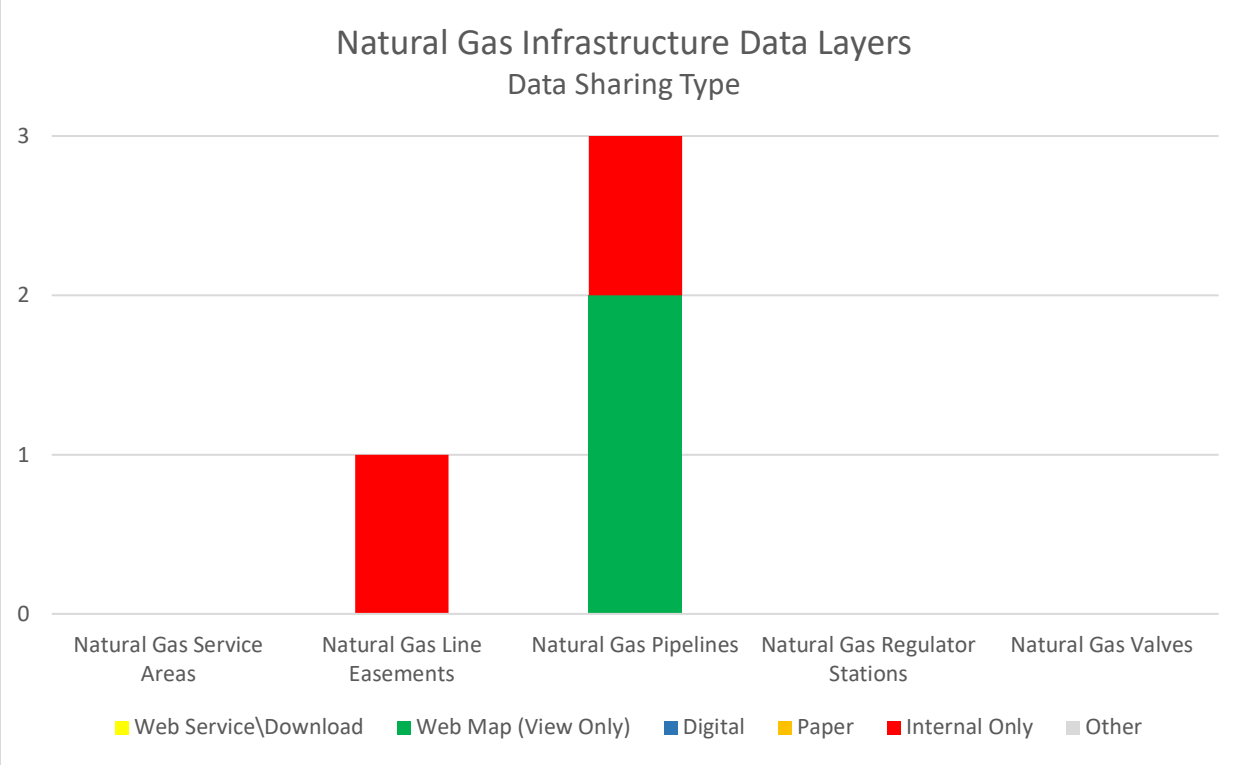


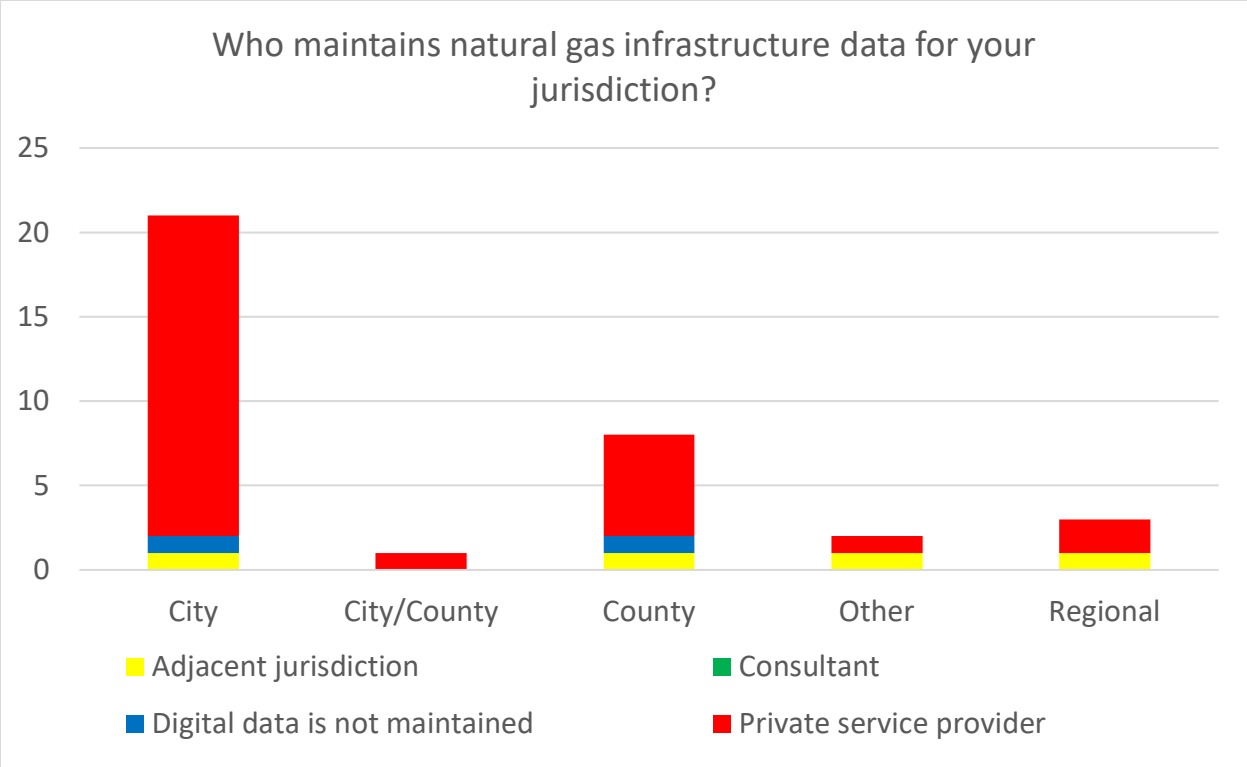
Is there anything you would like to clarify or explain about your telecommunications infrastructure data?
City
In the cloud in ArcGIS Online, data is collected using field maps.
Our IT Director chooses not to share fiber infrastructure information with the public for safety/security concerns.
We have some Town owned Fiber connecting Town owned facilities.
(blank)
City/County
(blank)
County
(blank)
Other
(blank)
Regional
Data is shared with consultants and contractors working directly with and for the Airport Authority. Our utility data is shared internally via web maps/apps.

