

Planning Your First GIS

A Step-by-Step Roadmap for Agencies Beginning their First Enterprise GIS Implementation

Introduction

Starting your first GIS can feel like a major technology project.

It does not have to be.

A successful GIS implementation begins with a simple question:

What does our agency need GIS to help us do?

The technology comes second.

This guide provides a practical roadmap for agencies that are starting their first enterprise GIS. It is designed for General Managers, department heads, operations managers, and staff who need to make good decisions without becoming GIS experts.

The objective is simple:

Build a GIS that your agency will use, maintain, and benefit from.

Step 1 — Define Why You Need GIS

Do not begin by selecting software.

Begin by identifying the problems you want GIS to solve.

Common reasons agencies implement GIS

-  Locate water, sewer, stormwater, or other infrastructure
-  Replace paper utility maps
-  Centralize asset information
-  Improve field operations
-  Improve emergency response
-  Connect GIS to work orders or CMMS

- ☐ Improve asset management
- ☐ Reduce time spent searching for information
- ☐ Support capital improvement planning
- ☐ Improve regulatory reporting
- ☐ Provide better information to management
- ☐ Reduce dependence on individual employees who know where everything is
- ☐ Create a reliable record of agency infrastructure
- ☐ Provide information to engineers and contractors
- ☐ Improve communication between departments

Define your top five objectives

1. _____
2. _____
3. _____
4. _____
5. _____

Rule

If you cannot explain why you need GIS in business terms, you are not ready to select GIS software.

Step 2 — Identify Your Users

Your GIS should be designed around the people who will use it.

Identify your users

- ☐ General Manager
- ☐ Operations Manager
- ☐ Maintenance staff
- ☐ Field crews

- ☐ Engineering staff
- ☐ Administrative staff
- ☐ Customer service staff
- ☐ Finance staff
- ☐ Emergency response personnel
- ☐ Outside engineers
- ☐ Contractors
- ☐ Board members
- ☐ Other: _____

For each user group, ask:

- ☐ What information do they need?
- ☐ How do they get that information today?
- ☐ What takes too much time?
- ☐ What information is difficult to find?
- ☐ What information is frequently wrong or outdated?
- ☐ What information do they need in the field?
- ☐ What information should they be able to update?

The most important question

Ask each department:

“What information do you need to do your job that is difficult to find today?”

Write down the answers.

Those answers should drive your GIS priorities.

Step 3 — Inventory Your Existing Information

Do not assume that you need to create everything from scratch.

Your agency may already have valuable information.

Look for:

-  Paper maps
-  CAD drawings
-  As-built drawings
-  Engineering plans
-  Existing GIS files
-  ESRI Shapefiles
-  Geodatabases
-  CAD files
-  GPS data
-  Aerial imagery
-  Parcel data
-  Address data
-  Spreadsheets
-  Asset inventories
-  Work-order data
-  CMMS data
-  Billing data
-  Inspection records
-  CCTV records

-  Photographs
-  Scanned documents
-  Regulatory records

Create an inventory

Information	Location	Format	Quality	Owner
Water system	_____	_____	_____	_____
Sewer system	_____	_____	_____	_____
Storm system	_____	_____	_____	_____
Parcels	_____	_____	_____	_____
Work orders	_____	_____	_____	_____

Do not wait for perfect data.

Start by understanding what you have.

Step 4 — Decide What Your GIS Must Contain

Do not try to map everything on day one.

Start with the information that provides the greatest operational value.

Typical water GIS

-  Water mains
-  Valves
-  Hydrants
-  Meters
-  Service connections
-  Tanks
-  Wells
-  Pump stations

-  Treatment facilities
-  Pressure zones
-  Easements

Typical sewer GIS

-  Gravity mains
-  Force mains
-  Manholes
-  Cleanouts
-  Lift stations
-  Sewer services
-  Treatment facilities
-  Easements
-  CCTV information

Typical stormwater GIS

-  Storm drains
-  Inlets
-  Catch basins
-  Manholes
-  Culverts
-  Channels
-  Outfalls
-  Detention facilities

-  Drainage areas

Other useful information

-  Roads
-  Parcels
-  Addresses
-  Buildings
-  Facilities
-  District boundaries
-  Easements
-  Projects
-  Flood zones
-  Aerial imagery

Prioritize each dataset

Essential: Needed for initial operations

Important: Needed soon after implementation

Future: Useful, but not required initially

Step 5 — Decide How Accurate the GIS Needs to Be

This is an important decision.

