



# Using Survey123 and ArcGIS Pro to Calculate Areas of Potential Effects (APE) for Historical Sites

*Presented by*  
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# Overview

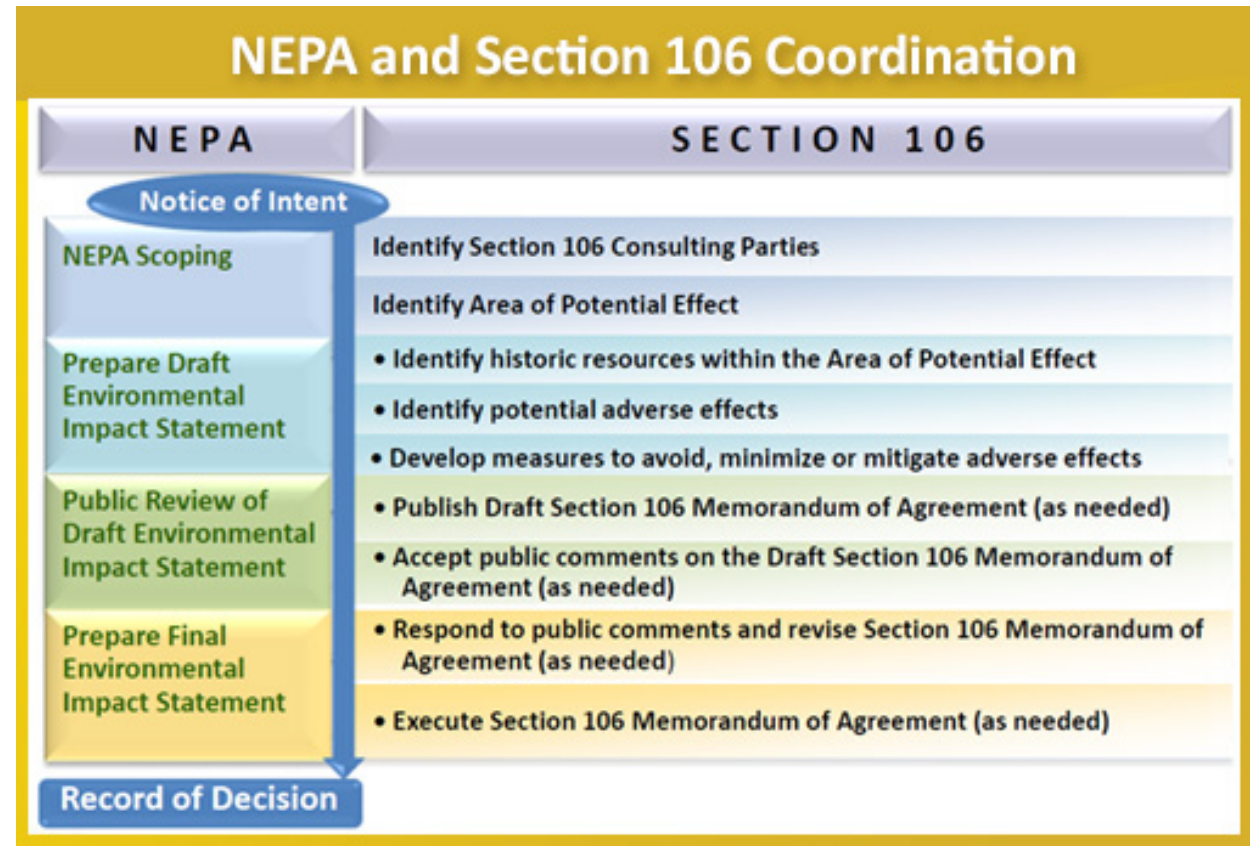
- Project History
- Integrating Survey123 with WebApp Builder
- Setting up ArcGIS Pro Tasks
- Generating Reports and Disseminating Data

# Project History



# Project History

- Section 106 of the National Historic Preservation Act
- Determine Historic Parcels within APE
- New modified approach to identify APE was agreed on by Federal Highways Administration (FHWA), Georgia Department of Transportation (GDOT), and Georgia State Historic Preservation Officer (GA SHPO)



# Workflows

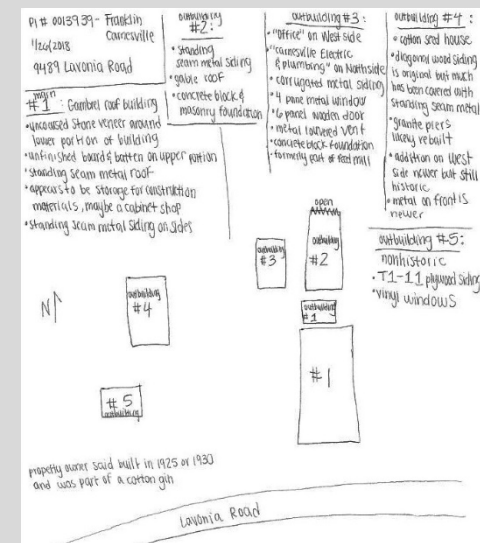
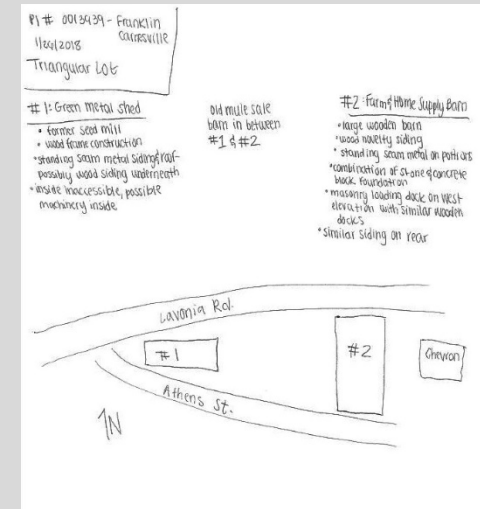
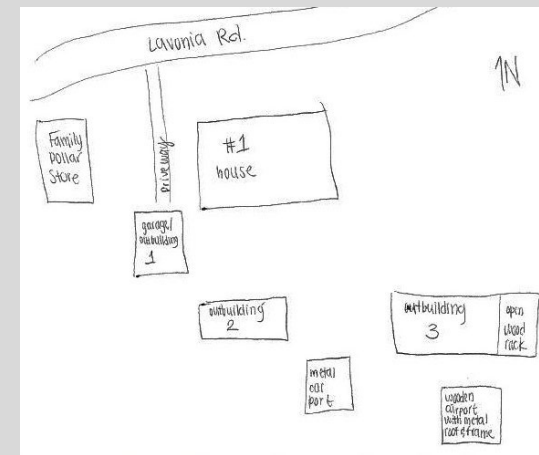
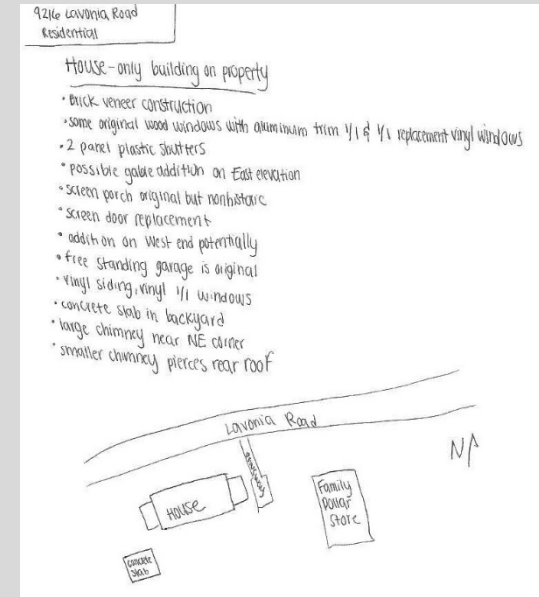
- Collect information about a property
- Initially was done on paper - was not a location based process
- Post processing included using the Measure tool in Google Earth or ArcMap (Could take months to complete the entire process)