Survey Results: Natural Gas

Q. Please tell us the ways you share the following data layers.



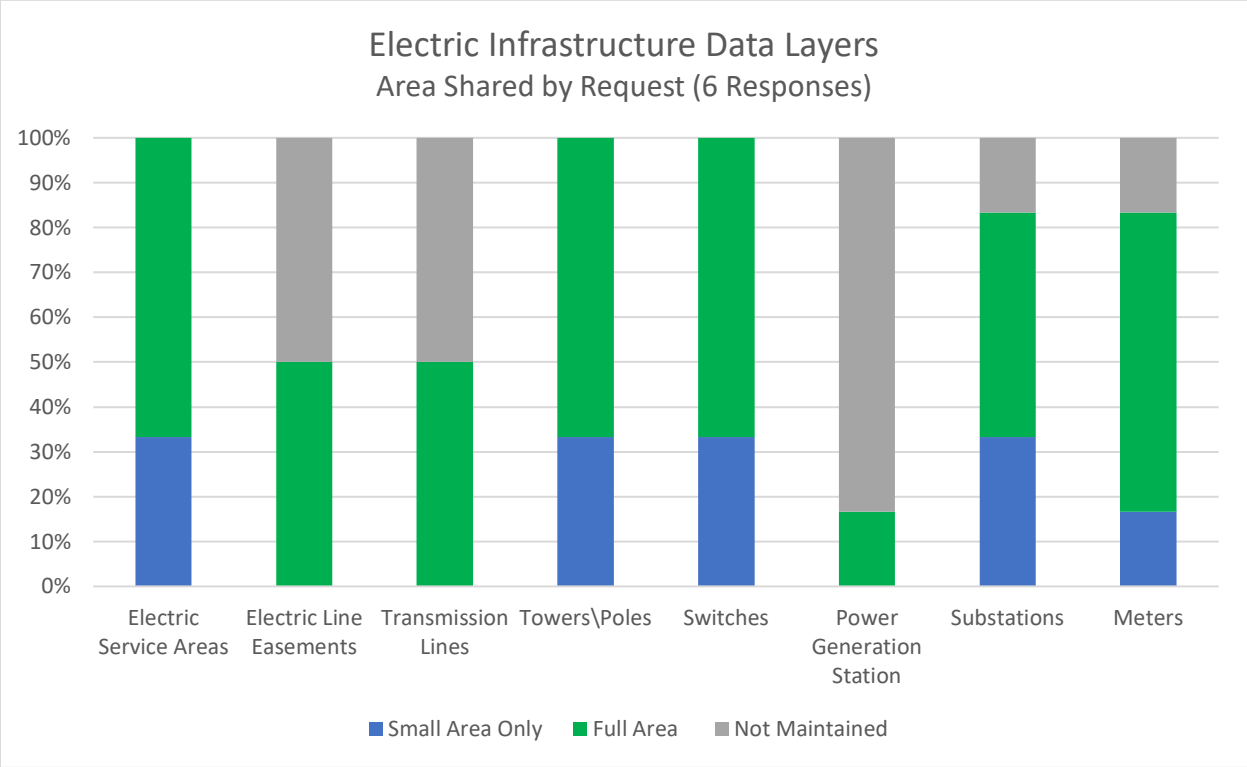


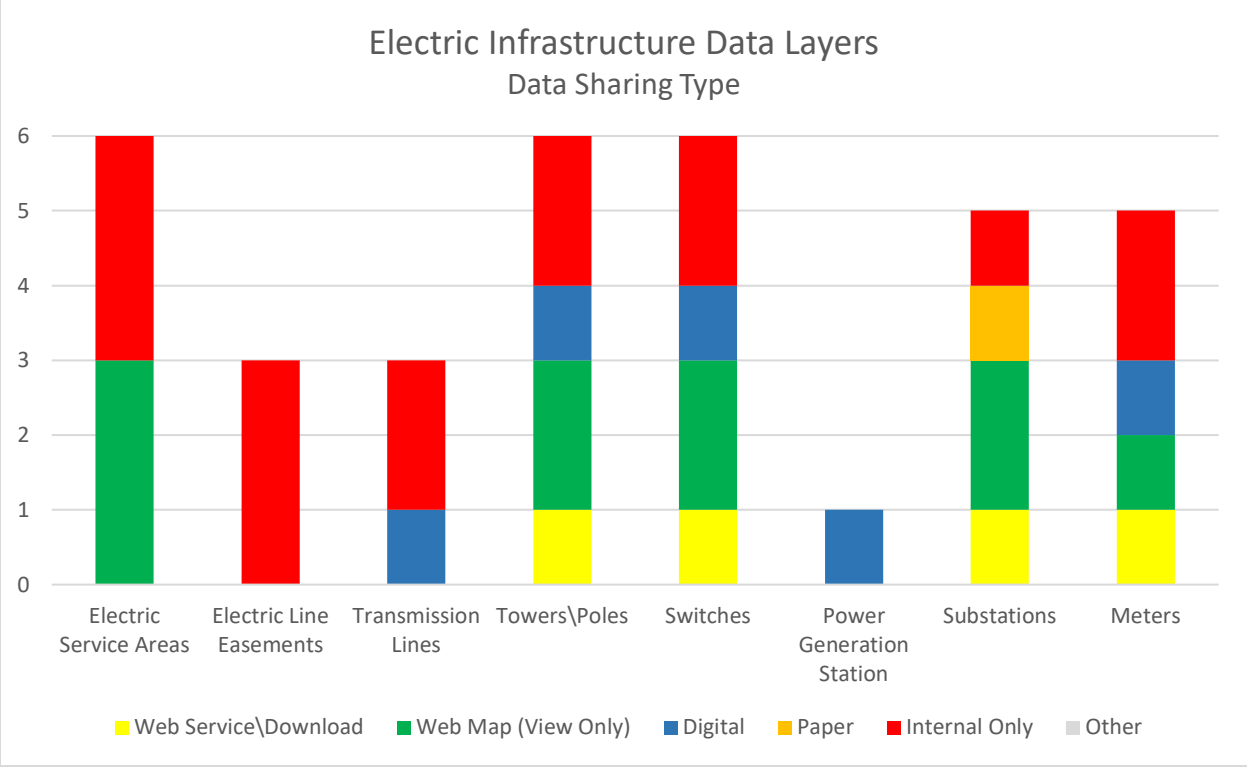


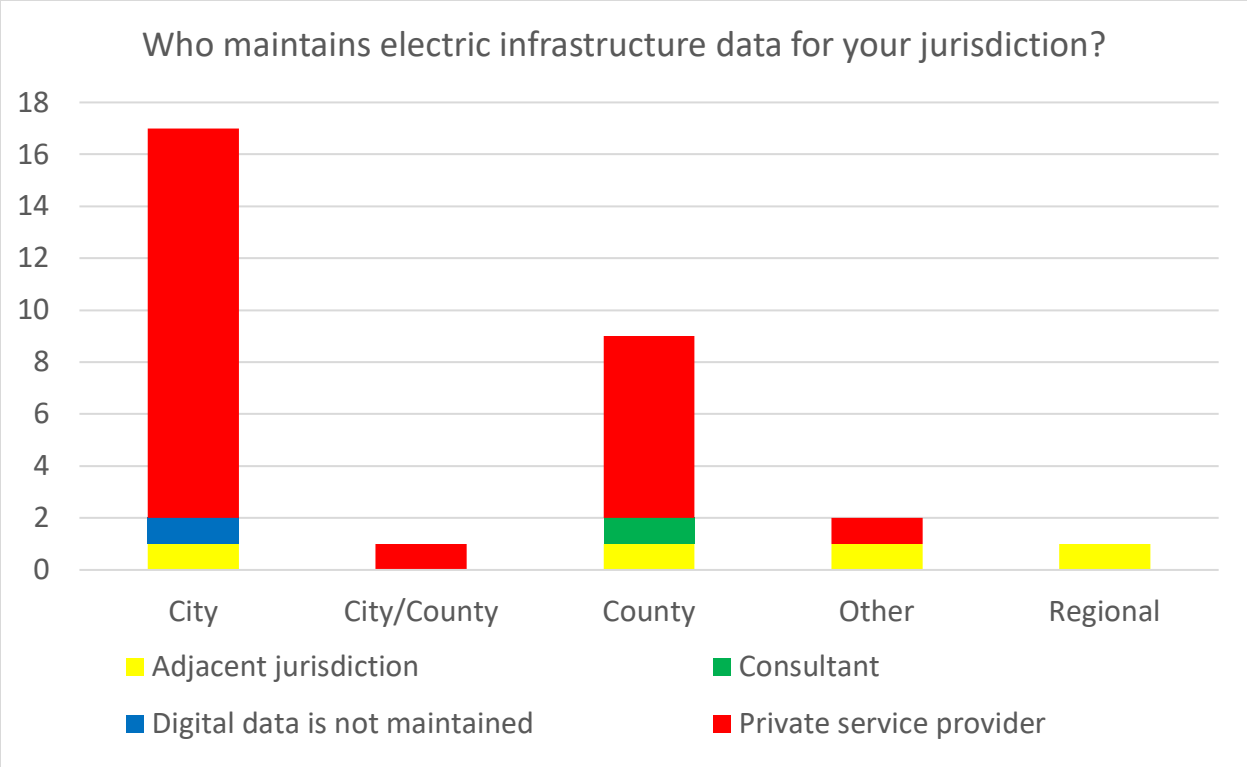
Is there anything you would like to clarify or explain about your natural gas infrastructure data?
City
(blank)
City/County
(blank)
County
The natural gas lines only appear on a password protected Website.
(blank)
Other
We have received PDF maps from SCANA/PSNC in the past, now they do not respond to data or map requests. We survey line locates, valves and meters and try to keep things updated even though we do not own or manage the infrastructure
(blank)
Regional
Data is shared with consultants and contractors working directly with and for the Airport Authority. Our utility data is shared internally via web maps/apps. Some of this infrastructure data was provided by gas provider.

