

## Policies and Procedures

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W W W . A L L E G A N C O U N T Y . O R G / G I S

M A Y 1 8 , 2 0 2 0



# Contents

<b>Contents</b>	<b>i</b>
<b>I Brand</b>	<b>1</b>
<b>1 Awards</b>	<b>3</b>
1.1 The GIS Champion Award . . . . .	3
1.1.1 GIS Champion . . . . .	3
GIS Champion Award . . . . .	3
Background . . . . .	3
Statement of Problem . . . . .	3
Analysis . . . . .	4
GIS Champion Award Code . . . . .	5
<b>II Methods</b>	<b>9</b>
<b>2 Documentation</b>	<b>11</b>
2.1 About Documentation . . . . .	11
2.1.1 How Jalapeño Works . . . . .	11
Problem and Analysis . . . . .	11
Background . . . . .	11
Statement of Problem . . . . .	11
Analysis . . . . .	11
Default sizes in Jalapeño . . . . .	12
Schema Change Procedure Default size . . . . .	12
Colors . . . . .	13
Blues . . . . .	13

Golds . . . . .	13
Oranges . . . . .	13
Geens . . . . .	14
Others . . . . .	14
Project Notes: . . . . .	15
Project File Structure: . . . . .	15
Using The Glossary . . . . .	17
Glossary Requirements . . . . .	17
Creating a new glossary entry . . . . .	17
Rebuilding the glossary . . . . .	17
Using glossary terms in a subdocument: . . . . .	17
To use a glossary term . . . . .	18
To add the glossary to the subdocument: . . . . .	18
Using The Bibliography(References) . . . . .	19
Bibliography requirements . . . . .	19
Inserting the bibliography . . . . .	19
Creating a new bibliography entry . . . . .	19
Rebuilding the bibliography . . . . .	19
To cite a bibliography source in a subdocument . . . . .	19
Using The Index . . . . .	20
Index requirements: . . . . .	20
Creating a new index entry . . . . .	20
Rebuilding the index . . . . .	20
Access the index from a subdocument . . . . .	20
Using an index term . . . . .	20
To add the index to the subdocument: . . . . .	21
Using the Appendices . . . . .	21
2.2 Document Storage Concepts . . . . .	22
2.2.1 GIS File Standard . . . . .	22
Folders inside the project folder . . . . .	22
<b>3 Team Concept</b>	<b>23</b>
3.1 Team Structure . . . . .	23
3.1.1 Paired Programming . . . . .	23

<b>4 Learning Concept</b>	<b>25</b>
4.1 Learning and Growth . . . . .	25
4.1.1 Learning And Growth Plan . . . . .	25
GISP Certification . . . . .	25
Critical Behaviors Goals . . . . .	25
Development Activities . . . . .	25
Results . . . . .	25
Maintain Metadata . . . . .	26
Critical Behaviors Goals . . . . .	26
Development Activities . . . . .	26
Results . . . . .	26
SMART Goal . . . . .	27
Critical Behaviors Goals . . . . .	27
Development Activities . . . . .	27
Results . . . . .	27
Customer Focus SMART Goal . . . . .	28
Critical Behaviors Goals . . . . .	28
Development Activities . . . . .	28
Results . . . . .	28
Teamwork SMART Goal . . . . .	29
Critical Behaviors Goals . . . . .	29
Development Activities . . . . .	29
Results . . . . .	29
GIS Promotion to Local Stakeholders . . . . .	30
Critical Behaviors Goals . . . . .	30
Development Activities . . . . .	30
Results . . . . .	30
4.1.2 Learning Loop . . . . .	30
Learning Loop . . . . .	30
Disconnect Users . . . . .	30
<b>III Service</b>	<b>31</b>
<b>5 Applications</b>	<b>33</b>

5.1 For Treasurer Department . . . . .	33
5.1.1 Forfeiture Data Collection . . . . .	33
Problem and Analysis . . . . .	33
Background . . . . .	33
Statement of Problem . . . . .	33
Analysis . . . . .	33
Design Overview . . . . .	34
Forfeiture App Summary . . . . .	35
Technologies Used in The Forfeiture App . . . . .	36
BSA Data . . . . .	36
ArcGIS Desktop . . . . .	36
ArcGIS Collector . . . . .	36
Enterprise Geodatabase . . . . .	36
ArcGIS Portal . . . . .	36
Data Details . . . . .	37
ForfeitureParcels Feature Class Details . . . . .	38
Webmap Details . . . . .	39
Feature Layer Details . . . . .	39
Basemap Details . . . . .	40
Hard Copy Record . . . . .	41
ArcGIS Server . . . . .	41
Administrative Manual . . . . .	42
Annual Setup . . . . .	42
To Connect to the Forfeiture Dataset . . . . .	42
Update the Forfeiture Dataset . . . . .	43
Delete the attached table . . . . .	43
Create new connection to BSA server . . . . .	44
To Connect to the BSA Server . . . . .	44
Create a Table Query For the New Data . . . . .	45
Select a Unique Identifier . . . . .	46
Add Parcels Layer to the Map . . . . .	48
Forfeiture parcel missing spatial data . . . . .	49
Create current year Forfeiture dataset . . . . .	51
Create Join . . . . .	51
Export Joined Features . . . . .	52

