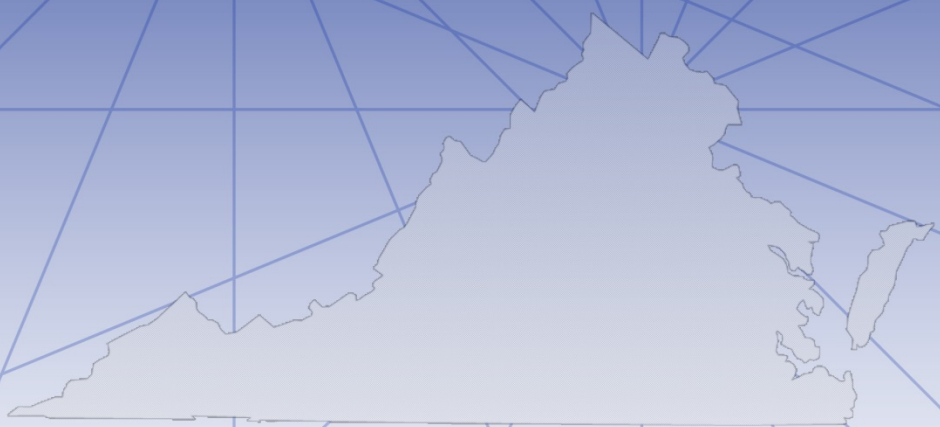
Virginia Information Technologies Agency

9-1-1 Addressing Operational and Administrative Best Practice



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Commonwealth of Virginia

9-1-1 Addressing: Operational and Administrative Best Practices

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This document is an overview of 9-1-1 addressing with a focus on the administrative and operational aspects of the process. It is primarily geared toward local government officials in GIS and/or public safety who wish to learn the following:

- The importance of having a consistent, uniform 9-1-1 addressing process
- The basics of the 9-1-1 addressing process, from assigning a 9-1-1 address to updating the address at the PSAP
- An overview of what is typically involved in the 9-1-1 addressing process

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Developed by the
Integrated Services Program
in consultation with the
Best Practice Steering Committee
and/or appropriate workgroup(s)

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Forward

A best practice is a generally accepted method that, when followed, shows consistent superior results based on experience and/or research. Best practices should be used as a benchmark by which to maintain quality, and are an alternative to mandatory legislated standards. When developing a best practice, it is important to identify the core principle, purpose and/or goal of the practice, while allowing flexibility for how it is implemented so it remains flexible for a variety of local conditions. Also, when best practices are considered for implementation on a wide scale, the committee must remain aware of sites with minimal to no resources, and consider how those sites will be supported in order to create the desired outcomes.

This best practices document was developed through a collaborative effort by ISP staff, the Best Practices Steering Committee and applicable workgroups or committees composed of Subject Matter Experts (SME) who have volunteered their time and insights.

These are consensus best practices, and their use is voluntary. Management of PSAPs is a local responsibility. Decisions regarding applicable content and practices, including whether and/or how a Virginia locality should implement this best practice, are strictly local decisions. VITA and the 9-1-1 Services Board assume no responsibility or liability for any such decisions or other use of this document. This best practice is not intended to be an exclusive resource; you should also consider other qualifications, standards, or documents related to this topic. All best practices are subject to change and will be reviewed by ISP staff and/or the BP Steering Committee at least annually following its publication date.

Outside of scheduled review, comments regarding VITA ISP best practices are accepted at any time and can be submitted to Stefanie.McGuffin@vita.virginia.gov. If the comment includes a recommended change, it is requested to accompany the recommendation with supporting material. If you have a question regarding any portion of this best practice, VITA ISP will consider and/or respond to your question in accordance with applicable law, policies, and procedures.