Not every GIS feature requires survey-level accuracy.

Ask what accuracy is required for each use.

Consider:

-  Emergency response
-  Asset location

- ☐ Maintenance
- ☐ Engineering
- ☐ Construction
- ☐ Regulatory requirements
- ☐ Capital planning
- ☐ Customer information
- ☐ General reference

Establish accuracy standards

For each asset type, determine:

Required accuracy: _____

Current accuracy: _____

Improvement required: _____

Important

Do not spend money achieving a level of accuracy that your operations do not require.

At the same time, do not assume that inaccurate data is acceptable simply because it is inexpensive.

Accuracy should match the business requirement.

Step 6 — Decide Who Will Maintain the GIS

This decision must be made before implementation.

Choose your maintenance model

- ☐ Internal GIS employee
- ☐ Existing employee assigned GIS responsibility
- ☐ Department staff maintain their own data
- ☐ Outside GIS consultant
- ☐ GIS service provider

- ☐ Combination of internal and external resources

Define responsibilities

Who will:

- ☐ Add new assets?
- ☐ Remove retired assets?
- ☐ Correct errors?
- ☐ Update locations?
- ☐ Process construction projects?
- ☐ Update attribute information?
- ☐ Maintain integrations?
- ☐ Review field updates?
- ☐ Perform quality control?
- ☐ Train new employees?
- ☐ Answer GIS questions?

Warning

A GIS that is not maintained will become outdated.

The maintenance plan is as important as the implementation plan.

Step 7 — Determine Your Technology Requirements

Now — and only now — should you begin defining technology requirements.

Your GIS should answer these questions:

- ☐ Can employees access it from normal web browsers?
- ☐ Can field employees use it?
- ☐ Does it work on phones and tablets?

- ☐ Does it require software installation?
- ☐ Does it require agency-owned servers?
- ☐ Can it operate in the cloud?
- ☐ Can it read existing GIS data?
- ☐ Can it connect to databases?
- ☐ Can it integrate with our CMMS?
- ☐ Can it integrate with work orders?
- ☐ Can it connect to document management?
- ☐ Can authorized users edit information?
- ☐ Can users search and query data?
- ☐ Can users create reports?
- ☐ Can users measure distances and areas?
- ☐ Can users trace utility systems?
- ☐ Can it support dashboards?
- ☐ Can it grow as our needs change?

Security questions

- ☐ Who can view data?
- ☐ Who can edit data?
- ☐ Who can administer the system?
- ☐ Is data encrypted?
- ☐ Is data backed up?
- ☐ Where is data hosted?

-  What happens if the service becomes unavailable?
 -  Can GIS data be downloaded?
 -  How are former employees removed?
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Step 8 — Establish Your Budget

Do not compare GIS products by software price alone.

Calculate the **total cost of ownership**.

Initial costs

-  Software
-  Implementation
-  Data conversion
-  Data creation
-  Data cleanup
-  GPS or field collection
-  Integration
-  Training
-  Hardware

Ongoing costs

-  Software subscription or licenses
-  Hosting
-  Maintenance
-  Technical support
-  GIS staff

- ☐ Data updates
- ☐ Training
- ☐ Custom programming
- ☐ Future integrations

Five-year cost

Year 1: \$ _____

Year 2: \$ _____

Year 3: \$ _____

Year 4: \$ _____

Year 5: \$ _____

Five-year total: \$ _____

Also calculate staff time.

Ask:

“How many hours of agency staff time will this GIS require?”

Staff time is a real cost.

Step 9 — Define Your Implementation Priorities

Avoid the temptation to build everything at once.

A phased approach is often better.

