Geographic Information System Lifecycle Best Practices Guide for Next Generation 911

Across the nation, the public safety communications community is looking to upgrade analog 911 systems to digital and Internet Protocol (IP)-based systems, known as Next Generation 911 (NG911) systems, to benefit from new capabilities and infrastructure, creating faster and more resilient communications systems. NG911 will strengthen and improve the ability to manage and share information and call load across jurisdictions. It will also allow the exchange of multimedia (e.g., photos, videos) between the public and emergency communications centers (ECC)/public safety answering points (PSAP).

How to Use this Document

This document provides:

- Overview of GIS lifecycle
- Best practices for each lifecycle phase
- Resources for GIS support

Public safety administrators, managers, and officials can use this document to familiarize themselves with GIS lifecycle best practices when transitioning to NG911. It does not contain specific, system-unique instructions or address governance considerations.

The data produced by a Geographic Information System (GIS) is an essential component of NG911 and improving public safety communications. GIS is defined as "a computer system that analyzes and displays geographically referenced information."[1] GIS accesses, uses, and analyzes spatial data from navigation systems such as Global Positioning System (GPS) and Global Navigation Satellite System (GNSS).[2] GIS capabilities[3] are necessary for NG911 systems to route calls to the most appropriate ECC/PSAP based on the caller's location. Accurate geographic data is essential for dispatch of emergency responders, and GIS capabilities continue to evolve (e.g., z-axis, 3D, enhanced user interface). GIS capabilities enable mapping applications to use location information from cellular towers and network switches or other supplemental location data sources.[4] This allows the ECC/PSAP to receive more accurate geographic information for the call, and it also allows the ECC/PSAP to share critical geographic information (e.g., mountainous terrain, waterways) with the appropriate agency to improve situational awareness.

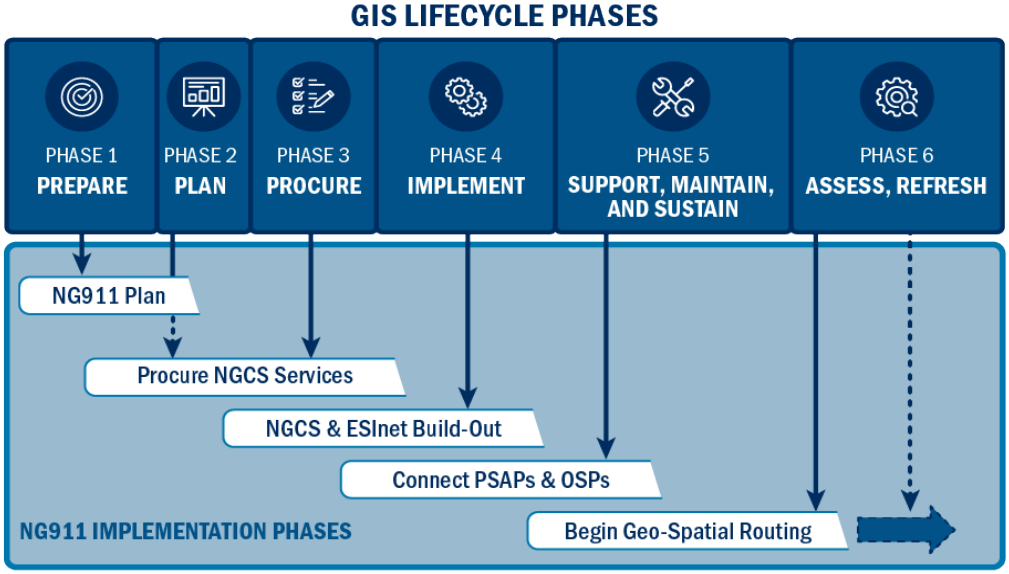

Figure 1. GIS Lifecycle Phases and Matching NG911 Implementation Phases

[1] United States Geological Survey (USGS), "What is a geographic information system (GIS)?" last accessed August 25, 2020.
[2] Humboldt State University, "GSP330: Mobile Mapping & GIS Terminology," last accessed August 25, 2020.
[3] In a NG911 system, providing location requires coordination between multiple elements. For example, a Location Validation Function (LVF) may validate the IP endpoint of the calling device against a local 911 authority's provisioned GIS data. The locally provisioned GIS data is also used to route the 911 call with the Emergency Call Routing Function (ECRF) or a similar function. A Location Information Server (LIS) is necessary to provide the location of the endpoint to route 911 calls if using the i3 standard (NENA Standard for NG9-1-1 GIS Data Model).
[4] For more information on the relationship between GIS and NG911, reference the NENA Standard for NG9-1-1 GIS Data Model and NENA Standards for the Provisioning and Maintenance of GIS data to ECRF and LVFs.