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Acknowledgements

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~and~

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Note : P = Primary; A = Alternate

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Abbreviations, Acronyms & Definitions

For the purpose of this best practice the following applies:

Term	Meaning
Addressing Agent	The person(s) or function(s) within a local government that has authority, either by policy or ordinance, to name roads and/or assign 9-1-1 addresses.
Automatic Location Information (ALI) Database	A database of information queried during a 9-1-1 call. A data record from this database is delivered to the PSAP during a 9-1-1 call, and includes a call back number, the address/location of the caller and sometimes supplemental emergency service information.
Emergency Service Number (ESN)	A 3-5 digit number representing a unique combination of emergency service agencies (law, fire, medical) designated to serve a specific range of addresses within a particular geographic area known as an emergency service zone (ESZ). This data is typically stored within a GIS, and the MSAG and returned with the ALI query. This is not necessarily the same as the call routing ESN used by the 9-1-1 service provider.
Geocoding	The process of transforming a description of a location—such as a pair of coordinates, an address, or a name of a place—to a location on the earth's surface.
Master Street Address Guide (MSAG) Database	A database of street names and house number ranges within an associated community used to define ESZs and its associated ESNs, to enable proper routing of E9-1-1 calls and may provide display of appropriate emergency response agencies to the PSAP call taker.
Ordinance	A law passed by a municipal government.

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Chapter 1: Introduction

The assignment of 9-1-1 addresses is often a complex process that involves many persons and functions within local government. This document can serve as a guide to assist with developing and/or streamlining that process, and it contains many items that can be put in place in totality or in part. This document aims to assist localities who want to improve addressing efficiency. During the creation of this document the authors discovered the *Addressing Guide 'Best Practices' Document, Version 2.0*. L.R. Kimball. State of Michigan, and cite it several times as a preferred, applicable best practice document. Appendix A of this document cites it and additional 9-1-1 addressing resources.

The purpose of 9-1-1 addressing is to provide the location of a structure, site or road for timely and efficient response in emergencies. Having a consistent, uniform addressing process is critical for emergency response.

A common misconception by the public is that the primary purpose of a 9-1-1 address is for mail carriers to locate delivery locations. Although mail carriers refer to 9-1-1 addresses for deliveries, the local government agency is responsible for creating and managing 9-1-1 addresses and road names and is deemed the addressing agent authority.

Having accurate 9-1-1 address information in a uniform, consistent format is necessary in emergency response situations when seconds matter. Many localities follow commonly used standards when assigning addresses, such as having even-numbered addresses on one side and odd-numbered addresses on the other side. In most areas, as address numbers increase in range, even addresses are on the right side of the road and odd addresses are on the left.

Chapter 2: Addressing Methodologies

Determining an appropriate methodology for assigning addressing in your locality is a first step in having a well-organized and understandable addressing system and must be adhered to as new addresses are assigned. The NENA book by Berryman, Mark, 2008, *Addressing Systems: A Training Guide for 9-1-1* is a preferred resource to use when determining addressing methodology. Also, according to the State of Michigan's "Addressing Guide 'Best Practices' Document, Version 2.0," the two major addressing types are **distance-based addressing** and **grid-based addressing**. In distance-based addressing, addresses are calculated sequentially, most commonly every 5.28 feet so that approximately 1000 addresses are available per mile of road starting from the previous intersection. In grid-based addressing, addresses are based on a pre-defined grid with a northing and easting coordinate system. The grid-based addressing is often used in cities where addresses are organized in blocks in structured increments, such as 100-199, 200-299, etc. When addressing in blocks, address ranges that allow for actual ranges, rather than potential ranges are recommended for more accurate geocoding along a road (pp. 14-15, 46).

Examples of localities that currently use distance-based addressing include Page and Scott Counties, and localities using grid-based addressing include Albemarle and Loudoun Counties. Links to ordinances describing both addressing types are in Appendix B.

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Regardless of the addressing method used, maintaining a uniform, sequential system helps emergency responders more quickly determine which side of the street they will find the emergency and how far along the road the address is located. This is particularly beneficial for longer roads. For example, in distance-based addressing using the 1000-addresses-per-mile method with even addresses on the right side of the road, if an incident is at 4000 Something Rd, then it is located approximately 4 miles from the beginning of Something Rd on the right.