Survey Results: Electric

Q. Please tell us the ways you share the following data layers.



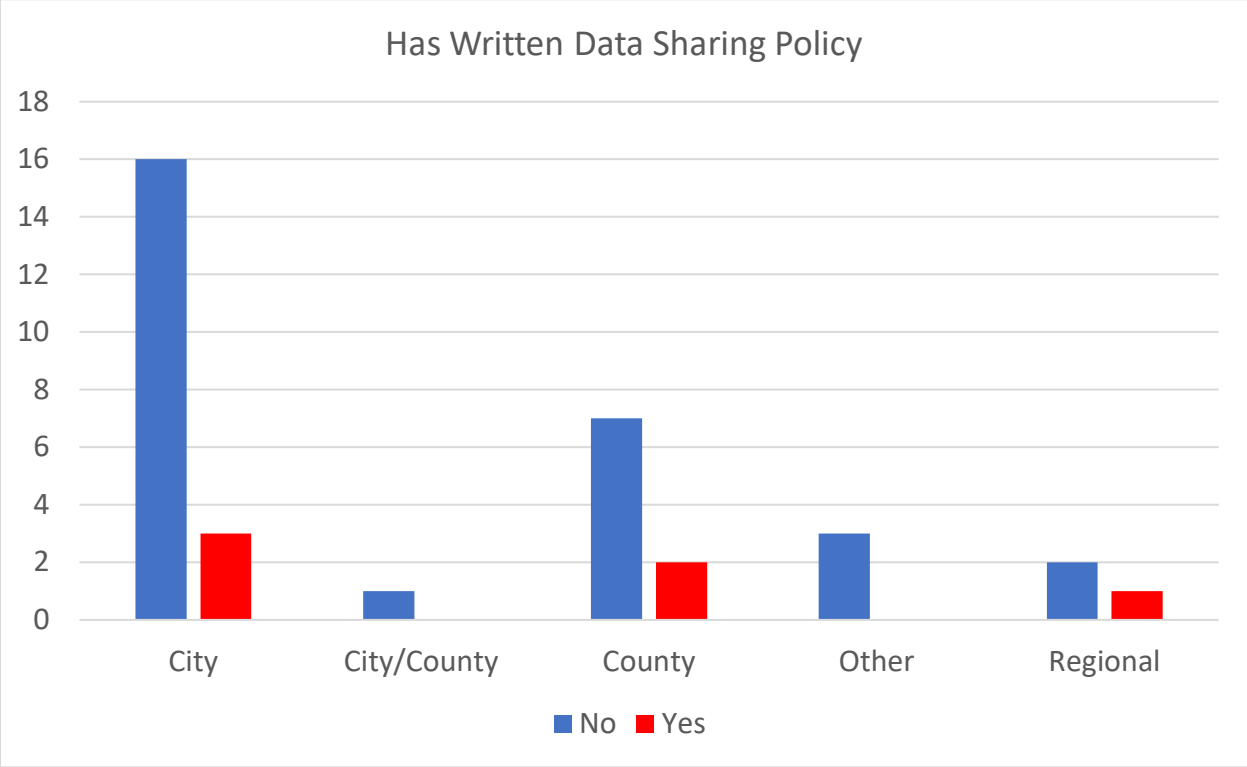




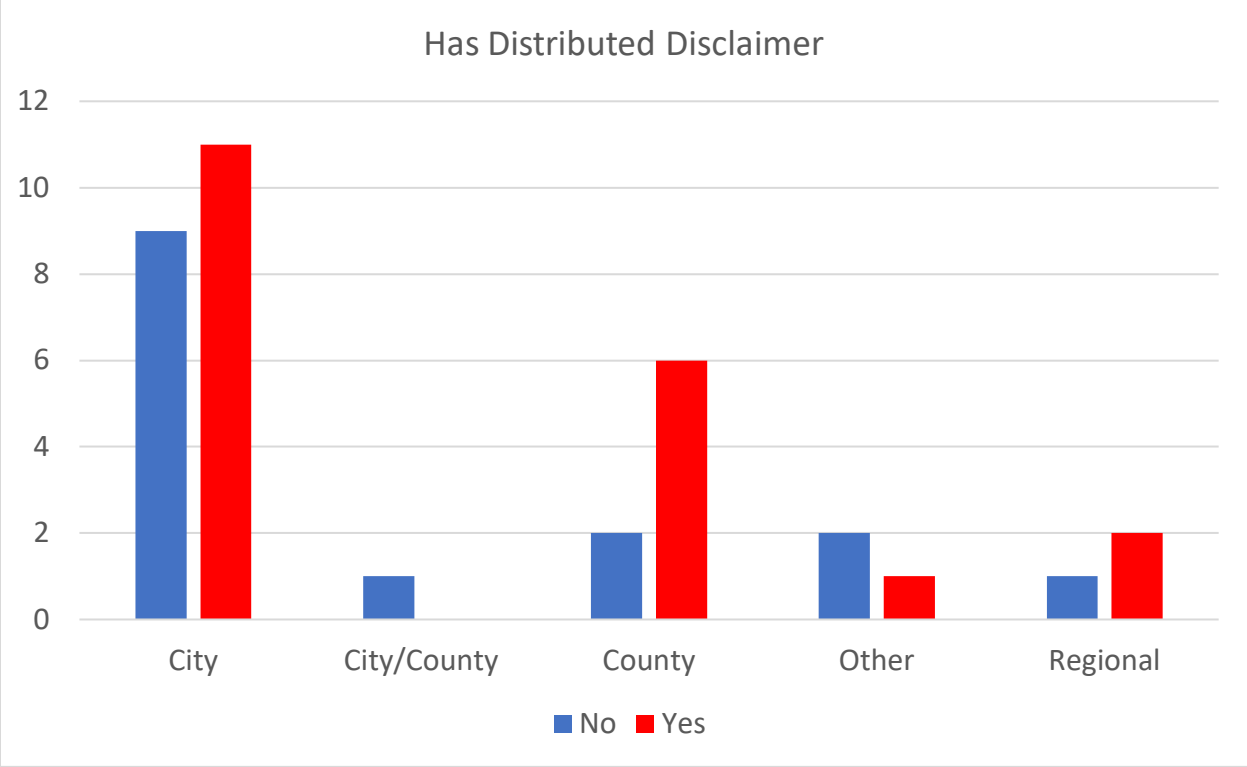
Is there anything you would like to clarify or explain about your electric infrastructure data?
Regional
Data is shared with consultants and contractors working directly with and for the Airport Authority. Our utility data is shared internally via web maps/apps. Some of this infrastructure data was provided by electric provider. Is not to be disseminated.

Survey Results: Policies and Disclaimers