There is a lifecycle to establishing and maintaining a GIS system. Figure 1 illustrates how the phases of the GIS lifecycle correspond to NG911 implementation phases and demonstrate the technology's essential role in NG911 transition. This document introduces each phase of the GIS lifecycle, highlights key considerations, and offers best practices. Additional GIS guidance resources are provided in the appendices for first-time GIS users and long-time GIS practitioners.

PHASE 1: PREPARE

The first phase of the GIS lifecycle is preparation. During this phase, organizations assess the need to replace, upgrade, maintain, share, or acquire a new GIS system. When assessing capabilities and integrating new technologies, it is important to look across the Emergency Communications Ecosystem as defined in the National Emergency Communications Plan to ensure capabilities are operable and interoperable across agencies and jurisdictions.[5] Organizations could also consider using the NG911 Self-Assessment Tool, a dynamic, detailed NG911 checklist, to determine their system's NG911 maturity state and help understand the necessary next steps to continue the NG911 deployment process. Organizations can use the results of their NG911 Self-Assessment to develop a checklist to assess their capabilities (e.g., software, hardware, cybersecurity, facility) and ensure they have implemented essential GIS components for NG911.

During this phase, it is important that organizations understand how their technologies interconnect with other coordinating entities, including GIS systems. Typically, the GIS system is not independently maintained and used by just one agency. For example, public safety agencies often work with public service and transportation departments to develop and maintain specific GIS data layers, and the jurisdiction's government may designate and maintain borders (e.g., city limits, county boundaries). In addition, organizations may consider user requirements and process modeling as a part of the GIS preparation process, as it is crucial to understand key concerns such as what type of data is needed, where the data originates, how the data is maintained, and who the authorized users and stewards may be.

It is recommended that organizations maintain strong and transparent GIS governance through inclusive policies. Organizations may establish working relationships with the existing GIS provisioning authority and the addressing authority in their jurisdiction, as well as neighboring jurisdictions. Organizations may determine staffing needs and research funding mechanisms to cover the duration of the GIS lifecycle and any transitional periods.

BEST PRACTICES FOR THIS PHASE INCLUDE:

✓	Assess the need to replace, upgrade, maintain, share, dispose of, or acquire a new GIS system
✓	Inform organization leadership, announce to staff, and secure the decision
✓	Establish GIS governance through policy and documentation that is inclusive of the evolving technical and operational environment
✓	Consider funding opportunities[6] and mechanisms for necessary transition, implementation (i.e. capital), operations and maintenance (O&M), and/or sustainment investment(s)

PHASE 2: PLAN

The second phase of the GIS lifecycle is planning. This phase involves collaborating with partners to develop a GIS implementation plan. It is recommended that organizations align the activities to overarching organizational missions and that they are compliant with the organization's existing rules, regulations, and guidance (e.g.,

[5] DHS, National Emergency Communications Plan, last modified July 13, 2020.
[6] Funding models may include: budget line items, grants, bonds, public-private partnerships, user fees, 911 surcharge fees, and leasing agreements. For additional guidance on funding, see https://www.dhs.gov/publication/funding-documents.

organizational mission and purpose, local and state 911 plans, Statewide Communication Interoperability Plan [SCIP], National Emergency Number Association [NENA] Functional and Interface Standards for Next Generation 9-1-1 Version 1.0 [i3] standard, NENA's NG911 GIS Data Model, the National 911 Program Office's 911 Data & Information Sharing: A Strategic Plan, resources from GIS organizations such as the National States Geographic Information Council [NSGIC] and Urban and Regional Information Systems Association [URISA]). Below is a list of NENA's required GIS data model layers:[7]