Load data to forfeitureParcels . . . . .	53
Match these fields . . . . .	55
Calculate Initial Values . . . . .	57
Calculate In List value . . . . .	57
Calculate Posted Value . . . . .	57
Calculate Posted InList Value . . . . .	57
Data Setup . . . . .	59
Register as versioned and Add Global IDs . . . . .	59
Create Attachments . . . . .	60
Calculate Acres in ForfeitureParcels . . . . .	60
Setup Users in ArcGIS . . . . .	61
Add New User to Feature Dataset . . . . .	62
Extend Privileges for New User . . . . .	63
Portal Setup . . . . .	64
Setup Users in Portal for ArcGIS . . . . .	64
Add Members to Portal . . . . .	65
Enter required info for new member . . . . .	66
Manage Treasurer Group . . . . .	67
Share Portal Content with the group . . . . .	68
Start services and webmap . . . . .	69
Find published MXD . . . . .	69
Publish Forfeiture Parcels Map Service . . . . .	70
General . . . . .	70
Capabilities . . . . .	70
Feature Access . . . . .	70
Publish Service . . . . .	72
Schema Change Procedure . . . . .	72
Form Edits Procedure . . . . .	73
User Manual . . . . .	74
Collection Device Setup . . . . .	74
Install Collector for ArcGIS . . . . .	74
Configure Collector . . . . .	75
Download the Forfeiture Field Map . . . . .	76
Choose Map Detail . . . . .	78
Open Camera Application Setup Details . . . . .	79

Install Open Camera . . . . .	79
Configure Open Camera . . . . .	80
Preprocessing Routine . . . . .	82
Synchronize the Forfeiture Field Map . . . . .	83
Field Data Collection . . . . .	84
Data Entry Details . . . . .	84
Mobile Device Summary . . . . .	84
Device 1 Field Operation . . . . .	85
Device 2 Field Operation . . . . .	93
Daily Postprocessing Routine . . . . .	95
Synchronize Data . . . . .	95
Synchronize the Field Collection Devices . . . . .	95
Reconcile Versions and Print Report . . . . .	96
Reconcile Tool Setup . . . . .	97
Print Reports . . . . .	98
Software . . . . .	99
ESRI Licensed Products . . . . .	99
ArcDesktop . . . . .	99
Enterprise ArcGIS Deployment . . . . .	99
Collector for ArcGIS . . . . .	99
Other Software . . . . .	99
Open Camera for Android . . . . .	99
5.2 For Equalization Department . . . . .	100
5.2.1 Tax Map Production . . . . .	100
Problem and Analysis . . . . .	100
Background . . . . .	100
Statement of Problem . . . . .	100
Analysis . . . . .	100
People Involved in the Workflow . . . . .	100
Tax Map Production Summary . . . . .	101
Technologies Used in The Tax Map Workflow . . . . .	102
ArcGIS Enterprise . . . . .	102
ArcGIS Desktop . . . . .	102
Production Data . . . . .	102
Python . . . . .	102

Adobe Acrobat . . . . .	102
Data Update Procedure . . . . .	103
Updates to AC_Pro.sde . . . . .	103
Update Procedure . . . . .	103
Parcel Editing and Parcel Publishing . . . . .	103
TaxMapIndexFrames . . . . .	104
TaxMapLayers . . . . .	104
TaxMapUnitBounds . . . . .	104
Workspace Folder Setup . . . . .	105
Production Data Creation . . . . .	105
Map Production Setup . . . . .	106
ArcGIS Desktop . . . . .	106
Map Refinement . . . . .	107
Map Production . . . . .	107
Create Books from Pages . . . . .	108
Share the map books with Equalization . . . . .	108
<b>6 Tools</b>	<b>109</b>
6.1 BSA Support . . . . .	109
6.1.1 Adding a Layer to the BSA GIS . . . . .	109
Tool Summary . . . . .	109
Background . . . . .	109
Why the Tool is Needed . . . . .	109
Who the Tool is For . . . . .	109
Takeaway . . . . .	109
Add an Imagery Layer . . . . .	110
6.2 Core Data . . . . .	115
6.2.1 GIS Data Maintenance . . . . .	115
Tool Summary . . . . .	115
Background . . . . .	115
Why is the Tool Needed . . . . .	115
Who is the Tool For . . . . .	115
Takeaways . . . . .	115
Overview . . . . .	116
Inputs . . . . .	116