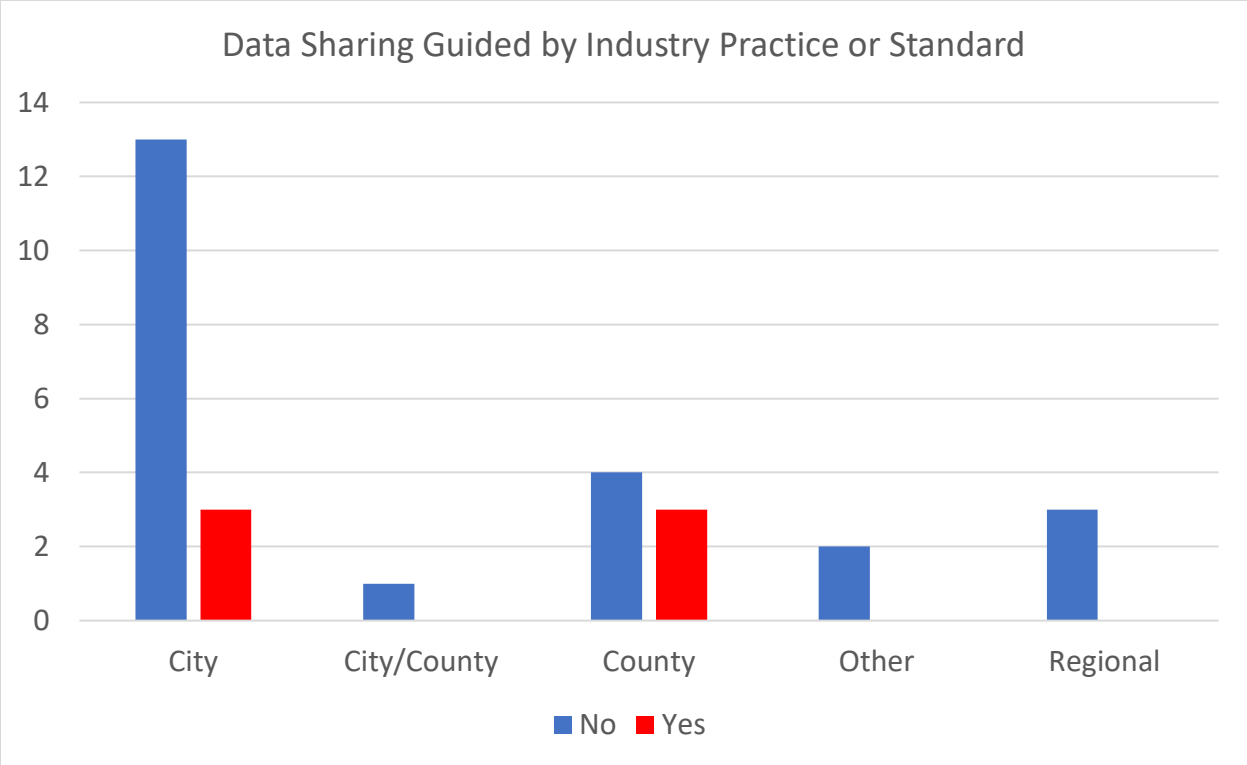
Q: Does your jurisdiction have a written data sharing policy? This may describe how data should be requested, what types of requests will be fulfilled, what type of data may be provided, or how the data may be used.



Q: If your jurisdiction shares data with nearby municipalities or counties, please describe what layers you share/collect and for what purpose. Are there security agreements or limitations placed on the data shared?



Q: Is your data sharing practice guided by an industry standard or regulation?