- Road centerlines
- Site/structure address points
- PSAP boundaries
- Emergency service boundaries
- Provisioning boundaries

The implementation plan outlines technical and policy requirements for implementing and managing GIS capabilities and data. Organizations should ensure that cybersecurity for the GIS system and the databases is planned out in accordance with existing federal, state, local, tribal, and territorial requirements, industry standards, and other guidance (e.g., National Institute of Standards and Technology [NIST] Cybersecurity Framework[8]). The plan should also be inclusive of feedback from agencies involved in implementing and executing GIS governance to ensure it meets user needs. For example, organizations can establish memorandums of understanding and agreement (MOU/A) with neighboring jurisdictions to address geographical challenges, such as meandering roadways that cross multiple jurisdictions. It is recommended that organizations consider adopting MOU/A on all GIS issues with their partners. For an example list, check the best practices table below.

During this phase, organizations could consider issuing a request for information (RFI) to help themselves better understand the technical offerings and potential cost ranges of third-party capabilities before releasing a request for proposal (RFP). The RFI helps organizations identify and outline the full set of technical and functional requirements for a project prior to releasing an RFP, thereby limiting the chances of having to re-release an updated RFP once an organization realizes the full scope of a GIS project's requirements. Reaching out to other organizations who have gone through similar transitions to gain firsthand knowledge of the process for a particular service offering can also prove beneficial.

BEST PRACTICES FOR THIS PHASE INCLUDE:

✓	Form a project team; define and document GIS system requirements from all departments and jurisdictions the ECC/PSAP is serving
✓	Create a project plan that aligns to all guiding documents (e.g., organizational mission and purpose, local and state 911 plans, regional goals and strategies such as SCIPs, industry and governmental guidance like ones from NSGIC and URISA, and regulations such as ones from NENA and the National 911 Program) and encompasses the entire GIS lifecycle
✓	Establish MOU/A on topics including: • Creation, storage, maintenance, transmission, and security of data • Establishment of rules and processes for data usage and terms of disclosure • Establishment of authorities • Development of conflict resolution processes • Definition of roles and obligations (such as the need to support the GIS administrator with accurate data) • Delineation of privacy and information sharing responsibilities
✓	Issue an RFI to gain a better understanding of technical requirements and offerings prior to releasing an RFP
✓	Develop a framework to address the risks, challenges, and concerns with implementing GIS

[7] NENA, "NENA Standard for NG9-1-1 GIS Data Model," last modified February 18, 2020, 17.
[8] For more on the NIST Cybersecurity Framework, visit https://www.nist.gov/cyberframework.

PHASE 3: PROCURE

The third phase of the GIS lifecycle is procurement. During this phase, organizations collaborate with partners to identify GIS system requirements. Organizations may develop a request for proposal (RFP) to select a vendor for providing GIS capabilities. Alternatively, organizations may look to procure GIS capabilities through a state GIS office (if applicable) or by establishing intergovernmental agreements with a major city to expand their current GIS services.

The RFP outlines GIS requirements to ensure the vendor can meet those needs. At a minimum, essential topics such as cybersecurity, ongoing operation and maintenance, and training for all personnel, are included in the RFP. Organizations could also consider developing a list of procurement and cyclical costs to aid the development of an RFP. On-going sustainment costs, such as platform or program interfaces, subscriptions, data input and maintenance, and training, can quickly surpass initial purchase prices.

BEST PRACTICES FOR THIS PHASE INCLUDE:

✓	Apply strategic funding method(s) that align to the GIS lifecycle

✓	Procure GIS resources[9], such as:
	• Hardware
	  ○ Computer servers
	  ○ Unique client machines (e.g., plotters)
	• Software
	  ○ Database management system (DBMS)
	  ○ Graphical user interface (GUI)
	  ○ Tools to input and manipulate geographic information and support search and analysis
	• Additional resources
	  ○ Staffing and work space
	  ○ Training and sustainment
	  ○ Other costs (e.g., interface to other data sources outside the organization)

