

Building a Transportation Asset Inventory in GIS

#12



Introduction

Geographic Information Systems (GIS) can help municipalities increase efficiency and reduce costs for asset management and transportation planning. But how do you get started?

You may already track transportation assets in a spreadsheet. Maybe you are new to your position and your predecessor took all of their institutional knowledge with them upon their departure and you are starting from scratch. A detailed roadmap demonstrating how to build a transportation asset inventory and options to be able to access GIS data is provided in a step-by-step process below.

Step 1: Create a List of Your Municipal Transportation Assets

Typical transportation assets owned and operated by municipalities would include municipally owned roads and other items within the road right-of-way (ROW). Table 1.0 lists potential transportation assets your municipality may own. If you do not own or are not responsible for maintaining any bridges, for example, there is no need to include that asset on your inventory.

Table 1.0- Potential Transportation Asset Categories

TRANSPORTATION ASSET CATEGORIES		
Roads	Stormwater outfalls	Traffic signals
Bridges	Stormwater pipes	Sidewalks
Culverts	Roadside swales	Curbs
Cross-pipes	Signs	ADA ramps
Stormwater inlets	Streetlights	Crosswalks
Stormwater manholes		Trails

Step 2: Identify What You Need to Know About Your Transportation Assets

The backbone of GIS contains a database file (i.e., spreadsheet). For each asset, you should consider what attribute fields (i.e., what you need to know about each asset) to include which will become column headings in the database file.

Refer to Table 2.0- Attribute Field List below for a list of attributes a municipality may elect to include for a particular asset. To fully maximize the benefit from GIS, the items entered in each attribute field should be named consistently during the data collection process.

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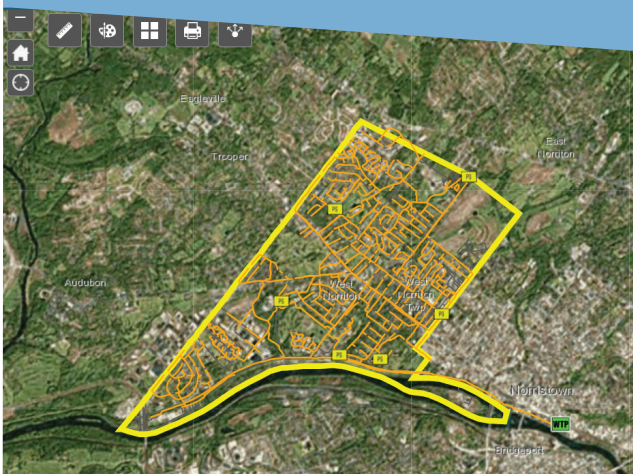
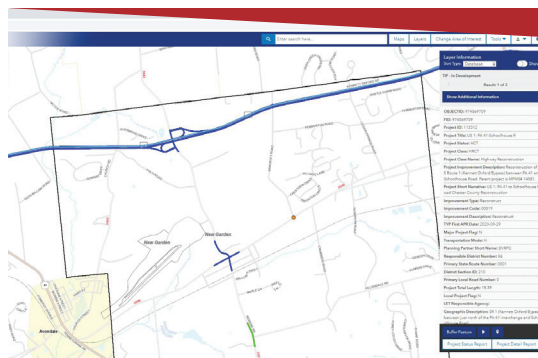


Table 2.0- Attribute Field List

ATTRIBUTE FIELD	EXAMPLE ENTRY TYPES
Unique ID Number	001, 002, 003
Latitude	-45.XXXXX (Decimal Degrees)
Longitude	75.XXXXX (Decimal Degrees)
Ownership	Township, State, Private
Responsible Party	Organization
Length	feet, miles, meters
Width	feet, miles, meters
Height	feet, meters, etc.
Location	Latitude, Longitude
Shape	circular, elliptical, etc.
Color	red, black, white
Type	Stop, One-Way or Road, Avenue, Street
Material	RCP, CMP, HDPE
Name	Emery, Doolan, Sproul
Size	inches, feet
Diameter	inches
Condition	poor, fair, good, excellent
Date Condition Last Assessed	XX/XX/XXXX
Photographs	Hyperlinks to photographs
Video	Hyperlink to video
Date Last Inspected	XX/XX/XXXX
Date of Last Maintenance Activity	XX/XX/XXXX
Maintenance Activity Type	crack seal, chip seal, seal coat
Data Collected/Populated	XX/XX/XXXX
Date Updated	XX/XX/XXXX
Notes	Text field to enter miscellaneous notes about the record.