If your jurisdiction shares data with nearby municipalities or counties, please describe what layers you share/collect and for what purpose. Are there security agreements or limitations placed on the data shared?
City
I speak only for local stormwater data sharing. We share this data with Chapel Hill to coordinate our respective programs. We agree to not distribute more widely
LandUse, Zoning, etc
No specific agreements that I'm aware of.
Only the fire departments of those municipalities have access to the water data for fire response. Not that I know of.
Our neighboring counties of Harnett and Johnson County periodically contact each other to share infrastructure data but there is no formal agreement for use and scope, generally it's for contextual purposes. Harnett County however extends a water district into our little South-eastern corner of Wake County so we have more of a formal relationship with their Utility department, however I am not aware of the formality or written aspects of any agreement since that's out of my GIS wheelhouse and likely more of the purview of Utility Department authorities.
Parcel, street and zoning data.
Roads, Sidewalk, Stormwater. No security agreements.
Security Forms are completed and noted which municipalities.
we receive data from Greenville Utilities
We share our entire storm water inventory dataset with Mecklenburg County Storm Water Services. Our inventory includes data outside the city limits and within the county boundary. They use our data mainly for viewing purposes, but also in an mobile data collection of outfall points. The county shares new outfall points with the City after the annual data collection is finished.
We share water lines and hydrants, plus sewer lines with the County for economic development purposes, 811 calls, and realtors. Only the pipe diameter is listed with the line layers and only the Hydrant Number is listed with hydrants.
County
County boundary, streets, parcels, fire districts and municipalities. No limitations and we provide them as downloadable data
Hydrant data is shared throughout for the Office of the State Firemarshal reports and fire insurance district ratings.
Municipalities and private companies share their data with Randolph in various formats. It is sometime getting this information from the private company. We are willing to share our data with other government agencies. We are not willing to share with general public.
Some provide water/sewer data upon our request while others have required that we sign a confidentiality agreement.
Stormwater and Wastewater data are maintained by Durham County and City of Durham Separately. City of Durham maintains all other Public Works data for all of Durham County. There are joint City-County departments for development/continuity purposes. As of now, we do not have security agreements or limitations in place.
There is a general verbal agreement that we to not share the City of Wilson's Utility Asset information with parties outside of our organization.
They can get all the data they need. If we get their utility data from a municipality we assure them that when we get a data request we only give out OUR data and not any data that a municipality shares with us.
Water & Sewer data

Other
They do not have electronic data
We share data with Orange Water and Sewer Authority
Regional
Electric lines/infrastructure (schematic format only) Gas Lines Yes, not to be shared publicly.
We are a Council of Governments, we work for the local municipalities. If they request it, we get it to them. It is their data and they paid for the collection of it. Security concerns really only arise when we get third party request. The third party request need to be ok'ed with the municipalities.
We share water main, hydrant, and valve data and sewer main, manhole, pump station, and valve data with the counties and municipalities in our service area. They in turn share planimetric data with us. We also share data with other utilities, and they in turn share their data with us; sewer, electric, gas, storm water.

Please tell us how your current data sharing practices benefit your jurisdiction.
City
Accurate field data for staff.
Affords us the opportunity to use current and accurate data.
At the moment, our data sharing is very minimal. So our current data sharing practices have little, if any, benefit.
By sharing out data we field fewer calls from developers, engineers, and the public who are interested in our utility infrastructure data, and they can make use of the data as they please given our disclaimers about its (mis)use. I cannot speak for others but my interpretation of the security implications of sharing this data are minimal at this time. As-built records are public records, so someone determined to find utility information has other avenues besides publicly available electronic means like webmaps and Open Data portals. The benefits of sharing data freely outweigh the risks in my opinion.
Development and shared understanding to prevent out of sequence construction
Greenville Utilities provides Greenville with Greenville infrastructure data we otherwise would not have.
Helps developers understand what is available to them when considering property development.
No Data Sharing Policy in place
not sure
overlapping and connected systems need to be complete
Planning purposes.
Prior to the web viewer "Charlotte Explorer" and the open data portal, I spent multiple hours each week fulfilling data requests from consulting engineers, land surveyors, and the general public. The web viewer and data portal saves all of us time and resources.
The only GIS data that we share with out jurisdiction is out zoning map.
There is no benefit.
These practices protect our data and our organization from malicious attacks and from data integrity concerns.
To know about stormwater infrastructure at our municipal boundary
We are able to prevent service distruptions when other departments in town need to dig by having our water lines on a map that we share with them
We rely on County based data for Streets, Address Points, & Parcels which are the underlying pieces of data for most of our cities operations.
We share lots of data with the county and local fire departments.
We would provide infrastructure to the County if requested. We get data from the County from their download page. I also have a special login to their map viewer that allows me to view utilities layers not available to the public. I also have the ability to access their record drawings.
City/County
We have overlapping service areas, it it is helpful to know where those areas are
County
Due to lack of organizational GIS licensees (including Water), our data can be used by departments unable to access the GIS data via GIS software. Departments such as Planning and Environmental Health access the information via our Public Web Map.
In the case above, citizens benefit from lower insurance rates.
No benefit
Public safety.
Since we have limited regulations regarding data sharing, we are able spend time developing robust datasets. Data sharing practices are currently in development as our data infrastructure advances.

There is limited data we can distribute for the entire network; however, we do help the public with their requests for smaller locations
We are able to provide downloadable data on our website so we can reduce the number of request
We have very few requests that can't be handled by simply directing them to our Esri Hub site
You are aware of lines that may be running down the same road and are able to provide proper service
Other
Coordination with OWASA is necessary for operations and asset management
Data sharing
They make it easier to share data with contractors/planners
Regional
It benefits the region because smaller municipalities cannot afford to have in house GIS teams. We collect the data, work with the data and house the data for them.
Security
We have established MOUAs with these entities and share data on a regular basis to keep it timely. We also have Standard Operating Procedures internal for staff to use/reference when sharing data to ensure consistency in distribution.

What would you change about your data sharing practices?
City
automate updates
Better documentation procedures.
Can't think of anything
Consultants would not want to rely on it for their work.
Data standards and greater understanding on an organizational level of data and standards.
Define a more robust disclosure and sharing practices document.
Greenville Utilities shares their infrastructure with Greenville but it can be a struggle to get certain data even though the City of Greenville owns Greenville Utility and operates under the same high functioning organization goals.
I think the practices are solid. The only thing I would change is the method to import our data into the spatial data warehouse.
I would like to see more cooperation with the County to improve the quality of the data.
I would make it less restrictive. Allow the public to view water and sewer lines online.
make it easier to find the data
more structure
More transparency and data sharing amongst organizations within the same geographic regions.
None
Nothing but possibly script some tools to assist us with performance
Our data sharing practices need to evolve into the digital age. We also need to make data accessible and to ensure all data sharing practices are safe and are not posing a risk.
Provide different downloadable formats besides shapefiles and GEOJSON in ArcGIS Open Data site.
We are in the process of creating Arc web applications to expand our data sharing practices.
We need a data governance/data policy for shared spatial data, similar to our open data policy and governance documents.
Written policy by Department Directors.
County
Have a policy in-place that would clearly define data distribution, whether it be GIS spatial data or hard copy/PDF's
I would like to create some policies
I'd be happy to alter our data sharing practices as dictated by our water department. Since its inception they have preferred the data to be publicly available.
Maybe get a more automated way. Are we outdated with having a request processor should we have it out there for people to obtain as needed?
Nothing
There are confusing limitations between City of Durham and Durham County. Consistency between the jurisdictions would simplify data sharing practices.
Other
Have more formalized policies
Need to get OWASA on board with sharing services
Not much
Regional
Formalize procedures for sharing
Things seem to work, but this come with a lot of trust and respect for each other.