PHASE 4: IMPLEMENT

The fourth phase of the GIS lifecycle is implementation. During this phase, the ECC/PSAP, GIS department, vendors, and all other partners continue to work together closely to execute the implementation plan. The implementation process of an organization varies based on the GIS paradigm, data management principles, available technology, and organizational setting.[10] It is possible that the plan could be impacted by external or internal changes beyond the scope of the project. Partners could document contingency plans if the project were to encounter delays. In addition to training the technical staff and the telecommunicators, it is recommended that organizations also train administrative staff, quality assurance staff, and the operations personnel (e.g., police officers, firefighters, emergency medical technicians) so that both the users and the data stewards are familiar with, and comfortable operating, the new GIS system.

[9] Leena Kanickaraj, "GIS Defined," January 2, 2018.
[10] Ron Briggs, "The GIS Implementation Process," last accessed August 26, 2020.

BEST PRACTICES FOR THIS PHASE INCLUDE:[11]

✓	Develop an implementation plan that details system installation, testing, training, and transition procedures containing: • Conceptual/system design • Physical design • Timeline and milestones • Administrative framework and staffing • Hardware and software installation • Data conversion and database construction • Application development
✓	Incorporate data management strategies that establish provisioning boundaries (i.e. jurisdiction responsible for uploading GIS data) and emergency service boundaries

PHASE 5: SUPPORT, MAINTAIN, AND SUSTAIN

The fifth phase of the GIS lifecycle is to support, maintain, and sustain the GIS system. Software and security upgrades as well as system and equipment repair are two crucial elements during this phase. GIS data maintenance is another element that warrants regular examination and validation, and processes on data deconfliction must be followed. For such activities to remain comprehensive and timely, partners may consider following a predetermined, ongoing O&M model to holistically accomplish O&M tasks.[12] As a part of the O&M model, partners will need to ensure that all agreements (e.g., MOU/A, client and vendor agreements) that support the GIS system are kept up-to-date.

BEST PRACTICES FOR THIS PHASE INCLUDE:

✓	Establish standard operating procedures (SOP)/standard operating guidelines (SOG) and update as needed to meet system and organization needs
✓	Inventory equipment and resources, conduct scheduled assessments, and communicate needs
✓	Establish physical security and cybersecurity risk management, address vulnerabilities, and mitigate incidents
✓	Ensure all GIS system agreements are up-to-date

At a minimum, partners need to develop procedures to ensure the maintenance of GIS, including adding new GIS data and correcting GIS files.[13] Below are example considerations for such procedures:[14]

Adding new information to the database:

- Identify information flow
- Train involved personnel
- Identify responsible personnel and their tasks
- Determine update frequency
- Determine update distribution method
- Schedule reoccurring meetings with involved parties to discuss related issues

Correcting database information:

- Implement standardized reporting form or process

[11] Ron Briggs, ibid.
[12] DHS, "Emergency Communications System Lifecycle Planning Guide, Compendium: Best Practices, Considerations, and Recommended Checklists," May 2018, 21.
[13] State of Arizona 9-1-1 Program, "Arizona NG9-1-1 GIS Guidelines and Best Practices," last modified August 2020.
[14] State of Arizona 9-1-1 Program, ibid.

- Identify and document information flow
- Train involved personnel
- Identify responsible personnel and their tasks
- Ensure and monitor that errors are being reported and corrected

Following the GIS implementation plan, securing the GIS system, and aligning policies to organizational directives and nationally recognized standards and guidelines will help partners better support, maintain, and sustain the system. Partners may consider mechanisms such as authentication, authorization, encryption, and logging and auditing[15] to protect the system, and may examine additional GIS platforms such as web, cloud, and mobile as potential additions or backup interfaces.

The sixth phase in the GIS lifecycle is assess and refresh the GIS system. The GIS system consists of numerous components and each of them will need to be evaluated on a consistent periodic basis and upgraded when necessary. As GIS remains a partnered task, when assessing the need to update or replace GIS capabilities, partners may consider adhering to industry technical standards and evaluating whether such efforts would support regional, state, and national interoperability initiatives.[16] Partners could also monitor regulatory and technology changes (e.g., Federal Communications Commission's [FCC] rule on requiring wireless carriers to deliver 911 caller's vertical location [z-axis], other emerging capabilities) to better assess the need for system updates or component replacement. Partners could again use strategic planning and existing documentation (e.g., records retention) to monitor system status and make appropriate decisions.