Chapter 3: Standards

A standard is a uniform structure that is commonly recognized. The National Emergency Number Association (NENA) has an established, adopted 9-1-1 addressing standard[1]. In addition, the United States Postal Service (USPS) has standards[2] to which localities should adhere, including road name prefix and suffix standards. Also, VITA is currently working on creating basic GIS data standards complementing NENA and USPS standards. The focus is on data structure and types of basic 9-1-1 address data that all localities should follow as a minimum. Localities are also responsible for road name signage and should follow the US Department of Transportation's Federal Highway Administration Manual on Uniform Traffic Control Devices[3].

Using a geographic information system (GIS) to consistently maintain and manage 9-1-1 addressing information provides a standard data format that can be utilized by many other location-based government systems and processes. Those may include the PSAP mapping system, building permitting systems, land parcel management systems, public utilities systems and services, etc. GIS data may be stored geospatially as vectors (points, lines, and polygons) or rasters (e.g., orthoimagery). The attribute tables in GIS data store more information about spatial features. For example, an address point in a GIS may have the following information in its attribute table: address number, street name, community name, and emergency service number (ESN). Within a GIS or mapping application, a user can easily access information.

As a minimum, one or more employees at a locality that assigns and maintains addresses must be familiar with the adopted addressing process, USPS addressing standards, and GIS data maintenance standards. It is recommended that GIS personnel who work with 9-1-1 addressing are familiar with the addressing process and adhere to GIS data standards for 9-1-1 data maintenance. Some localities that do not have a dedicated person focusing on GIS tasks have a contractor updating and maintaining GIS data. In this case, ensuring that GIS data are properly maintained and provided to all governments departments that need it, is critically important.

[1] NENA Standards and Informational Documents can be found here: www.nena.org/?page=Standards#All Standards.
[2] USPS Postal Standard can be found here: http://pe.usps.gov/text/pub28/welcome.htm
[3] The Manual on Uniform Traffic Control Devices can be found here: https://mutcd.fhwa.dot.gov/ser-shs_millennium.htm

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Chapter 4: Ordinances & Establishing a Uniform Addressing Procedure

One of the key steps in 9-1-1 addressing is to establish an addressing ordinance. An addressing ordinance lays out a uniform addressing procedure that provides guidelines and enforcement of addressing policies. Common topics in an addressing ordinance may include, but are not limited to, the following:

- **Identification of addressing authority**
- **Addressing procedures**: include timing of address assignment and criteria for change, process and workflows, notifications, etc.
- **Road name designations**: include road naming process and standards used
- **Road name signage**: include types of signs designating public or private roads, and identifies who is responsible for installation and maintenance, and any associated costs
- **Posting of Address**: details how addresses should be posted, including size of numbers, using a contrasting background, appropriate placement, etc.
- **Address changes:** include purpose of changing an address and process originating from the locality and the homeowner/resident. Should also include any costs associated with an address change
- **Enforcement:** states the department that enforces violations and details any penalties

Ideally, all addresses should conform to the addressing ordinance for consistency and reliability in emergency response. However, in some cases, exceptions are made at the discretion of the decision-making official(s) at the locality.

Many local government agencies have an E9-1-1 Addressing Ordinance. You will find some examples of existing addressing ordinances at the end of this document (Appendix B).

Chapter 5: Workflows - Identifying Roles in the 9-1-1 Addressing Process

A workflow documents the step-by-step process of completing a task. In order to establish a workflow for 9-1-1 addressing, it is important to know everyone involved in the 9-1-1 addressing process and to have that process well defined and documented. The following are some questions to consider when creating a workflow for your agency:

1. Where does a homeowner need to go to obtain a 9-1-1 address?
2. Who determines a new 9-1-1 address, and how is it determined?
3. Who maintains the automatic location information (ALI) and master street address guide (MSAG) databases?
4. Who updates and maintains computer aided dispatch (CAD) data?
5. What departments and agencies need to know when a new 9-1-1 address is assigned?
6. Who is responsible for informing the homeowner of the new 9-1-1 address?
7. Who is involved with the naming of new roads? Are property owners involved in this process?
8. Should a committee be developed for deciding address changes?