# Previous Collection Efforts

- Prior to having GIS involved, the field teams used hand drawings to layout their notes
- Problems:
  - Field notes can go missing or get damaged
  - Can be illegible
  - Not location based
- Surveyed points would be required by a surveyor to evaluate the potential impact calculations
- If a surveyor wasn't available, points were digitized from an aerial – which skews the accuracy of the data

**Post-process would take about 50-60 hours to complete**





# Using a GIS Solution for Data Collection



# Using a GIS Solution for Data Collection

- The team needed to collect the information
  - About the Historic Parcel
  - Building Surveys
  - ROW Surveys
  - Feature Surveys
- Used an integration of Survey123 within a webapp to collect data and update attribute data
- Streamlined the calculation and output processes to reduce time and produce a high quality product





# Set up Surveys using SurveyConnect

- Survey123 was set up to collect information the field team would typically take notes on paper
- At least three survey forms were needed for each property
- The surveys were built through SurveyConnect using an excel spreadsheet
  - They contained questions with built in logic, domains, a point location, and had the ability to take photos

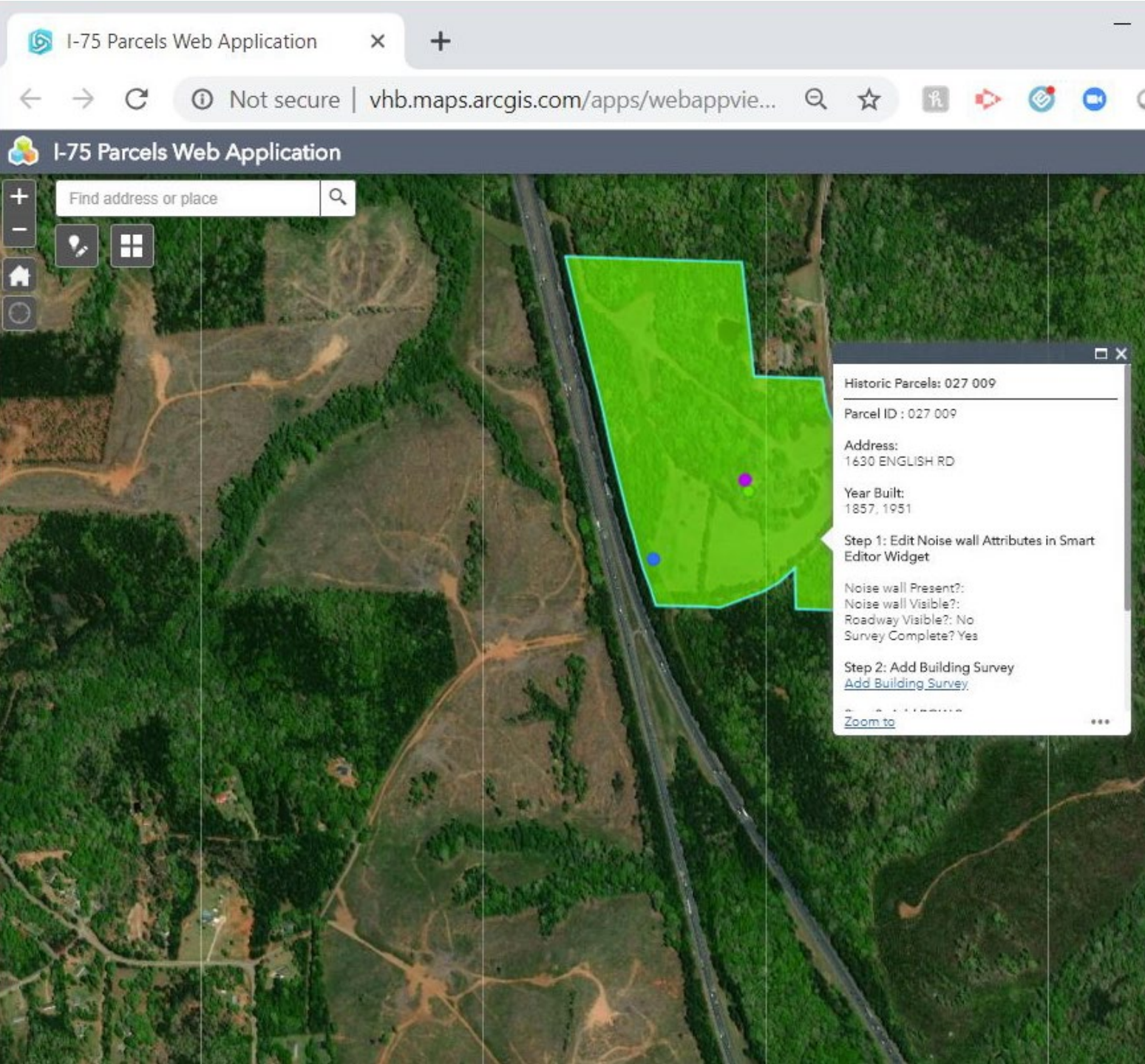
The image shows the Survey123 Connect for ArcGIS interface. On the left, an Excel spreadsheet is open, displaying a survey form structure with columns for type, name, and label. The spreadsheet data is as follows:

	A	B	C
1	type	name	label
2	text	txtparcelid	Parcel ID
3	geopoint	gpBuilding	Building Location
4	text	txtBuildingLocationNotes	Building Location Notes
5	select_one bldgtype	soBuildingType	Building Type
6	text	txtBTOther	Building Type Other
7	select_one bldgstyle	soBuildingStyle	Building Style
8	text	txtBSOther	Building Style Other
9	select_one prelimeval	soPreliminaryEval	Preliminary Evaluation
10	text	txtPrelimEvalNotes	Preliminary Evaluation Notes
11	image	imgPhoto1	Photo 1
12	image	imgPhoto2	Photo 2
13	image	imgPhoto3	Photo 3
14	image	imgPhoto4	Photo 4
15			
16			
17			
18			
19			
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21			
22			
23			
24			
25			
26			