BEST PRACTICES FOR THIS PHASE INCLUDE:

✓	Review GIS system arrangement and determine update needs
✓	Follow previously established procurement process

Conclusion

The success of each phase of the GIS lifecycle contributes to the overall success of GIS implementation. It is recommended that an ECC/PSAP establish strong governance, form close partnerships, and outline consistent procedures in addition to complying with overarching local, regional, state, and national level GIS and NG911 guidance. It is also recommended that organizations continue to adapt emerging technology, review regulatory changes, and maintain a strong cybersecurity posture as the GIS lifecycle progresses. GIS is essential to NG911 and will remain a critical piece in achieving an interoperable and resilient public safety communications environment.

[15] Michael Young, Randall Williams, "Designing an Enterprise GIS Security Strategy," last accessed August 26, 2020.
[16] DHS, "Emergency Communications System Lifecycle Planning Guide, Compendium: Best Practices, Considerations, and Recommended Checklists," May 2018, 26, 27.

Appendix A GIS Lifecycle Resources

Tables A-1 and A-2 provide non-comprehensive lists of available resources to assist public safety decision-makers and officials in developing their own unique GIS best practices. *The resources provided are not exhaustive and do not imply endorsement for organizations or their products*.

Table A-1. Government GIS Resources

Organization	Resource Name	Description
Department of Transportation	The National 911 Program Next Generation 911 (NG911) Interstate Playbook: Chapter 1	This document summarizes fundamental NG911 GIS considerations, requirements, focus points, and best practices. It outlines considerations for regional (multijurisdictional or consolidated) or interstate GIS implementations and provides directions for annual GIS audits.
	The National 911 Program Next Generation 911 (NG911) Interstate Playbook: Chapter 2	This document provides an in-depth overview of NG911 GIS implementation and identifies policy, standards, processes, and procedure considerations for cross-jurisdictional GIS collaboration.
Federal Geographic Data Committee (FGDC)	Key Publications	The FGDC offers a variety of GIS-related resources, including annual reports, geospatial standards, white papers, reports, and other documents. For example, this FDGC profile reconciles the *United States Thoroughfare, Landmark, and Postal Address Data Standard* and the National Emergency Number Association (NENA) *Next Generation 9-1-1 (NG9-1-1) Civic Location Data Exchange Format (CLDXF) Standard*.
United States Geographical Survey (USGS)	What is a geographic information system (GIS)	This USGS webpage contains GIS definition and example graphic, as well as links to additional GIS-related topics, such as mapping, remote sensing, geospatial data, the national map, and web map services.
National Geospatial-Intelligence Agency (NGA)	NGA Products & Services	While the NGA does not sell or perform services for the public, its website does host a repository of GIS and mapping resources that are available to the general public.

Table A-2. State and Local GIS Resources

Organization	Description and Link
Kansas 911 Coordinating Council	Kansas 911's GIS webpage presents key NG911 GIS resources, including: • Its NG911 GIS initiative timeline and committee information • GIS Standards, tools, templates, and policies • Information on its GIS Pilot Study and the GIS Enhancement Project • Statewide NG911 imagery • Emergency Services IP Network (ESInet) and Master Street Address Guide (MSAG) GIS data alignment • GIS Training, videos, events, and meetings https://www.kansas911.org/gis/
Pennsylvania Emergency Management Agency (PEMA)	PEMA's NG911 GIS webpage explains the current NG911 environment, highlights the importance of GIS for NG911, and links to resources such as education sessions, best practices and templates, and its statewide NG911 GIS data gap analysis. https://www.pema.pa.gov/911-program/partners/ng911-GIS/Pages/default.aspx
Minnesota Department of Public Safety	*The Role of GIS in Next Generation 911* document serves as introductory guidance to the role of GIS in NG911 transition. The document provides background on legacy E911 location database systems, outlines the difference between the NENA i2 and i3 standards, and demonstrates GIS' functions and roles in the NG911 environment. https://dps.mn.gov/divisions/ecn/programs/911/Documents/GIS_Article_102208v7.pdf
Virginia Information Technologies Agency (VITA)	The VITA maintains a NG911 news archive that provides articles on NG911 and related GIS deployment in the commonwealth. Documents such as NG911 GIS Data Provisioning and Maintenance, Virginia NG911 GIS Resources, and GIS Report Cards are all example references for emergency communications centers (ECC)/public safety answering points (PSAP). https://www.vita.virginia.gov/integrated-services/psc-9-1-1-services/ng9-1-1-deployment/ng9-1-1-news-archives/
Illinois Office of the Statewide 911 Administrator	The Office's website hosts reference materials related to GIS for NG911, such as the state's NG911 GIS governance policy, data readiness checklist, and geodatabase templates. https://www2.illinois.gov/sites/statewide911/about/Pages/911-Information.aspx