To establish a framework for data collection, save a spreadsheet for each asset category. Label a column in the spreadsheet for each of the attribute fields from Table 2.0 you would like to include. Each row in the spreadsheet will become a point, polyline, or polygon in GIS.

For example, you would name your spreadsheet “Stormwater Manholes” and each row will be displayed as a point or individual manhole in GIS similar to Figure 1.0.

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	MH ID	RIM ELEVATION	INVERT ELEVATION	INVERT ELEVATION	OUT ELEVATION	Condition...	Last Inspection	Last Condition Rating Date	Last Inspection Comm...
1	63.19.2	274.7	266.11	260.92	260.71	5	12/30/2021	2/15/2022	Televised on 12/30/2021
2	69.19.2.1	278	263.15	<Null>	262.93	5	12/30/2021	2/15/2022	Televised on 12/30/2021
3	69.19.2.2	275.2	264.92	265.01	264.8	5	12/30/2021	2/15/2022	Televised on 12/30/2021
4	69.19.2.3	275.5	<Null>	<Null>	266.78	5	12/30/2021	2/15/2022	Televised on 12/30/2021
5	69.19.2.4	288.25	<Null>	<Null>	279.97	5	12/30/2021	2/15/2022	Televised on 12/30/2021
6	63.19.4.3	292.3	<Null>	<Null>	284.3	5	12/30/2021	2/15/2022	Televised on 12/30/2021
7	63.19.4.2	291	282.45	<Null>	282.26	5	12/30/2021	2/15/2022	Televised on 12/30/2021
8	63.19.4.1	295.3	281.02	<Null>	280.84	5	12/30/2021	2/15/2022	Televised on 12/30/2021
9	63.19.4	286.8	279.18	<Null>	278.94	5	12/30/2021	2/15/2022 11:52:56 AM	<Null>
10	63.19.3	<Null>	<Null>	<Null>	<Null>	5	12/30/2021	2/15/2022	Televised on 12/30/2021
11	362	315.8	307.89	0	307.89	4	11/9/2021 1:00:00 AM	11/15/2021 5:00:00 AM	Cone and riser replaced.
12	361	312.8	305.67	0	304.67	4	11/9/2021 1:00:00 AM	11/15/2021 5:00:00 AM	Cone and riser replaced.
13	360	313.9	304.65	0	304.65	4	11/9/2021 1:00:00 AM	11/8/2021 5:00:00 AM	Cone and riser replaced.
14	500	422.52	0	0	0	4	9/29/2021	9/30/2021	<Null>
15	393.6	426.26	0	0	0	4	9/29/2021	9/30/2021	<Null>
16	501	<Null>	<Null>	<Null>	<Null>	4	9/29/2021	9/30/2021	<Null>
17	502	<Null>	<Null>	<Null>	<Null>	4	9/29/2021	9/30/2021	<Null>
18	503	<Null>	<Null>	<Null>	<Null>	4	9/29/2021	9/30/2021	<Null>
19	63.19.1	<Null>	<Null>	<Null>	<Null>	2	6/17/2021 11:00:00 PM	6/23/2021 4:00:00 AM	Five 5 gallon buckets...
20	326	271.29	264.32	264.9	264.12	4	5/6/2021 4:00:00 AM	5/12/2021 4:00:00 AM	Located in grass near...
21	327	277.3	269.84	0	269.84	4	5/6/2021 4:00:00 AM	5/12/2021 4:00:00 AM	Located in asphalt sur...
22	325	271.6	264.44	0	264.44	4	5/6/2021 4:00:00 AM	3/11/2022 5:00:00 AM	Located in grass proxi...
23	324	270.5	263.3	0	263.3	4	5/6/2021 4:00:00 AM	5/12/2021 4:00:00 AM	Located in grass proxi...
24	322	267.5	262.02	0	262.02	4	5/6/2021 4:00:00 AM	5/12/2021 4:00:00 AM	Located in grass proxi...
25	321	268	261.39	0	261.39	4	5/6/2021 4:00:00 AM	5/12/2021 4:00:00 AM	Located in grass proxi...