On the right, the Survey123 Connect for ArcGIS interface is shown, displaying the survey form for 'Atlanta APE Building Survey'. The form includes a map view showing the location (28°34'N 81°23'W ± 108 m) and a list of questions corresponding to the spreadsheet data. The questions are:

- Building Location Notes
- Building Type
- Building Style
- Preliminary Evaluation

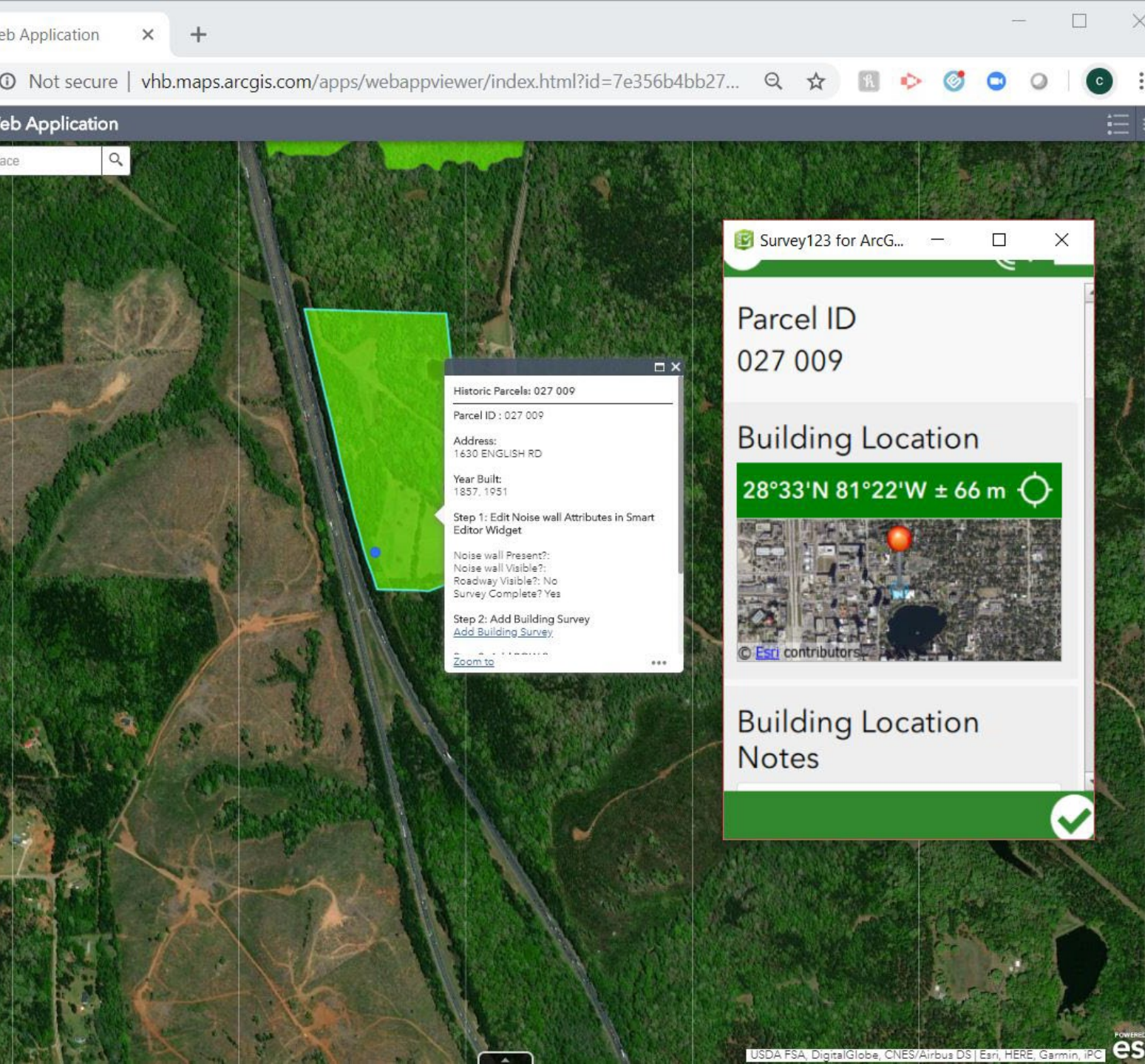
The interface also shows a 'Validate Input' button and a 'Load time on Windows 1.9 seconds' indicator.



# Using Survey123 within WebApp Builder

- Through WebApp Builder, we configured the pop-up to outline the steps for the data collection process
- Steps directed the user to access specific surveys for each property
- Steps also walk the user through the process of updating the attributes about the property





# Using Survey123 within WebApp Builder

- The parcel id was passed to the "Parcel" field in each survey form through webapp builder
  - Reducing the risk of keystroking the wrong id in the field
- Survey123 opens from clicking the hyperlink
- Survey points display in web-app after survey is submitted



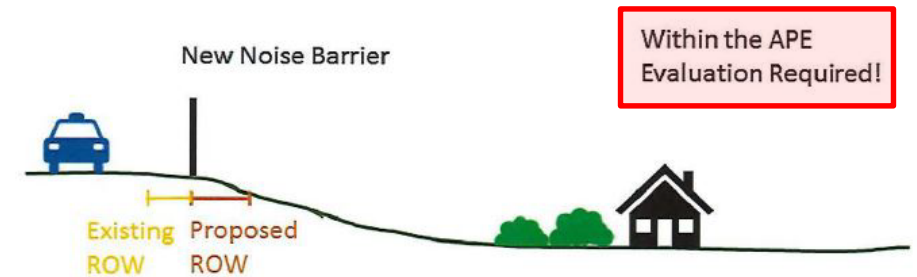
# Post-processing the Data Collected

- After the surveys were complete, the analysis began
- Historians needed to know the visual impact of the historic site based on the presence of a noise wall
- If a noise wall is present but not visible, it is included in the APE
- If the noise wall is present AND is visible, it is not in the APE