What information would you like to see in an infrastructure data best practices document?
City
Everything in our EDAR form
examples of data models, examples of metadata
General best practices.
Guidance on sharing and editing and data integrity.
I would like to see an example of one.
I would like to see disclaimers that cover online/AGOL sharing privileges, and I would like to know the important differences between infrastructure data best practices vs. all other types of data.
map web address, contact information, allowable usage,
Minimum metadata requirements, standard/typical sections or chapters, adoptions practices (internal policy or Board approval), best management practices, data update best practices (frequency, accuracy), document update suggestions.
Minimum standards. Metadata standards
None
Not Sure
protection
recommended datasets to share
Recommended schema and metadata standards
Security risk pros and cons, examples of security breaches/destruction/manipulation from the past, notes on scope of data the public utilizes or not, projections for future security issues to be aware of.
Some entities will not share any data because they don't believe they can freely share specific data, so I would like to see a support document that allows for what data is shareable data
Standard documents for best practices.
Template policies, recommended schemas, metadata standards.
Who is using the data and maintained metadata.
County
creator, date created and date updated
data limitations
Data standards, attribute standards, required information for certain infrastructure, sharing guidelines
Federal regulations and guidelines. Including Best Practices for organizational use. IE if our Water department should simply acquire arc licenses vs using the public site.
I'd like to see more collaboration between the private and public sector given the proper use restrictions. I'd like to see more credence given to open sharing of data. Data is not to be hoarded and siloed, especially in the public space. Private industry that is given special benefits and/or preference for operating within our state should also be required at a minimum to share their data with governmental units under certain use restrictions.
Not sure.
References to controlling statutes or codes; best practices for data sharing;
What entities are utilizing this best practices document - County, City, etx
What's the liability of a contractor uses outdated data and it costs a project lots of money because they designed it on data that was outdated, because they didn't request updated information.

Other
Not Sure
Probably elaborate on themes in and motives behind disclaimer
Who is using the data and for what purpose in addition to limitations on data.
Regional
Complete list of types of infrastructure data and potential attributes how data is used best practices for organizations needing to meet security standards Examples of data sharing polices for internal and external entities Examples of legal language limiting use and resharing of data Examples of disclaimers
Data requested, intended use, removal/end of use

How would your jurisdiction benefit from an infrastructure data best practices document?
City
Accountability and accuracy.
better protection
clarity
Clarity and direction moving forward.
consistent methods across jurisdictions
Could use as a guide to develop internal procedures.
Data standardization and vetted understanding of data collection capabilities, use, and purpose.
I'm sure I would use it for guidance.
It would help us in our stormwater database maintenance and sharing
not much
Outline who is able to access it, how it is to be used, and disclaimers about misuse.
Sharing with others.
The only GIS data that we share without jurisdiction is out zoning map.
We could further protect our infrastructure data and integrity.
We could use it as a foundation for formalizing our own written policies for data sharing.
We would have a starting point to begin our data collection efforts and a shell to develop policies within our organization.
With the current utility mapping project just getting underway, if will be important to have infrastructure data best practices set and established before we dive into it.
County
I would have some documentation to point to vs my opinion.
It would be helpful to know whether we are way out of line with the industry standard
It would be super helpful so that City of Durham and Durham County can produce datasets that are compatible with datasets from other municipalities.
It would give us a reference to fall back on when our data is questioned
Maybe get a starting point on updating our process and still protect ourselves.
Would hope that it could be used as a tool or template to develop our policies & practices
Would provide clarity and consistency for the organization when requests are presented.
Other
Better understanding of the end-use and reduce risk of reliance on incomplete information
We could see what other utilities have
Regional
Better understanding of other organizations workflows, the successes and opportunities for improvement in the data/information collection, management and sharing space
It would be nice to align with others, and not be the bad guy who won't share their entire dataset with an outside vendor.

What else should we know about your data sharing practices?
City
I applaud this survey and the effort to expand our collective understanding of the scope of data sharing and it's perceived pros and cons by various organizations. I've been interested in seeing a document like this for may years.
I would like to see other towns examples of the data sharing practices.
Nothing at this time.
We anticipate that our community will want more access to this data in the future, so your efforts will be helpful to us in providing this
We do keep track of who request data. This is something we may lose as we move to Open Data.
work in progress
County
Are policies are not robust considering we do not have a high demand for shared data.
It would be good if private companies, such as power companies, would share their data with Government Entities. This data is critical to Emergency Response.
We are open to sharing any data that would not violate existing policies regarding the sharing of private health information (PHI), identifying financial information, or personal identifying information (PII).
We try to provide our users with the most accurate and usable datasets
Other
Can't think of anything to add, I'll be happy to talk if you have questions

Appendix 5: Industry Best Practices and Resources

HIFLD

The Homeland Infrastructure Foundation Level Data list provides an example of data layers that the federal government has determined safe for public display (Open) or requiring an approval and data user agreement (Secure). These layers could be reviewed by providers and used as a guide when determining whether a data layer is safe for open data sharing. The links below can be used to review open data layers. Some layers appear in both the open and secure options with differing levels of data available, so care must be taken not to eliminate a layer from open sharing just because it shows up on the secured list. HIFLD may have an open version.

HIFLD Data Catalog Access and Disclaimers

The HIFLD catalog is a complete list of all HIFLD data layers in one centralized spreadsheet. This HIFLD catalog can be used for search and discovery of HIFLD datasets. You can use the HIFLD catalog to find a specific layer and it provides useful supplemental information on each layer. The catalog includes name of layers, categories, links to the data, and the source of the data. There are three dataset tabs in the catalog: OPEN, SECURE, and LICENSED.

ACCESS:

HIFLD Open URL: https://hifld-geoplatform.opendata.arcgis.com/

HIFLD Open is publicly available, and ***no*** login is required to access those datasets.

HIFLD Secure and Licensed URL:: **https://gii.**dhs.gov/hifld/data/secure

HIFLD Secure and Licensed are available after going through an approval process that includes establishing HSIN credentials and signing a data use agreement. Government personnel from state, local, federal, tribal, and territorial entities and Fusion Centers can request access to secure and licensed datasets. You can request HSIN credentials at the HIFLD Secure and Licensed link above.

Questions? Contact: hifld@hq.dhs.gov

The HIFLD catalog is a complete list of all HIFLD data layers in one centralized spreadsheet. This HIFLD catalog can
HIFLD catalog to find a specific layer and it provides useful supplemental information on each layer. The catalog inclu
data. There are three dataset tabs in the catalog: OPEN, SECURE, and LICENSED.

ACCESS:
HIFLD Open URL:
https://hifld-geoplatform.opendata.arcgis.com/
HIFLD Open is publicly available, and ***no*** login is required to access those datasets.