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9. Who maintains and orders road signs?
10. Who is responsible for posting the address? If it is the property owner, what is the penalty when the address is not posted?
11. Are there fees associated with name changes initiated by the homeowner(s) if they are allowed?
12. Who is the final authority for all of the above? Is there an appeals process? Should a waiver option exist for property owners wishing to avoid an address change?
13. Who reviews and investigates opportunities derived from the VITA - GIS, MSAG and ALI analyses, and who is responsible for correcting or adjusting data as necessary?

The jurisdiction needs to plan out and determine who does what, from the creation of the locality's 9-1-1 address application to the update of address data at the PSAP. Various offices need to be immediately informed of new addresses. Examples include the PSAP, police/fire/rescue agencies, GIS, voter registrar, Commissioner of the Revenue, townships within a jurisdiction, utilities, and USPS offices, among others.

The determination of an address is typically based on where the structure or features access intersects the road. The location may be determined by field work, such as collecting GPS coordinates in the field. In addition, many localities use GIS software to calculate the address number.

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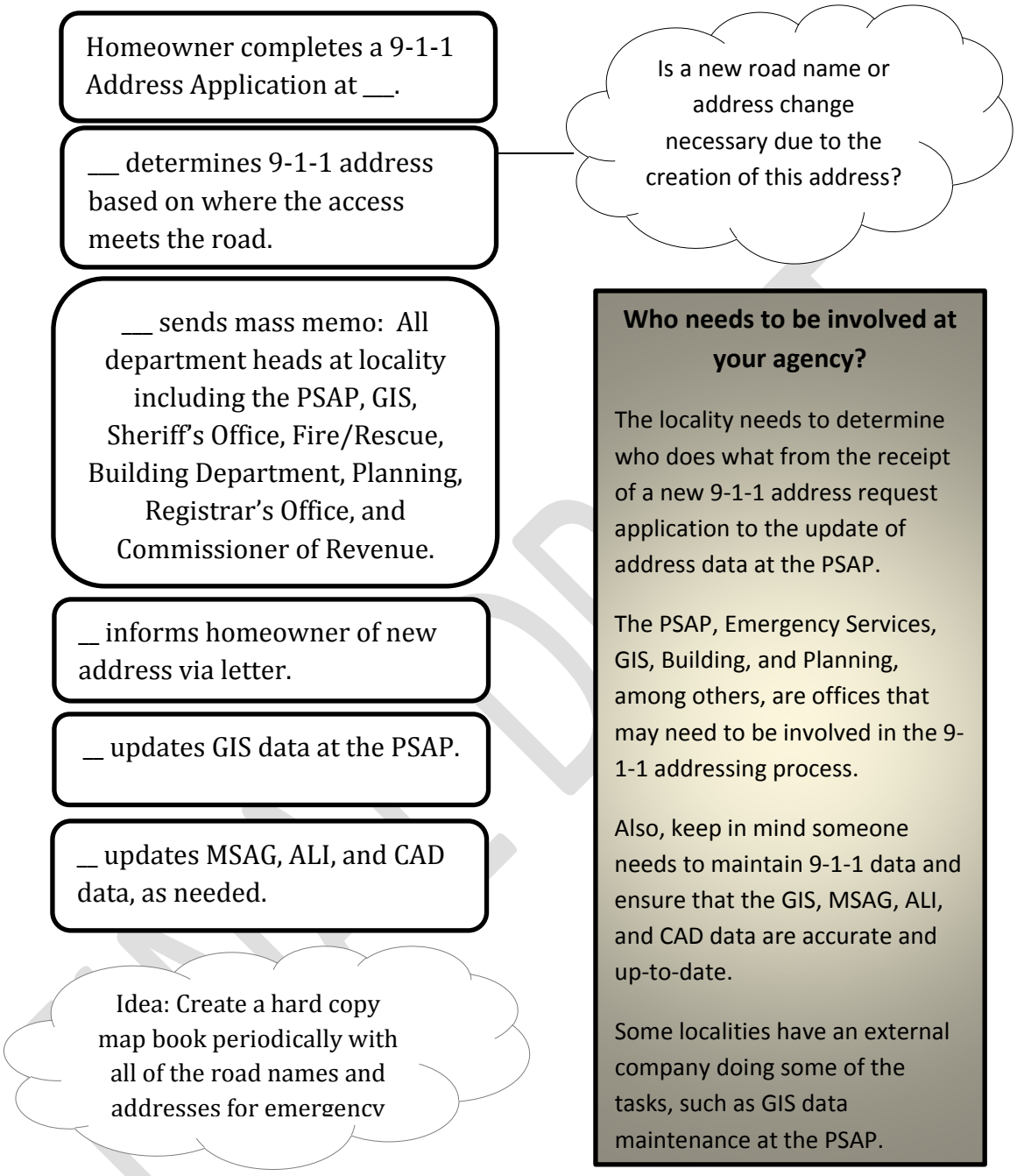