## Example Graphics

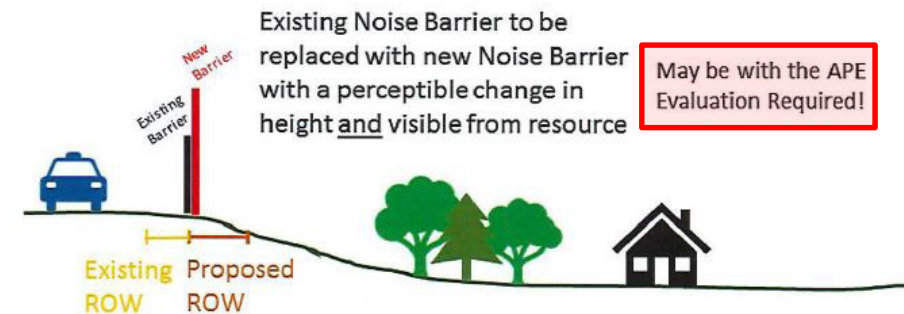
### Example F

Visual Impact—  
Within the APE



### Example G

Potential Visual  
Impact—May be  
within the APE



# Performing Calculations

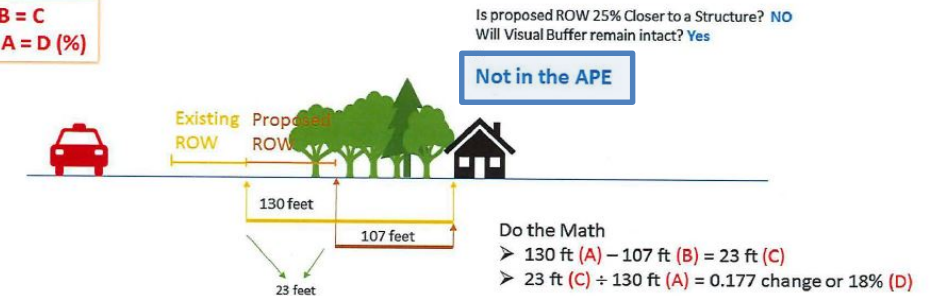
- Historians needed to know the percent of encroachment of a proposed ROW versus the existing ROW
- If the percent of change is 25% or greater, the property is considered in the APE as a physical impact
- Math calculations were run for each point collected, for every site
- Updates in proposed ROW meant they would need to re-calculate

## Determining the Distance – Example 1

(A) Distance from Existing ROW to Feature – (B) Distance from Proposed ROW to Feature = (C) X ft change

(C) X ft Change ÷ (A) Distance from Existing ROW to Feature = (D) % change

$$\begin{aligned} A - B &= C \\ C \div A &= D (\%) \end{aligned}$$

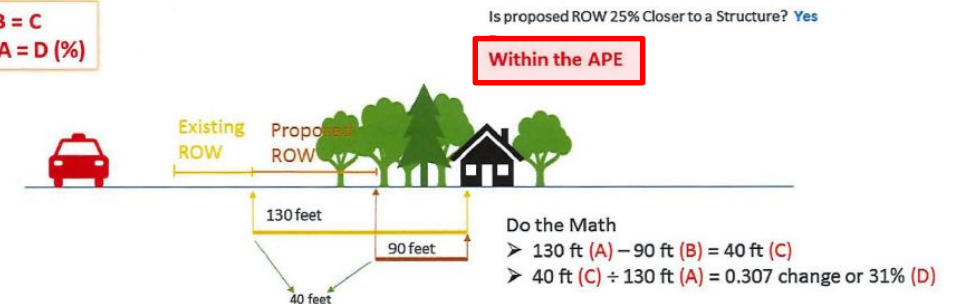


## Determining the Distance – Example 2

(A) Distance from Existing ROW to Feature – (B) Distance from Proposed ROW to Feature = (C) X ft change

(C) X ft Change ÷ (A) Distance from Existing ROW to Feature = (D) % change

$$\begin{aligned} A - B &= C \\ C \div A &= D (\%) \end{aligned}$$



# Setting up ArcGIS Pro Tasks





# Setting up ArcGIS Pro Tasks

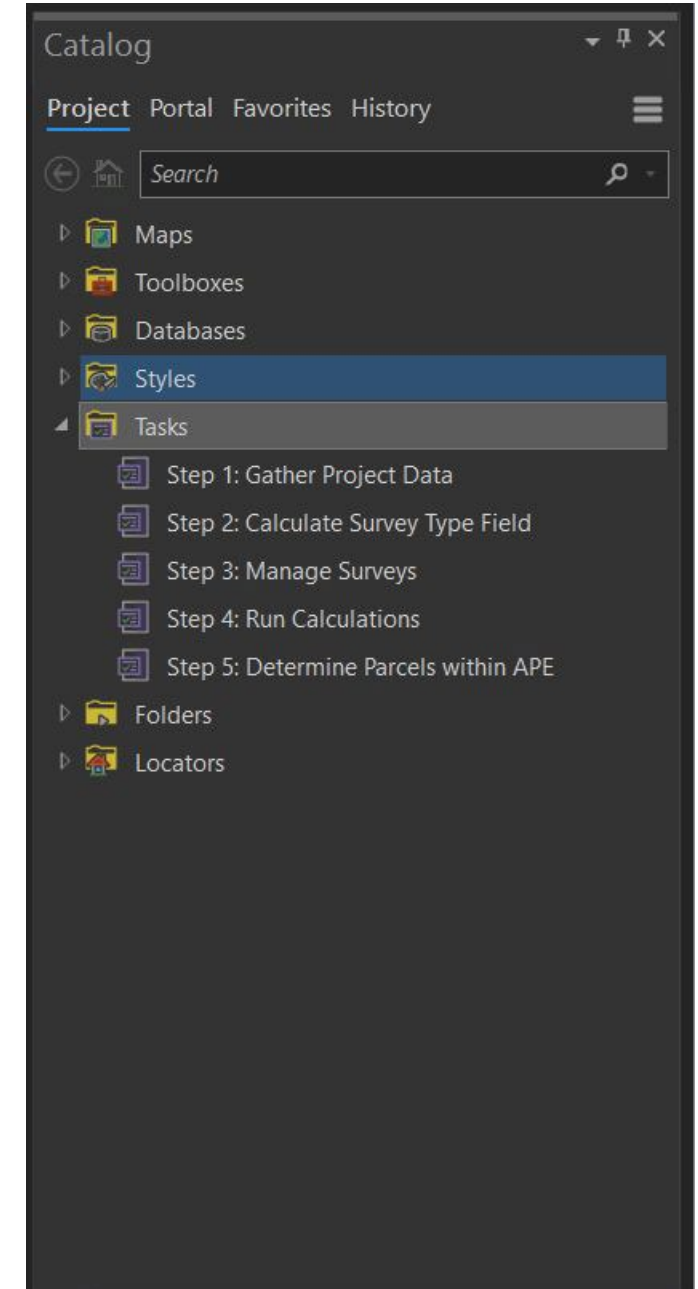
## What is a task?

"A task is a set of preconfigured steps that guide you and others through a workflow or business process. A task can be used to implement a best-practice workflow, improve the efficiency of a workflow, or create a series of interactive tutorial steps."

- Esri

# Tasks vs. Model Builder

- Similar in concept, but have different capabilities
  - Tasks outline a workflow process
- Can be run multiple times, or has the option to skip the step
- ModelBuilder automates geoprocessing workflows
- ModelBuilder can be run within a Task



ArcGIS Pro - TestProj\_CC - I\_75\_APE\_Feature\_Survey

Project Map Insert Analysis View Edit Imagery Share View Appearance Labeling Data

<None>

Attribute Table Table From Selection All Switch Clear Layer From Selection Fields Subtypes Domains Attribute Rules Contingent Values Add Archive Spatial Join Joins Relationships

Definition Query Table Selection Design Archiving Relationship

Tasks ? ▾

← Add and Update Fields

1. Add Field in Feature Survey  
2. Open Table (Ctrl+T)  
3. Calculate Field

Calculate the field

"SurveyType" = "Feature"

Parameters Environments ?