HIFLD Secure and Licensed URL:
https://gii.dhs.gov/hifld/data/secure
HIFLD Secure and Licensed are available after going through an approval process that includes establishing HSIN cr
from state, local, federal, tribal, and territorial entities and Fusion Centers can request access to secure and licensed
Licensed link above.

Questions? Contact: hifld@hq.dhs.gov

HIFLD Open Data List

HIFLD Category	Layer Name	Source	Data Service
Chemicals	Environmental Protection Agency (EPA) Facilities	United States Environmental Protection Agency (EPA)	Service Link
Chemicals	Environmental Protection Agency (EPA) Facility Registry Service (FRS) Power Plants	Oak Ridge National Lab (ORNL)	Service Link
Chemicals	EPA Comprehensive Environmental Response Compensation and Liability Information System Facilities	United States Environmental Protection Agency (EPA)	Service Link
HIFLD Category	**Layer Name**	**Source**	**Data Service**
Chemicals	EPA Emergency Response (ER) Facility Response Plan (FRP) Facilities	United States Environmental Protection Agency (EPA)	Service Link
Chemicals	EPA Emergency Response (ER) Risk Management Plan (RMP) Facilities	United States Environmental Protection Agency (EPA)	Service Link
Chemicals	EPA Emergency Response (ER) Toxic Substances Control Act (TSCA) Facilities	United States Environmental Protection Agency (EPA)	Service Link
Chemicals	FRS Interests	United States Environmental Protection Agency (EPA)	Service Link
Chemicals	Solid Waste Landfill Facilities	United States Environmental Protection Agency (EPA)	Service Link
Chemicals	Wastewater Treatment Plants	United States Environmental Protection Agency (EPA)	Service Link
Communications	AM Transmission Towers	Federal Communications Commission (FCC)	Service Link
Communications	Antenna Structure Registrate	Federal Communications Commission (FCC)	Service Link
Communications	Broadband Radio Service (BRS) and Educational Broadband Service (EBS) Transmitters	Federal Communications Commission (FCC)	Service Link
Communications	Cellular Service Areas	Federal Communications Commission (FCC)	Service Link
Communications	Cellular Towers	Federal Communications Commission (FCC)	Service Link

Communications	FM Transmission Towers	Federal Communications Commission (FCC)	Service Link
Communications	Land Mobile Broadcast Towers	Federal Communications Commission (FCC)	Service Link
Communications	Land Mobile Commercial Transmission Towers	Federal Communications Commission (FCC)	Service Link
Communications	Land Mobile Private Transmission Towers	Federal Communications Commission (FCC)	Service Link
Communications	Microwave Service Towers	Federal Communications Commission (FCC)	Service Link
Communications	Paging Transmission Towers	Federal Communications Commission (FCC)	Service Link
Communications	TV Analog Station Transmitters	Federal Communications Commission (FCC)	Service Link
HIFLD Category	**Layer Name**	**Source**	**Data Service**
Communications	TV Broadcast Contours	Federal Communications Commission (FCC)	Service Link
Communications	TV Digital Station Transmitters	Federal Communications Commission (FCC)	Service Link
Energy	Biodiesel Plants	Oak Ridge National Lab (ORNL)	Service Link
Energy	Bottom Wells	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Control Areas	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	DOE Petroleum Reserves	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Electric Holding Company Areas	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Electric Planning Areas	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Electric Power Transmission Lines	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Electric Retail Service Territories	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Electric Substations	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Environmental Protection Agency (EPA) Facility Registry Service (FRS) Power Plants	United States Environmental Protection Agency (EPA)	Service Link
Energy	Ethanol Plants	Oak Ridge National Laboratory (ORNL)	Service Link

Energy	Ethanol Transloading Facilities	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Federal Energy Regulatory Commission (FERC) Regions	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	FERC Regions	Oak Ridge National Lab (ORNL)	Service Link
Energy	Generating Units	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Hydrocarbon Gas Liquid Pipelines	U.S. Energy Information Administration (EIA)	Service Link
Energy	Independent System Operators	Oak Ridge National Lab (ORNL)	Service Link
Energy	Independent System Operators	Oak Ridge National Laboratory (ORNL)	Service Link
HIFLD Category	**Layer Name**	**Source**	**Data Service**
Energy	Liquified Natural Gas Import Exports and Terminals	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Natural Gas Compressor Stations	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Natural Gas Import and Export	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Natural Gas Local Distribution Company Service Territories	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Natural Gas Market Hubs	U.S. Energy Information Administration (EIA)	Service Link
Energy	Natural Gas Pipelines	U.S. Energy Information Administration (EIA)	Service Link
Energy	Natural Gas Processing Plants	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Natural Gas Receipt Delivery Points	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Natural Gas Service Territories	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Natural Gas Storage Facilities	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	NERC Regions	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	NERC Reliability Coordinators	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Non Gasoline Alternative Fueling Stations	National Renewable Energy Labs (NREL)	Service Link

Energy	Oil and Natural Gas Fields	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Oil and Natural Gas Interconnects	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Oil and Natural Gas Platforms	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Oil and Natural Gas Wells	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Oil Refineries	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Oil Refinery (Polygon)	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Outer Continental Shelf (OCS) Drilling Platforms	Bureau of Ocean Energy Management (BOEM)	Service Link
HIFLD Category	**Layer Name**	**Source**	**Data Service**
Energy	Outer Continental Shelf (OCS) Oil and Natural Gas Wells	Bureau of Ocean Energy Management (BOEM)	Service Link
Energy	Petroleum Ports	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Petroleum Terminals	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	POL Pumping Stations	Oak Ridge National Laboratory (ORNL)	Service Link
Energy	Power Plants	Oak Ridge National Laboratory (ORNL)	Service Link

HIFLD Secure Data List

(Access Constraints: Federal, State, and Local Government and Industry Partner Access Only)

HIFLD Category	Layer Name	Source	Feature Type
Chemical	Chemical Manufacturing	Dun & Bradstreet (D&B)	Points
Chemical	EPA Comprehensive Environmental Response Compensation and Liability Information System CERCLS Facilities	Environmental Protection Agency (EPA)	Points
Chemical	EPA Emergency Response (ER) Risk Management Plan (RMP) Facilities	Environmental Protection Agency (EPA)	Points
Chemical	EPA Emergency Response (ER) Toxic Release Inventory (TRI) Facilities	Environmental Protection Agency (EPA)	Points
Chemical	EPA Emergency Response (ER) Toxic Substances Control Act (TSCA) Facilities	Environmental Protection Agency (EPA)	Points
Chemical	EPA Emergency Response ER Facility Response Plan FRP Facilities	Environmental Protection Agency (EPA)	Points