Below is an example of an addressing workflow:

It is recommended that everyone involved in the 9-1-1 addressing process be familiar with the locality's 9-1-1 addressing workflow. The primary goal of developing a workflow is to have up-to-date 9-1-1 GIS data at the PSAP, which helps in an emergency when time is critical. 9-1-1 dispatchers and emergency responders rely on accurate 9-1-1 information from their GIS mapping, as well as the CAD, ALI and MSAG databases.

ALI and MSAG databases are maintained by the 9-1-1 service provider or another third party (i.e., West or Comtech Telecommunications Corp.) and must be updated as new addresses and roads are created, and addresses and road names are changed. In Virginia, the two primary 9-1-1 service providers are Verizon and CenturyLink. In some cases, another party houses the ALI and MSAG databases. For example, for those on the West A-9-1-1 network, West provides these databases. Location determination depends on the ALI database, and the MSAG database contains road name and address range information for each road segment from where the road begins to where it ends. Often, a designated person in the PSAP, the GIS office, or emergency services personnel updates ALI and MSAG databases since that person in contact with their 9-1-1 service provider.

CAD data is also often updated by the PSAP or emergency services, with exceptions, and the database is maintained by the CAD provider. Similar to the ALI and MSAG, CAD must also reflect up-to-date address and street intersection (aka cross-street) information.

Chapter 6: New Road Names and Address Changes

The Code of Virginia gives localities the authority to name roads.[4] When naming a new road or making an address change, a PSAP or emergency services manager is often involved in the process. Others involved often include GIS personnel and landowners as well as leaders at the local government agency, such as the county administrator and board of supervisors or city council. As with a new address assignment, all offices impacted by the change need to be informed once the road is named. Also, external offices such as USPS offices, town managers, and police/fire/rescue chiefs, must be informed, as needed. Creating a workflow similar to 9-1-1 addressing is recommended for new road names and address changes.

New road names should not be identical to or sound similar to an existing road name to prevent confusion when someone dials 9-1-1 and states the address of the emergency. Additionally, identical or similar sounding road names along the borders of a jurisdictions and/or serviced by the same post office should be avoided. Oftentimes, localities refer to a list of existing road names when deciding on a new one.

Address changes are sometimes necessary to facilitate efficient and effective emergency response. Address changes involve informing individuals, such as the homeowner/landowner, USPS, and townships. A workflow should exist for address changes so that each person who needs to be involved is informed in a methodical, organized process. For address changes that require new road names, some jurisdictions ask the homeowners/residents affected by the address change to make a list of suggested new road names.

[4] Code of Virginia, § 15.2-2019. Localities may name streets, roads and alleys.

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Some citizens affected by address changes may protest or request for an appeal, often an address change requires making various adjustments, which consume time and/or money. Examples include updating the doctor's office, bank, and other organizations. In localities where citizens are responsible for maintaining their address postings at their residences and businesses, their address postings need to be changed or replaced. In addition, business owners need to change their letterheads and business cards to reflect their new addresses. Therefore, it is important to understand and clearly communicate the purpose of changing addresses to the citizens affected, as well as to the local government agency. It is also a good practice to keep a record of documentation and correspondence. Aside from paper copies or digital files outside the GIS, this can be done creating digital forms or copies and having them as attachments to address point features. This allows for a history of information accessible to all system users. Having an address change policy approved by elected officials, that outlines the situations that necessitate an address change, and details the authority of the locality to do so, is also best practice.