Input Table  
I\_75\_APE\_Feature\_Survey

Field Name  
SurveyType

Expression Type  
Python 3

Expression

Fields Helpers

ObjectID .conjugate()  
GlobalID .denominator()  
Parcel ID .imag()  
Feature Location Number .numerator()

Calculate Field

Running...

View Details Open History

Skip Run Finish

Progress (3/3)

Map X

SPALDING

Experiment Griffin

Cabin Creek

Buck Creek

1:232,623 84.1701092°W 33.3303839°N

I\_75\_APE\_Building\_Survey I\_75\_APE\_Feature\_Survey X

Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete

Feature	Other Feature Type	CreationDate	Creator	EditDate
Feature	<Null>	3/25/2019 1:34:41 PM	ENicoletti@vhb.com...	4/17/2019 6:59:00
Field	<Null>	3/25/2019 1:53:03 PM	ENicoletti@vhb.com...	4/17/2019 6:59:01
Field	<Null>	3/25/2019 2:10:46 PM	dnanderson@vhb.co...	4/17/2019 6:59:02
Field	Stone landscaping	3/25/2019 2:29:28 PM	ENicoletti@vhb.com...	4/17/2019 6:59:03
Field	Field	3/25/2019 2:31:23 PM	dnanderson@vhb.co...	4/17/2019 6:59:03
Field	<Null>	3/25/2019 2:44:20 PM	ENicoletti@vhb.com...	4/17/2019 6:59:03
Field	Pond	3/25/2019 2:49:59 PM	ENicoletti@vhb.com...	4/17/2019 6:59:03
Field	<Null>	3/25/2019 2:51:32 PM	dnanderson@vhb.co...	4/17/2019 6:59:03
Field	<Null>	3/25/2019 2:55:46 PM	ENicoletti@vhb.com...	4/17/2019 6:59:04
Field	Wall (wood)	3/25/2019 3:00:40 PM	dnanderson@vhb.co...	4/17/2019 6:59:04

# ArcGIS Pro Tasks

- Allows for the analysis process to be re-run
- Allows for more than one person to pick up the project and run the tasks
- Important with new parcels coming in/out of the study area
- Essential for updates to the proposed ROW and running the calculations



# Model Builder within a Task

- Within step 4, a model runs the calculations to determine which surveys are closest to the ROW
- Calculates the percent of change of the ROW
- Then determines which parcels are within the APE

The screenshot displays the Model Builder interface with a workflow diagram on the left and a detailed execution log on the right.

**Workflow Diagram:**

- Inputs: Survey Points (Merge), Existing ROW, PropROW.
- Processors: Calculate Near Distance, Calculate Near Distance 2.
- Outputs: Survey Points (Merge) 2, Survey Points (Merge) 4.

**Execution Log (Near Calculations):**

Processing 6 of 6  
Executing Calculate Field (2)...

Executing (Calculate Near Distance): Near Merge ROW\_Existing # NO\_LOCATION NO\_ANGLE Planar  
Start Time: Thursday, April 25, 2019 3:34:12 PM  
Determining data processing extents...  
Building a neighborhood index from the Near Features...  
Generating Near Table...  
Found 403 feature(s)  
Succeeded at Thursday, April 25, 2019 3:35:10 PM (Elapsed Time: 58.52 seconds)

Executing (Add Field (Existing Distance)): AddField Merge ExistDist "Float (single precision)" # # "Existing Distance" NULLABLE NON\_REQUIRED #  
Start Time: Thursday, April 25, 2019 3:35:23 PM  
**WARNING 000012: ExistDist already exists**  
Succeeded at Thursday, April 25, 2019 3:35:54 PM (Elapsed Time: 30.57 seconds)

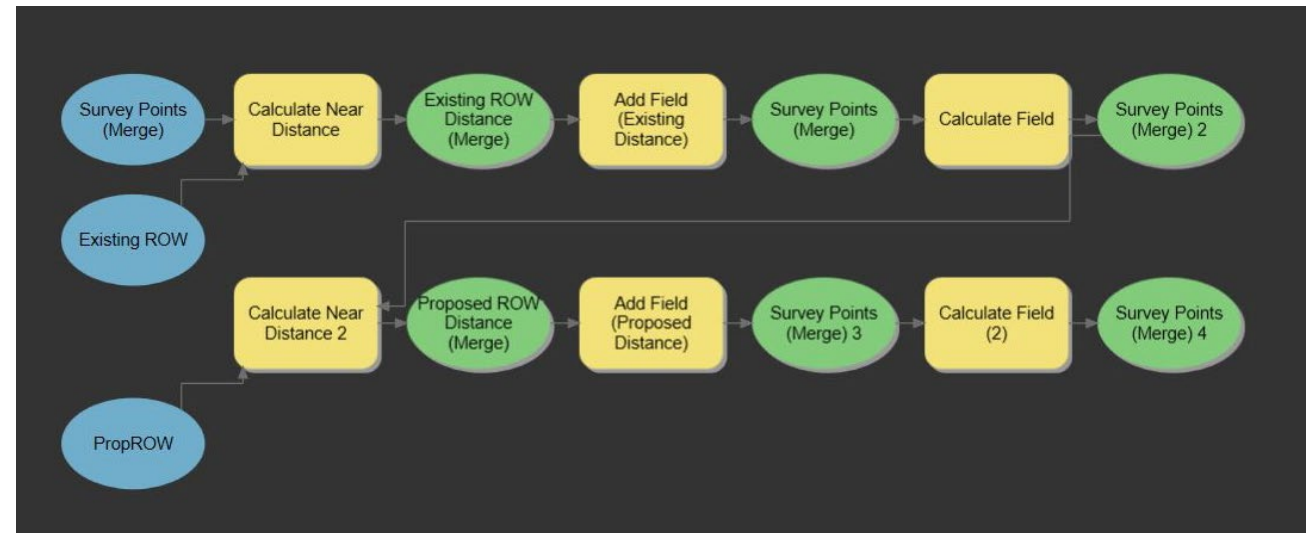
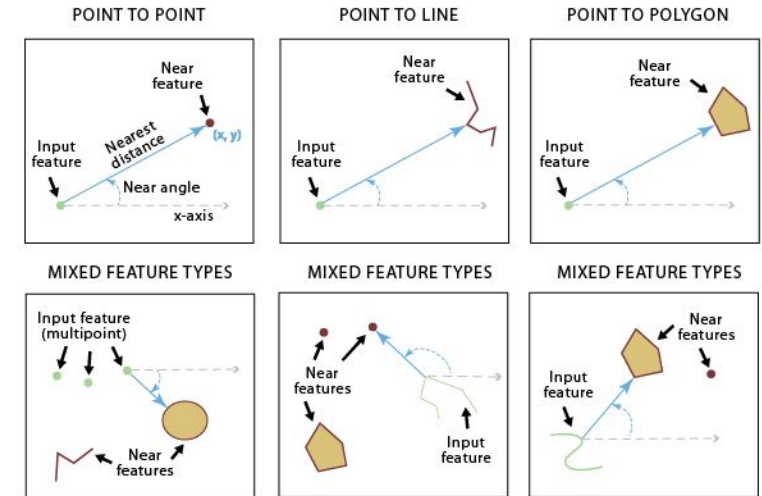
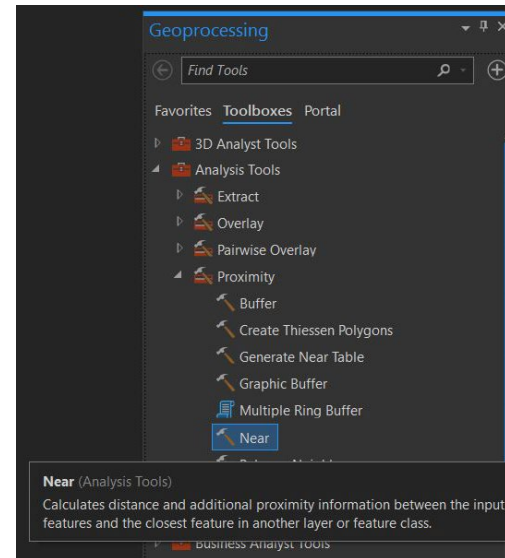
Executing (Calculate Field): CalculateField Merge ExistDist INEAR\_DIST1 "Python 3" #  
Start Time: Thursday, April 25, 2019 3:36:38 PM  
Succeeded at Thursday, April 25, 2019 3:37:07 PM (Elapsed Time: 28.18 seconds)