Table A-3. Industry and Trade Association Resources

Organization	Description and Link
DATAMARK	DATAMARK's "Beyond The 98: Understanding When GIS Data Is Ready For NG9-1-1" whitepaper provides steps to ensure GIS data readiness for NG911. https://datamarkgis.com/app/uploads/2018/06/Datamark-Beyond-98pct.pdf
GeoComm	GeoComm has a dedicated webpage with educational resources that includes articles, webinars/recordings, infographics, eBooks, white papers, and case studies to help guide ECCs/PSAPs on transitioning existing GIS capabilities to NG911. https://geo-comm.com/top5/ & https://geo-comm.com/blog/

Organization	Description and Link
National Alliance for Public Safety GIS (NAPSG) Foundation	The NAPSG Foundation provides resources on GIS concepts and principles, implementation steps, and best practices and standards on technology, training and exercise, and use. They also provide a publicly available tool that helps ECCs/PSAPs to determine their geospatial maturity. https://www.napsgfoundation.org/all-resources/ • "A Quick Guide to Building a GIS For Your Public Safety Agency" https://www.esri.com/library/brochures/pdfs/napsg-guide-bro.pdf • "Capability and Readiness Assessment Tool (CARAT)" https://www.napsgfoundation.org/carat/
National Emergency Number Association (NENA)	NENA's website contains a complete archive of all its 9-1-1 standards, including those related to NG911. https://www.nena.org/page/Standards Specific resources related to GIS data structures include: • "Standard data formats for E911 Data Exchange & GIS Mapping" https://www.nena.org/page/DataFormats • "Standard for NG911 GIS Data Model" https://www.nena.org/page/NG911GISDataModel
National States Geographic Information Council (NSGIC)	The NSGIC has a dedicated NG911 webpage that provides resources on workshops and webinars, NENA GIS standards and documents, and other resource documents to educate and update the 911 community on NG911 GIS standards and regulations. https://www.nsgic.org/next-generation-9-1-1
Open Geospatial Consortium (OGC)	OGC develops open standards for spatial data and spatial processing. https://www.ogc.org/
Urban and Regional Information Systems Association (URISA)	URISA's "Geospatial Fact Sheet: Next Generation 9-1-1" emphasizes the importance of NG911 GIS, provides definition to "GIS-centric call routing," highlights URISA's NG911 initiatives, and provides links to NG911 guidelines and GIS standard bodies. https://www.urisa.org/clientuploads/directory/Documents/Committees/Professional%20Education/URISA_GeospatialFactSheet_NG911_June2019.pdf

Appendix B GIS Best Practices

PHASE 1: PREPARE

- ☐ Assess the need to replace, upgrade, maintain, share, dispose of, or acquire a new GIS system
- ☐ Inform organization leadership, announce to staff, and secure the decision
- ☐ Establish GIS governance through policy and documentation that is inclusive of the evolving technical and operational environment
- ☐ Consider funding opportunities and mechanisms for necessary transition, implementation (i.e. capital), operations and maintenance (O&M), and/or sustainment investment(s)