Chapter 7: Communication: Getting the Message Out Effectively

In addition to understanding the role of each individual in the 9-1-1 addressing process, getting the message out effectively requires knowing who to contact and a structured means of informing everyone involved. Many localities use standardized forms and templates as part of their workflow in communicating the right information to the right people. The following forms and templates may be used in 9-1-1 addressing:

- 9-1-1 Address Application: What a homeowner/resident fills out to request a 9-1-1 address for a structure that has not been assigned an address. The locality decides whether to assess a fee to a 9-1-1 address assignment and determines whether the locality or the homeowner/resident installs a house number sign.
- Road Name Request Form: What a homeowner/resident fills out to request a new road name.
- Data Discrepancy Form: Form used internally to identify, detail, and track discrepancies found in locality datasets and field data. It may also be used to update the various databases at the locality when a new address is assigned.
- Address Assignment Template: Template letter used to send new address assignment to homeowner/resident.
- Address Change Notification Template: Template letter used to send an address change assignment to homeowner/resident.

The State of Michigan's "Addressing Guide 'Best Practices' Document, Version 2.0" shows examples of the above forms and templates for reference, in addition to other references pertaining to 9-1-1 addressing (pp. 50-67). A link to this document is in Appendix A. Each local government agency should develop their forms and templates in consultation with others at the agency involved in 9-1-1 addressing.

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Chapter 8: Maintaining Accurate and Up-to-Date 9-1-1 GIS Data at the PSAP

Regular maintenance of accurate and up-to-date 9-1-1 GIS data at the PSAP is an ongoing process. Localities need personnel to maintain the 9-1-1 GIS data as well as to ensure the MSAG, ALI, and CAD databases are updated by responsible parties. As soon as a 9-1-1 address is created or changed, the GIS data, as well as the MSAG, ALI, and CAD databases, should reflect the change.

Data quality checks are part of maintaining 9-1-1 data integrity. It is also known as quality assurance/quality control (QA/QC). When checking for data quality, localities may rely on various methods to work on improving their 9-1-1 data. They may include the following:

- Field checks (real world vs. GIS data)
- Comparing ALI and MSAG databases with GIS data
- Comparing Assessor's Office/Commissioner of Revenue database with GIS data
- Comparing voter registration database with GIS data
- Comparing utilities database with GIS data
- Comparing USPS information with GIS data

Comparing the 9-1-1 GIS data to each of the databases helps identify discrepancies between the databases and the GIS. Inconsistencies may stem from an error in the GIS or in one of the databases. Once discovered, errors should be processed in a timely manner, whether they are fixed or reported to the database owner. Field checks are also important, because the 9-1-1 GIS data, the ALI database, and the MSAG database should ultimately be consistent with the real world. Working with emergency personnel and others in the locality who do field work help facilitate field checking. Also, some people keep a record of processed fixes for reference.

A locality may obtain the ALI and MSAG databases from the PSAP's 9-1-1 service provider or a third party that maintains them. In Virginia, the PSAP manager is usually able to receive these databases at no cost a limited number of times per year.

Databases from the Assessor's Office/Commissioner of Revenue, voter registration, and utilities may be obtained internally from these offices. USPS may sometimes help in providing information for purposes of improving 9-1-1 data. In addition, USPS benefits from having accurate 9-1-1 address information.

Ultimately, field checks ensure that 9-1-1 address data are consistent with reality. Regardless of whether these addresses conform to standards, emergency responders usually rely on what is posted in the field. However, checking the GIS data with other databases help improve GIS data quality as well as the quality of the respective databases.

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VITA does complimentary GIS, MSAG, and ALI analyses for local government agencies that provide them with the locality's MSAG and ALI databases and GIS data. Also, some GIS vendors perform these services.