Executing (Calculate Near Distance 2): Near Merge PropROW # NO\_LOCATION NO\_ANGLE Planar  
Start Time: Thursday, April 25, 2019 3:37:45 PM  
Determining data processing extents...  
Building a neighborhood index from the Near Features...  
Generating Near Table...  
Found 403 feature(s)  
Succeeded at Thursday, April 25, 2019 3:39:29 PM (Elapsed Time: 1 minutes 43 seconds)

Buttons: Run, Finish

# Using the 'Near' Function

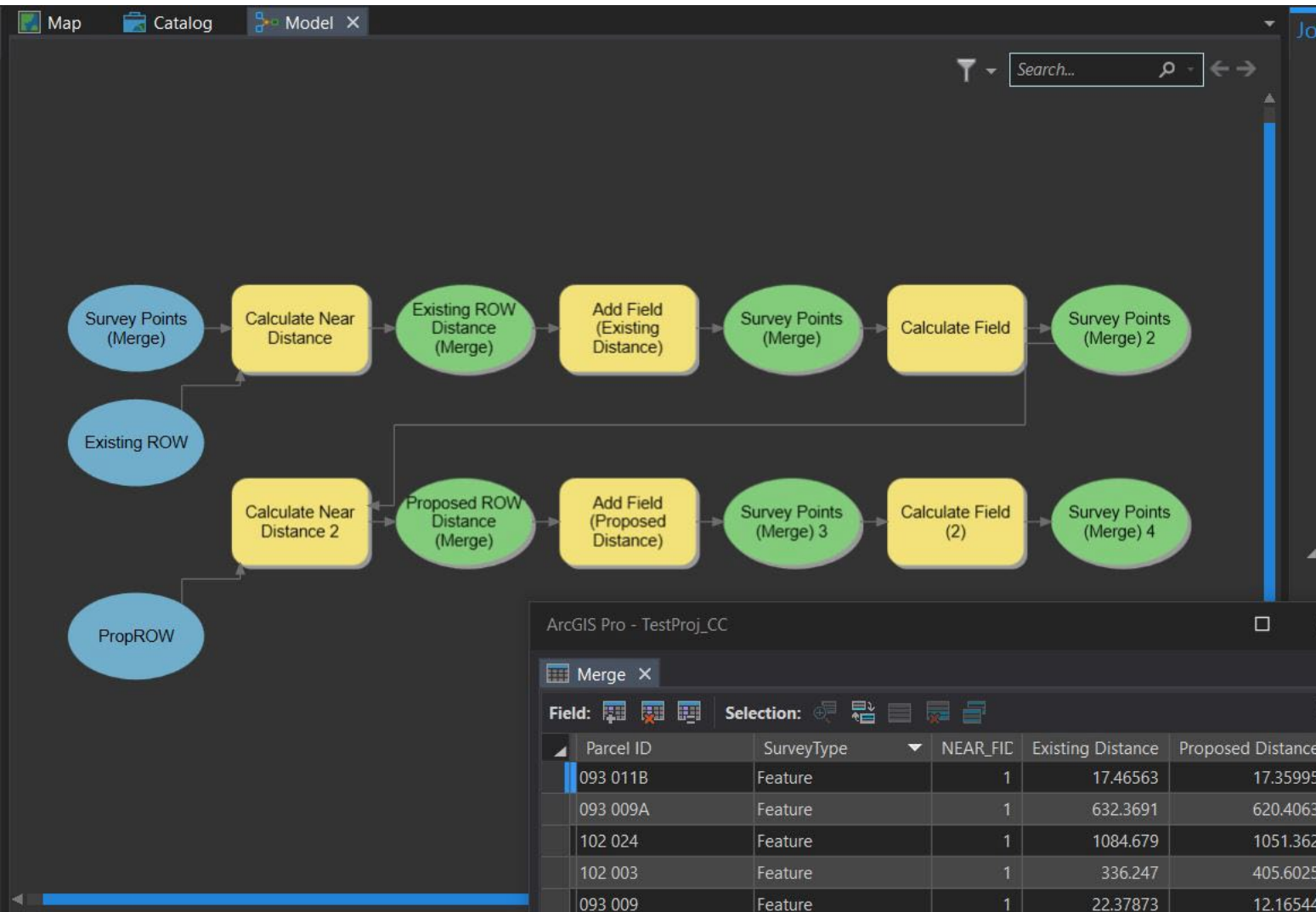
- The Near function was used in a model to calculate the distance to
  - the existing ROW
  - the proposed ROW



# Running the Calculations

- The result of the model is a point feature class that contained
  - The type of survey that was being impacted for each parcel
  - The distance from the point to the existing ROW
  - The distance from the point to the proposed ROW
- Again, originally this was calculated one-by-one, by hand, using the measure tool in Google Earth or ruler in ArcMap

**What once took 60 hours, can now be run in seconds!**





# Determining Which Parcels are Within the APE

- The parcels are considered to be within the APE if the new ROW is physically impacting or visually impacting the site.
  - Inside APE due to:
    - ROW calculations
    - Surveys located within proposed ROW
    - Noise wall presence/visibility