Figure 1- Excerpt from GIS Attribute Table for Manholes

Step 3: Collect the Information You Need

Different data collection methods are available to fill in the “Example Entry Type” column in Table 2.0 above. These methods are listed below. You may decide to use one or a combination. This process can certainly evolve and change over time.

- Populate a spreadsheet for a GIS analyst to import into GIS
- iPad/tablet or Smartphone (Digitize or Location-based)
- iPad/tablet with external antenna
- Traditional GPS
- Digitizing plans (may need assistance from a GIS analyst)

- Digitizing based on aerial imagery (may need assistance from a GIS analyst)
- Geoprocessing to automatically add points where streams cross roads for culverts, for example (may need assistance from a GIS analyst)

Step 4: Identify Other Data Needs

When building a system, GIS layers from outside sources are helpful to provide basemapping for the layers you create. Table 3.0- Other Data Needs/ Wants lists examples of these layers and sources and where they can be obtained. For any data layer, it is recommended that it be obtained directly from the source who publishes and maintains the data.

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The Pennsylvania Spatial Data Access (PASDA) site serves as an official public access open geospatial data portal and many state organizations and other entities host their layers on this website (<https://www.pasda.psu.edu/>). Your Metropolitan or Regional Planning Organization (MPO or RPO) may also be able to provide these GIS layers or guide you in the direction for where to obtain them.

Table 3.0- Other Data Needs/Wants

LAYER	SOURCE
Municipal boundaries	County or PennDOT
Streams	USGS
Parcels	County
Township Zoning	Your municipality
Township Land Use	Your municipality
Floodplains/Flood Hazard Areas	FEMA
Contours	PASDA (DCNR PA MAP Program)
Municipal Facilities	Your municipality
Sanitary Sewer	Sanitary Sewer Owner

Step 5: Create the Platform in Which You Will Access Your GIS Data

There are several different platforms in which you can view, edit, and interact with your GIS data. All of these will likely require a GIS analyst or outside assistance for the initial set-up.

Examples are listed below:

- [QGIS](#) (free- no online platform)
- [PennDOT One Map](#) (free- online platform)
- [ESRI/ArcGIS Online](#) (not free)
- Other Proprietary Software (not free)

The most commonly used GIS platform is ESRI/ArcGIS. Click on the two links below for examples of what types of applications can be created using ArcGIS Online (AGOL).

[New Hanover Township Web Map App](#)

[West Norriton Township Public GIS Hub](#)

Step 6: Establish Roles and Responsibilities

When beginning the implementation of GIS, it is important to consider roles, responsibilities, and accountability to ensure the quality of the data being collected and maintained. Your municipality should answer the following questions:

- Who will be collecting the data?
- Who will be digitizing data?
- Who will be maintaining data?
- Who will create and maintain web map apps?
- Considerations:
 - o Does your municipality need to add staff?
 - o Does your municipality need to hire a consultant?
 - o Can PennDOT Connects provide technical assistance?

Resources:

PennDOT Connects can provide municipalities with the opportunity to see how to interact with different types of interactive GIS web map applications in addition to an introduction of how to collect and maintain data and how applications are created. For assistance with this process, contact PennDOT Connects for technical assistance at: <https://www.pennodt.gov/ProjectAndPrograms/Planning/Pages/Land-Use-and-Transportation-Planning.aspx>, paconnects@pa.gov, or 717-710-2090.