PHASE 2: PLAN

- ☐ Form a project team; define and document GIS system requirements from all departments and jurisdictions the ECC/PSAP is serving
- ☐ Create a project plan that aligns to all guiding documents (e.g., organizational mission and purpose, local and state 911 plans, regional goals and strategies such as SCIPs, industry and governmental guidance [e.g., National States Geographic Information Council, the Urban and Regional Information System Association, NIST Cybersecurity Framework], and regulations such as ones from NENA and the National 911 Program) and encompasses the entire GIS lifecycle
- ☐ Establish MOU/A on topics including:
  - ☐ Creation, storage, maintenance, transmission, and security of data
  - ☐ Establishment of rules and processes for data usage and terms of disclosure
  - ☐ Establishment of authorities
  - ☐ Development of conflict resolution processes
  - ☐ Definition of roles and obligations (such as the need to support the GIS administrator with accurate data)
  - ☐ Delineation of privacy and information sharing responsibilities
- ☐ Issue an RFI to gain a better understanding of technical requirements and offerings prior to releasing an RFP
- ☐ Develop a framework to address the risks, challenges, and concerns with implementing GIS

PHASE 3: PROCURE

- ☐ Apply strategic funding method(s) that align to the GIS lifecycle
- ☐ Procure GIS resources, such as:
  - ☐ Hardware
    - Computer servers
    - Unique client machines (e.g., plotters)
  - ☐ Software
    - Database management system (DBMS)
    - Graphical user interface (GUI)
    - Tools to input and manipulate geographic information and support search and analysis
- ☐ Additional resources
  - ☐ Staffing and work space
  - ☐ Training and sustainment
  - ☐ Other costs (e.g., interface to other data sources outside the organization)

PHASE 4: IMPLEMENT

- ☐ Develop an implementation plan that details system installation, testing, training, and transition procedures containing:
  - ☐ Conceptual/system design
  - ☐ Physical design
  - ☐ Timeline and milestones
  - ☐ Application development
  - ☐ Administrative framework and staffing
  - ☐ Hardware and software installation
  - ☐ Data conversion and database construction
- ☐ Incorporate data management strategies that establish provisioning boundaries (i.e. jurisdiction responsible for uploading GIS data) and emergency service boundaries

PHASE 5: SUPPORT, MAINTAIN, AND SUSTAIN

- ☐ Establish standard operating procedures (SOP)/standard operating guidelines (SOG) and update as needed to meet system and organization needs
- ☐ Inventory equipment and resources, conduct scheduled assessments, and communicate needs
- ☐ Establish physical security and cybersecurity risk management, address vulnerabilities, and mitigate incidents
- ☐ Ensure all GIS system agreements are up-to-date

PHASE 6: ASSESS, REFRESH

- ☐ Review GIS system arrangement and determine update needs
- ☐ Follow previously established procurement process

Appendix C Acronyms

Acronym	Term
CARAT	Capability and Readiness Assessment Tool
CLDXF	Civic Location Data Exchange Format
DBMS	Database Management System
DOT	Department of Transportation
ECC	Emergency Communications Center
ESInet	Emergency Services Internet Protocol Network
FCC	Federal Communications Commission
FGDC	Federal Geographic Data Committee
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GUI	Graphical User Interface
IP	Internet Protocol
MOU/A	Memorandums of Understanding and Agreement
NAPSG	National Alliance for Public Safety GIS
NECP	National Emergency Communications Plan
NENA	National Emergency Number Association
NG911	Next Generation 911
NGA	National Geospatial-Intelligence Agency
NGCS	Next Generation Core Service
NHTSA	National Highway Traffic Safety Administration
NIST	National Institute of Standards and Technology
NSGIC	National States Geographic Information Council
OGC	Open Geospatial Consortium
O&M	Operations and Maintenance
OSP	Originating Service Provider
PEMA	Pennsylvania Emergency Management Agency
PSAP	Public Safety Answering Point
RFI	Request for Information
RFP	Request for Proposal
SCIP	Statewide Communication Interoperability Plan
SOG	Standard Operating Guideline
SOP	Standard Operating Procedure
URISA	Urban and Regional Information Systems Association
VITA	Virginia Information Technologies Agency