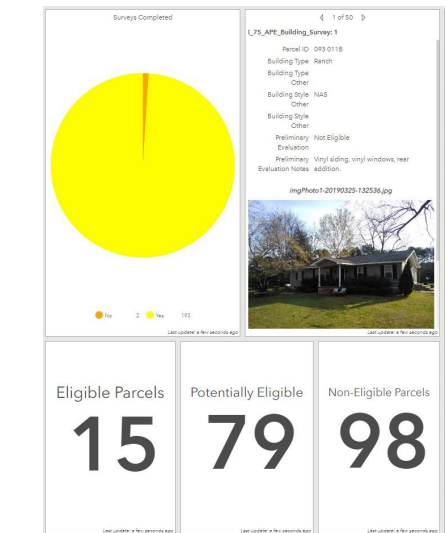
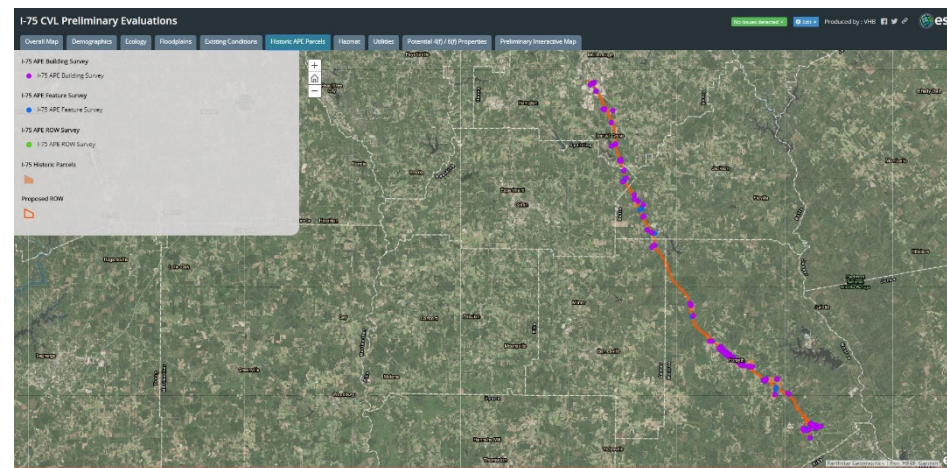
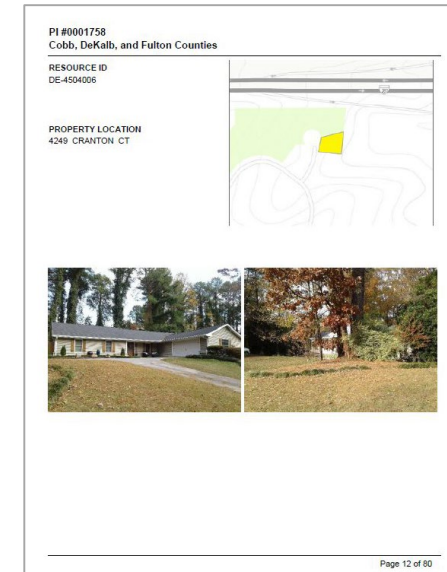
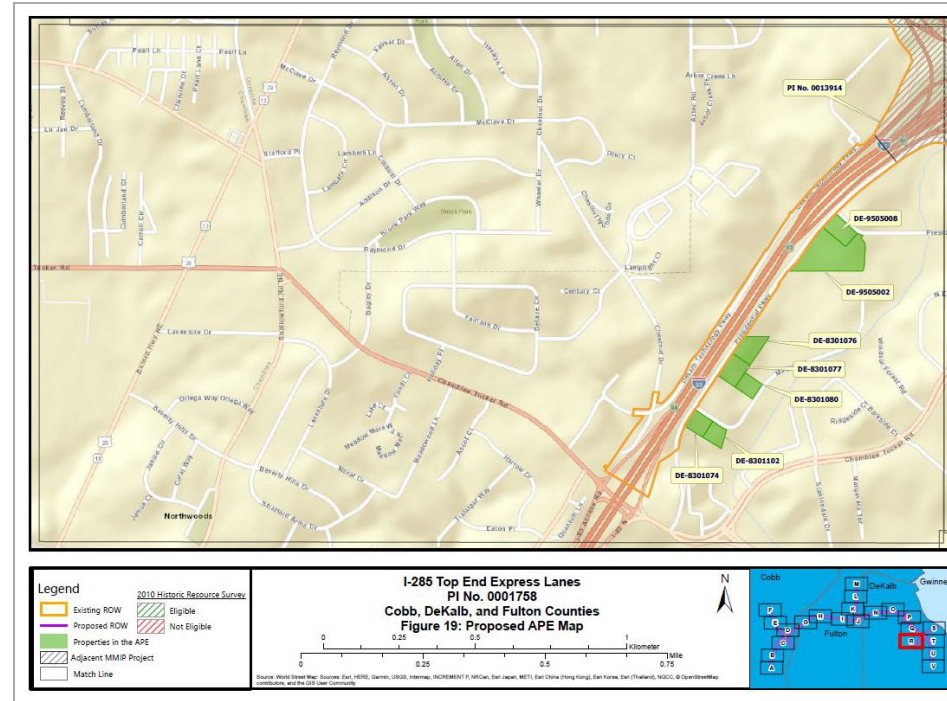
# Generating Reports and Disseminating Data





# Generating Reports and Disseminating Data

- Reports pull in information from the parcel feature class, building surveys, and ROW surveys
- Along with the physical submitted copy, a dashboard was also created to share with stakeholders
- Furthermore, this information was put into a story map to highlight all the impacts along the study corridor that the team collected using GIS





Surveys Completed

1 of 50

I\_75\_APE\_Building\_Survey: 1

Parcel ID 093 011B

Building Type Ranch

Building Type Other

Building Style NAS

Building Style Other

Building Style Other

Preliminary Not Eligible

Evaluation

Preliminary Vinyl siding, vinyl windows, rear  
Evaluation Notes addition.