Chemical	EPA Emergency Response ER Toxic Substance Control Act TSCA Facilities	Environmental Protection Agency (EPA)	Points
Chemical	EPA ER Risk Management Plan RMP Facilities	Environmental Protection Agency (EPA)	Points
Chemical	EPA Resource Conservation and Recovery Act Treatment Storage and Disposal Facilities (RCRATSD)	Environmental Protection Agency (EPA)	Points
Chemical	Solid Waste Landfill Facilities	Oak Ridge National Lab (ORNL)	Points
Chemical	Waste Management and Remediation Services	Dun & Bradstreet (D&B)	Points
Chemical	Environmental Protection Agency EPA Facility Registry Service FRS Power Plants	Oak Ridge National Lab (ORNL)	Points
Communications	Internet Exchange Points	Department of Homeland Security (DHS) (iMap data)	Points
Communications	Internet Service Providers (HIFLD 2016)	Department of Homeland Security (DHS) (iMap data)	Points
HIFLD Category	**Layer Name**	**Source**	**Feature Type**
Communications	IT Location Portals	Department of Homeland Security (DHS) (iMap data)	Points
Communications	AM Transmission Towers	Federal Communications Commission (FCC)	Points
Communications	Antenna Structure Registrate	Federal Communications Commission (FCC)	Areas
Communications	Broadband Radio Service (BRS) and Educational Broadband Service EBS transmitters	Federal Communications Commission (FCC)	Points
Communications	Cell Towers	Federal Communications Commission (FCC)	Points
Communications	FM Transmission Towers	Federal Communications Commission (FCC)	Points
Communications	Internet Exchange Points	Federal Communications Commission (FCC)	Points
Communications	Land Mobile Commercial Transmission Towers	Federal Communications Commission (FCC)	Points
Communications	Microwave Service Towers	Federal Communications Commission (FCC)	Points
Communications	Paging Transmission Towers	Federal Communications Commission (FCC)	Points
Communications	TV Analog Station Transmission Towers	Federal Communications Commission (FCC)	Points
Communications	TV Broadcast Towers	Federal Communications Commission (FCC)	Points
Communications	TV Digital Station Towers	Federal Communications Commission (FCC)	Points
Energy	Biodiesel Plants	Oak Ridge National Lab (ORNL)	Points
Energy	Bottom Wells	Oak Ridge National Lab (ORNL)	Points

Energy	Control Areas	Oak Ridge National Lab (ORNL)	Area
Energy	Distribution Control Facilities	Oak Ridge National Lab (ORNL)	Points
Energy	DOE Petroleum Reserves	Oak Ridge National Lab (ORNL)	Points
Energy	Electrc Substations	Environmental Protection Agency (EPA)	Points
Energy	Electric Holding Company Areas	Oak Ridge National Lab (ORNL)	Area
Energy	Electric Planning Areas	Oak Ridge National Lab (ORNL)	Area
Energy	Electric Power Transmission Lines	Oak Ridge National Lab (ORNL)	Lines
Energy	Electric Retail Service Territories	Oak Ridge National Lab (ORNL)	Polygons
HIFLD Category	**Layer Name**	**Source**	**Feature Type**
Energy	Electric Substations	Oak Ridge National Lab (ORNL)	Points
Energy	Environmental Protection Agency (EPA) Facility Registry Service (FRS) Power Plants	United States Environmental Protection Agency (EPA)	Points
Energy	Ethanol Plants	Oak Ridge National Lab (ORNL)	Points
Energy	Ethanol Transloading Facilities	Oak Ridge National Lab (ORNL)	Points
Energy	Federal Energy Regulatory Commission (FERC) Regions	Oak Ridge National Lab (ORNL)	Polygons
Energy	FERC Regions	Oak Ridge National Lab (ORNL)	Polygons
Energy	Generating Units	Oak Ridge National Lab (ORNL)	Points
Energy	Hydrocarbon Gas Liquid Pipelines	U.S. Energy Information Administration (EIA)	Lines
Energy	Independent System Operators	Oak Ridge National Lab (ORNL)	Points
Energy	Independent System Operators	Oak Ridge National Lab (ORNL)	Points
Energy	Liquified Natural Gas Import Exports and Terminals	Oak Ridge National Lab (ORNL)	Points
Energy	Natural Gas Compressor Stations	Oak Ridge National Lab (ORNL)	Points
Energy	Natural Gas Import and Export	Oak Ridge National Lab (ORNL)	Points
Energy	Natural Gas Local Distribution Company Service Territories	Oak Ridge National Lab (ORNL)	Polygons
Energy	Natural Gas Market Hubs	U.S. Energy Information Administration (EIA)	Points

Energy	Natural Gas Pipelines	U.S. Energy Information Administration (EIA)	Lines
Energy	Natural Gas Processing Plants	Oak Ridge National Lab (ORNL)	Points
Energy	Natural Gas Receipt Delivery Points	Oak Ridge National Lab (ORNL)	Points
Energy	Natural Gas Service Territories	Oak Ridge National Lab (ORNL)	Polygons
Energy	Natural Gas Storage Facilities	Oak Ridge National Lab (ORNL)	Points
Energy	NERC Regions	Oak Ridge National Lab (ORNL)	Polygons
Energy	NERC Reliability Coordinators	Oak Ridge National Lab (ORNL)	Points
Energy	Non Gasoline Alternative Fueling Stations	National Renewable Energy Labs (NREL)	Points
HIFLD Category	**Layer Name**	**Source**	**Feature Type**
Energy	Non Gasoline Alternative Fueling Stations (FOUO)	National Renewable Energy Labs (NREL)	Points
Energy	Oil and Natural Gas Fields	Oak Ridge National Lab (ORNL)	Points
Energy	Oil and Natural Gas Interconnects	Oak Ridge National Lab (ORNL)	Points
Energy	Oil and Natural Gas Platforms	Oak Ridge National Lab (ORNL)	Points
Energy	Oil and Natural Gas Wells	Oak Ridge National Lab (ORNL)	Points
Energy	Oil Refineries	Oak Ridge National Lab (ORNL)	Points
Energy	Oil Refinery (Polygon)	Oak Ridge National Lab (ORNL)	Polygons
Energy	Outer Continental Shelf (OCS) Drilling Platforms	Bureau of Ocean Energy Management (BOEM)	Points
Energy	Outer Continental Shelf (OCS) Oil and Natural Gas Wells	Bureau of Ocean Energy Management (BOEM)	Points
Energy	Petroleum Ports	Oak Ridge National Lab (ORNL)	Points
Energy	Petroleum Terminals	Oak Ridge National Lab (ORNL)	Points
Energy	POL Pumping Stations	Oak Ridge National Lab (ORNL)	Points
Energy	Power Plants	Oak Ridge National Lab (ORNL)	Points
Energy	Propane Retailer Locations	Department of Homeland Security (DHS) (iMap data)	Points

ESRI GIS Data Standards

The following represent data schemas that can be implemented for GIS mapping of infrastructure features. Industry advocacy groups may have other standards available to members only.

Stormwater

Electric

Water

Sewer

Pipeline (Natural Gas)

Telecommunications