Conclusion

Many people are directly or indirectly impacted by new 9-1-1 addresses and address changes. Understanding the role of each individual in the 9-1-1 addressing process from start to finish is important. In addition, everyone, internally and externally, who needs to be notified of new 9-1-1 addresses and address changes must be informed in a timely manner. Ordinances and standards help localities create and maintain organized, uniform 9-1-1 addresses in a jurisdiction.

The purpose of 9-1-1 addressing is for emergency personnel to respond to emergencies. Having accurate, consistent, and up-to-date 9-1-1 data is imperative for quick and effective emergency response.

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Appendix A: References

"Addressing Guide 'Best Practices' Document, Version 2.0." L.R. Kimball. State of Michigan. http://www.michigan.gov/documents/cgi/DOC120313LRK_State_of_Michigan_Addressing_Guide_379249_7.pdf

"Addressing Services in Jefferson County." Jefferson County Commission. http://www.jeffersoncountywv.org/county-government/departments/gis-addressing/addressing

"Forms and Publications." State of Vermont Enhanced 911 Services Board. http://e911.vermont.gov/municipalities/forms

"GIS Data Collection and Maintenance." NENA. http://www.nena.org/general/custom.asp?page=gisdatacollection

"Publication 28 – Postal Addressing Standards." USPS. http://pe.usps.gov/text/pub28/welcome.htm

"Street Suffix Abbreviations." USPS. http://pe.usps.gov/text/pub28/28apc_002.htm

"Synchronizing GIS with MSAG and ALI." NENA. http://www.nena.org/general/custom.asp?page=synch_gis_msag_ali

NENA Information Document for Development of Site/Structure Address Point GIS Data for 9-1-1. http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/Standards/NENA-INF-014.12015_SSAP_INF.pdf?hhSearchTerms=%22Enter+and+Development+and+site%2fstructure+and+address+and+point%22

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Appendix B: Examples of Addressing Ordinances and Documents in Virginia

Albemarle County, VA
Road Naming and Property Numbering Ordinance and Manual https://www.albemarle.org/upload/images/Forms_Center/Departments/Geographic_Data_Services/Forms/Road_Naming_and_Property_Numbering_Ordinance_and_Manual.pdf

Goochland County, VA
Chapter 12 – Streets and Roads: Article II Road Names; Address Numbers
https://www.municode.com/library/va/goochland_county/codes/code_of_ordinances?nodeId=COOR_CH12STRO_ARTIIRONAADNU

Loudoun County, VA
1026.06 Determination of Addresses http://www.amlegal.com/nxt/gateway.dll/Virginia/loudounco_va/partten-streetsutilitiesandpublicservice/titletwo-streetandsidewalkareas/chapter1026addressingofpremises?f=templates$fn=default.htm$3.0$vid=amlegal:loudounco_va$anc=JD_1026.06

Page County, VA
Chapter 127: E-911 Addressing
http://ecode360.com/9200544

Prince William County, VA
County Code Chapter 24 – Streets
https://www.municode.com/library/va/prince_william_county/codes/code_of_ordinances?nodeId=CH24ST

Scott County, VA
Ordinance No. 2005-01: Ordinance to Provide for the Naming of Streets and Roads in Scott County, Virginia
http://scottcountyva.com/911law.pdf

Wise County, VA
County Code Chapter 18 – E911 Addressing System
https://www.municode.com/library/va/wise_county/codes/code_of_ordinances?searchRequest=%7B%22searchText%22:%22addressing%22,%22pageNum%22:1,%22resultsPerPage%22:25,%22booleanSearch%22:false,%22stemming%22:true,%22fuzzy%22:false,%22synonym%22:false,%22contentTypes%22:%5B%22CODES%22%5D,%22productIds%22:%5B%5D%7D&nodeId=COCO_CH18.5STSI_ARTIIIE-ADSY

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Version History

Version	Summary	Date
1.0	Initial BP documents developed by ISP staff and reviewed by several members of the commonwealth's local government community. The draft documents was presented via an educational webinar.	1/1/2016
1.1	Annual review of document Minor revisions were made and the document was put into the standard best practice template.	2/8/2017
2.0	Document updated and accepted by the BP Steering Committee and the 9-1-1 Services Board.	

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