imgPhoto1-20190325-132536.jpg



Last update: a few seconds ago

No 2 Yes 193

Last update: a few seconds ago

Eligible Parcels

15

Last update: a few seconds ago

Potentially Eligible

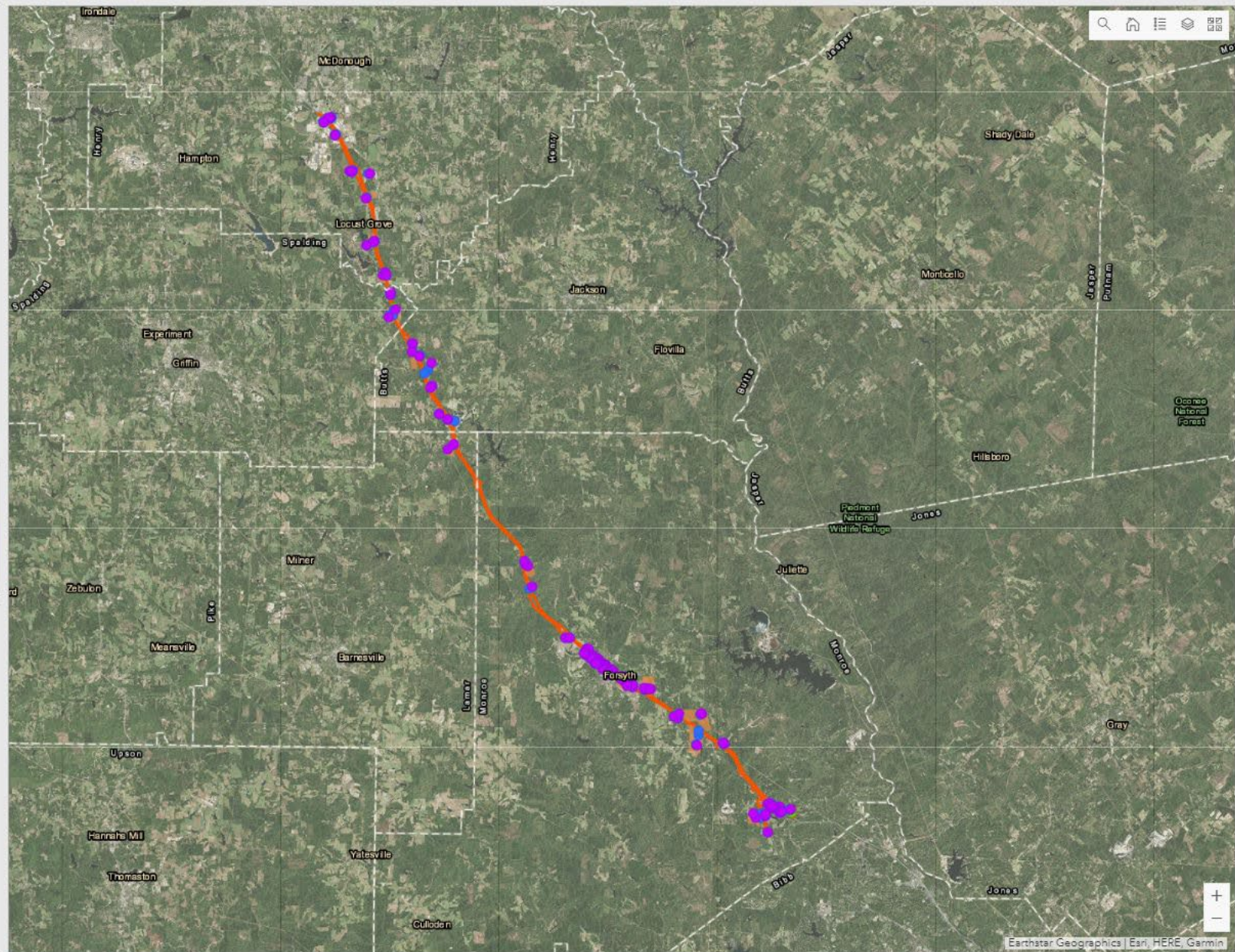
79

Last update: a few seconds ago

Non-Eligible Parcels

98

Last update: a few seconds ago

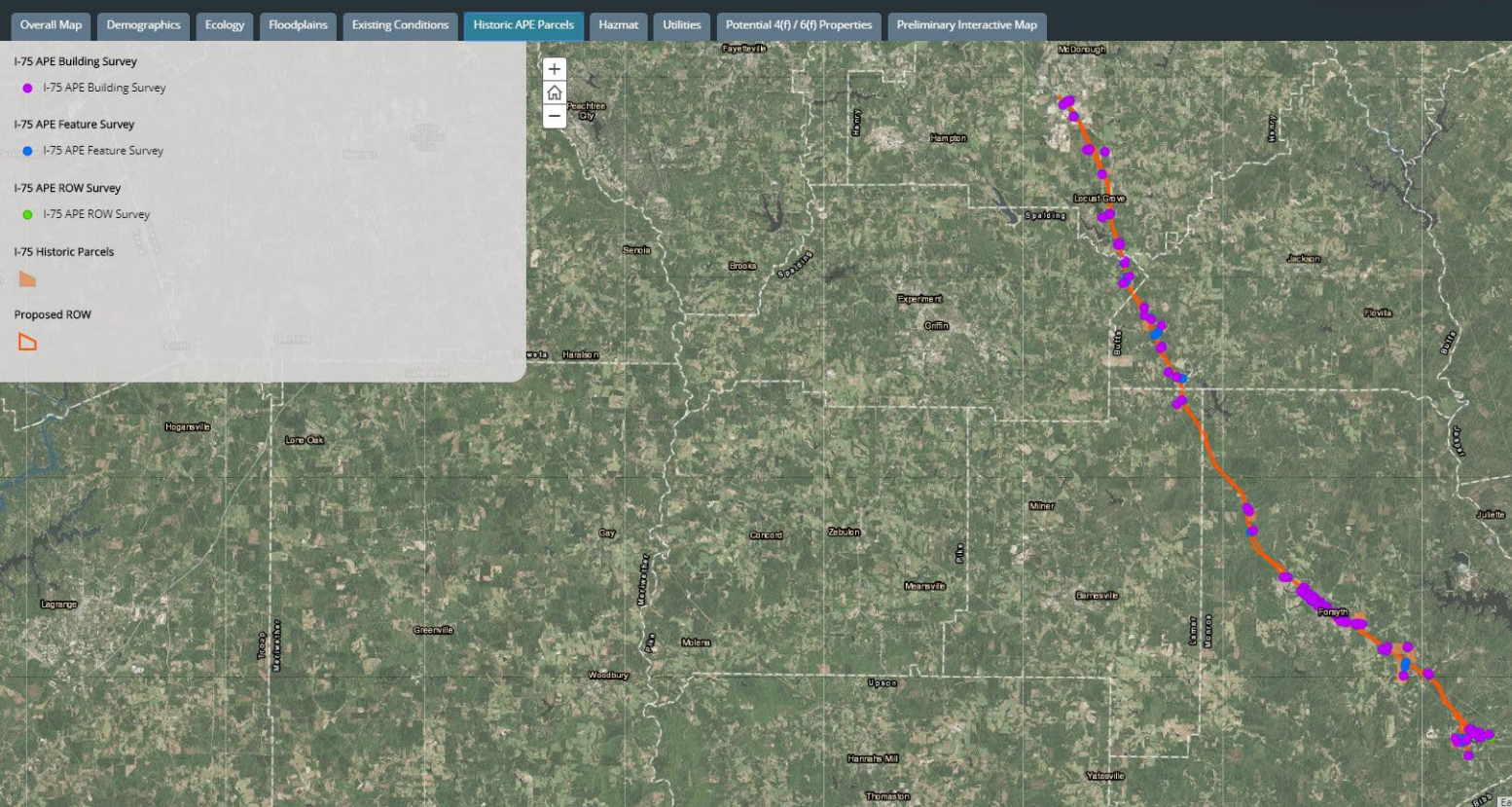


QA/QC Dashboard



# Conclusion

## I-75 CVL Preliminary Evaluations



- Using GIS has streamlined the data collection and post processing calculation efforts, and has also shown its value with displaying information to the stakeholders
- Post-collection efforts were displayed in a story map along with other field collection efforts
- A dashboard was also created to highlight how many surveys were collected and how many properties fell into the Historic APE

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