Phase 1 — Foundation

- ☐ Core infrastructure
- ☐ Parcels
- ☐ Addresses
- ☐ Basic searching
- ☐ Basic reporting
- ☐ User access

-  Data standards

Phase 2 — Operations

-  Work orders
-  Inspections
-  Maintenance
-  Field access
-  Photographs
-  Documents
-  Asset history

Phase 3 — Advanced Operations

-  Utility tracing
-  Dashboards
-  Advanced reporting
-  Asset management
-  Capital planning
-  Automated workflows
-  Additional system integrations

Rule

Implement the capabilities that solve today's problems first.

Do not build complexity simply because it is available.

Step 10 — Select Your GIS Partner

You are not only buying software.

You are selecting a partner that may become responsible for an important part of your agency's information infrastructure.

Evaluate:

- ☐ Industry experience
- ☐ Experience with agencies similar to ours
- ☐ Understanding of utility operations
- ☐ Implementation experience
- ☐ Data conversion experience
- ☐ Integration experience
- ☐ Training
- ☐ Technical support
- ☐ Long-term maintenance
- ☐ References
- ☐ Financial stability
- ☐ Security practices
- ☐ Five-year cost
- ☐ Ability to scale

Ask for references.

Then ask the references:

“What went wrong?”

A vendor's ability to discuss problems honestly can tell you a great deal.

Step 11 — Require a Demonstration Using Your Problems

Do not accept a generic sales demonstration.

Give each vendor the same tasks.

Ask them to demonstrate:

-  Find an asset
-  View asset information
-  Search by address
-  Search by asset number
-  Create a report
-  Measure distance
-  Measure area
-  Update an asset
-  Create a work order
-  View maintenance history
-  Locate information in the field
-  Trace a utility system
-  View related documents
-  Display a dashboard
-  Connect to an existing system

Then ask your employees:

“Could you use this?”

Their answer matters more than the sales presentation.

Step 12 — Create a Simple Implementation Plan

Before signing a contract, establish responsibilities and dates.

Implementation checklist

- ☐ Project manager assigned
- ☐ Agency project team identified
- ☐ Vendor project team identified
- ☐ Data inventory completed
- ☐ Data priorities established
- ☐ Data standards established
- ☐ Data conversion plan approved
- ☐ System configured
- ☐ Integrations defined
- ☐ Security configured
- ☐ Testing completed
- ☐ Field testing completed
- ☐ User training completed
- ☐ Data quality reviewed
- ☐ Acceptance criteria defined
- ☐ Go-live date established
- ☐ Maintenance process established
- ☐ Support process established

Define “done”

Do not allow implementation to end with:

“The software has been installed.”

Implementation is complete when the agency can **use the system successfully**.

Step 13 — Train for Jobs, Not Software

Do not train everyone on every GIS function.

Train employees on what they need to accomplish.

General Manager

-  Find information
-  View dashboards
-  Review reports
-  Answer management questions

Operations Staff

-  Find assets
-  View asset information
-  Review maintenance
-  Create work orders
-  Update information

Field Staff

-  Find assets
-  Navigate to assets
-  View history
-  Perform inspections
-  Record field changes

Administrators

-  Manage users
-  Manage data
-  Perform quality control
-  Run reports
-  Manage system configuration

Rule

Training should teach people how to do their jobs better — not how to become GIS technicians.

Step 14 — Test Before Going Live

Do not make the entire agency your testing department.

Select representative users.

Test:

-  Data accuracy
-  Asset locations
-  Search
-  Reports
-  Editing
-  Field access
-  Mobile devices
-  Integrations
-  User permissions
-  Performance
-  Backups

- ☐ Security
- ☐ Emergency procedures

Ask testers:

- ☐ Can you find what you need?
- ☐ Can you understand the information?
- ☐ Can you complete your normal workflow?
- ☐ Is anything confusing?
- ☐ Is anything missing?
- ☐ Is anything unnecessarily difficult?

Fix the problems before go-live.

Step 15 — Launch With a Purpose

Do not announce:

“Our new GIS is now live.”

Instead, communicate what has changed.

For example:

“Starting Monday, field staff can use the GIS to locate assets, review maintenance history, and record inspections from the field.”

That tells employees why they should care.

Launch checklist

- ☐ Users have accounts
- ☐ Users have been trained
- ☐ Data has been checked
- ☐ Support contacts are known
- ☐ Quick-reference guides are available

- ☐ Field devices are ready
 - ☐ Integrations are working
 - ☐ Backup procedures are active
 - ☐ Maintenance procedures are active
 - ☐ Success measurements are established
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Step 16 — Measure Results

Do not wait a year to determine whether your GIS worked.

Measure results at:

- ☐ 30 days
- ☐ 90 days
- ☐ 6 months
- ☐ 12 months

Measure:

Time

- ☐ Time to find an asset
- ☐ Time to create a map
- ☐ Time to answer information requests
- ☐ Time to retrieve maintenance history

Usage

- ☐ Number of users
- ☐ Frequency of use
- ☐ Field usage
- ☐ Department usage

Data

-  Data accuracy
-  Data completeness
-  Data update time
-  Number of corrections

Operations

-  Work-order efficiency
-  Inspection efficiency
-  Emergency response
-  Repeat field visits

Financial

-  Staff hours saved
-  Contractor costs reduced
-  Engineering costs reduced
-  Paper processes eliminated
-  Duplicate data entry reduced

Step 17 — Improve the GIS

Your first GIS implementation is the beginning.

After six months, ask:

“What is working?”

Then:

“What is not working?”

Then:

“What should we add next?”

Annual GIS review

- ☐ Review user feedback
 - ☐ Review usage
 - ☐ Review data accuracy
 - ☐ Review maintenance
 - ☐ Review costs
 - ☐ Review integrations
 - ☐ Review security
 - ☐ Identify new business needs
 - ☐ Prioritize improvements
 - ☐ Update the GIS roadmap
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The First GIS Decision Checklist

Before you approve your project, make sure you can answer these questions.

Business

- ☐ What problems will GIS solve?
- ☐ Who will use it?
- ☐ What will improve?
- ☐ How will we measure success?

Data

- ☐ What information do we already have?
- ☐ What information must be created?
- ☐ What information is most important?

- ☐ How accurate must it be?
- ☐ Who will maintain it?

Technology

- ☐ Where will GIS be hosted?
- ☐ How will users access it?
- ☐ Does it support field use?
- ☐ Does it integrate with our existing systems?
- ☐ Is our data secure?
- ☐ Can the system grow?

Financial

- ☐ What is the implementation cost?
- ☐ What is the annual cost?
- ☐ What is the five-year cost?
- ☐ What staff time is required?
- ☐ What measurable savings are expected?

Implementation

- ☐ Who owns the project?
- ☐ Who is responsible for the data?
- ☐ What is Phase 1?
- ☐ What is the implementation schedule?
- ☐ What does “complete” mean?
- ☐ How will users be trained?
- ☐ How will the system be supported?

The 10 Rules for Your First GIS

1. Start with business problems.

Not technology.

2. Start small.

Build a useful foundation before adding complexity.

3. Use the data you already have.

Do not recreate information unnecessarily.

4. Make the GIS easy to use.

If employees avoid it, the system has failed.

5. Design for field employees.

They are often the people who need the information most.

6. Integrate whenever practical.

Do not create another information silo.

7. Plan for maintenance.

A GIS is never finished.

8. Measure results.

Track time, accuracy, usage, and operational value.

9. Do not confuse complexity with capability.

More technology does not automatically create more value.

10. Make the GIS serve the agency.

The agency should not have to serve the GIS.

Final Thought

Your first GIS does not need to be the biggest, most complicated, or most expensive system available.

It needs to be **useful**.

It needs to help employees find information.

It needs to help them do their work.

It needs to provide management with better information.

It needs to remain current.

And it needs to provide measurable value for the money your agency spends.

If you begin with those principles, your first GIS can become much more than a digital map.

It can become the information system your agency uses to understand and manage its infrastructure every day.