Outputs . . . . .	116
6.2.2 Control Points . . . . .	117
Editing Control Points . . . . .	117
Fabric Point Move to Feature Addin . . . . .	117
Configure Addin . . . . .	118
6.3 Core Data Schema . . . . .	121
Problem and Analysis . . . . .	121
Background . . . . .	121
Statement of Problem . . . . .	121
Analysis . . . . .	121
Design . . . . .	122
Overview . . . . .	122
6.3.1 Production Data . . . . .	123
Domains . . . . .	123
Directory Location . . . . .	123
Domain Documentation . . . . .	123
6.4 ESRI Tools . . . . .	124
6.4.1 COGO Tools in ArcGIS . . . . .	124
6.5 GIS Administration . . . . .	125
Register a server with ArcGIS Server . . . . .	125
Site Settings in Server Manager . . . . .	125
Add Fieldwork to Registered Databases . . . . .	126
Register Database . . . . .	127
6.5.1 Connecting to ArcGIS Server Admin Directory . . . . .	128
Generate a Portal Token . . . . .	128
Run the Python Script . . . . .	128
ArcGIS Server Admin Login . . . . .	129
Login to Juniper . . . . .	129
Connect to ArcGIS Server localhost . . . . .	129
6.5.2 New Connections in ArcCatalog . . . . .	130
Install SQL Server on client machine . . . . .	130
Connect ArcGIS to a SQL Server Database . . . . .	132
New Connection Dialog . . . . .	133
6.5.3 Create Query in ArcGIS to SQL Database . . . . .	134
Add Query Layer . . . . .	134

Details of the Query Layer . . . . .	135
More Details of the Query Layer . . . . .	136
Open Results Table . . . . .	137
6.5.4 Enterprise Geodatabase Maintenance . . . . .	138
Enterprise Geodatabase Compression Routine . . . . .	138
Disconnect Users . . . . .	138
Rebuild Indexes . . . . .	140
Recalculate Statistics . . . . .	141
Compress . . . . .	142
Rebuild Indexes Again . . . . .	143
Recalculate Statistics . . . . .	144
Enterprise Geodatabase Performance Troubleshooting . . .	145
Feature Dataset Editing Performance . . . . .	145
Unregister As Versioned . . . . .	146
Restart the SQL Server . . . . .	147
Register the FDS as Versioned . . . . .	148
6.5.5 Managing Map Services . . . . .	149
Stopping the GIS Server . . . . .	149
Fixing Damaged Services . . . . .	150
Use the ArcGIS Server Account Utility . . . . .	150
Remove Lock Files . . . . .	156
6.5.6 Managing Geodatabase Replicas . . . . .	158
Adding A New Feature Class To A Replica . . . . .	158
Summary . . . . .	158
Steps . . . . .	158
6.5.7 Managing Geodatabase Versions . . . . .	160
Version Queries . . . . .	160
SQL Queries . . . . .	160
Orphaned Versions . . . . .	161
Remove orphaned versions . . . . .	161
6.5.8 MXD Management . . . . .	164
Find/Replace Text Object . . . . .	164
Python Code . . . . .	164
6.6 L <sup>A</sup> T <sub>E</sub> X Packages . . . . .	165
6.6.1 Common Errors . . . . .	165

The Form of an Error . . . . .	165
<del>TEX</del> Errors . . . . .	165
<del>TeX</del> Errors . . . . .	166
Warnings . . . . .	166
Underfull . . . . .	166
Overfull . . . . .	166
References . . . . .	167
Beginning and Ending . . . . .	167
Begin Ended by End . . . . .	167
End Occurred Inside a Group . . . . .	168
Ended by End of Line . . . . .	168
Missing Begin Document . . . . .	169
Errors Usually Caused by Bad Spelling . . . . .	169
Unknown Control Sequence . . . . .	169
Environment Undefined . . . . .	169
Bad File Name . . . . .	169
Cannot Find File Name . . . . .	170
Fatal Errors . . . . .	170
Runaway Argument . . . . .	170
Just an * . . . . .	170
Emergency Stop . . . . .	171
Please Type a Command or Say End . . . . .	171
Graphics Errors . . . . .	171
Too Many Unprocessed Floats . . . . .	171
Unknown Graphics Extension . . . . .	172
Division by Zero . . . . .	172
Math Errors . . . . .	172
Display Math Should End With \$\$ . . . . .	172
Bad Math Environment Delimiter . . . . .	172
Missing Right . . . . .	173
Missing Delimiter . . . . .	173
Missing \$ Inserted . . . . .	173
Tabular Environment Errors . . . . .	173
Misplaced Alignment Tab Character & . . . . .	173
Extra Alignment Tab . . . . .	174

Argument Has an Extra }	174
Errors With Lists	174
Missing Item	174
Too Deeply Nested	175
Miscellaneous Errors	175
Only Used in the Preamble	175
There Is No Line/Page Here to End	175
Command Already Defined	175
Missing Number	176
6.6.2 float Package	176
usepackage	176
Simple Use	176
Options	176
Use with Options	176
Commands	177
6.6.3 Graphics Examples and Notes	177
Curly Frame	177
Rectangle Frame	177
6.6.4 graphicx Package	178
usepackage	178
Simple Use	178
Options	179
Use with Options	179
Commands	179
6.6.5 hyperref Package	179
Introduction	179
Simple Use	180
Options	180
Use with Options	180
Commands	181
6.6.6 import Package	182
usepackage	182
Simple Use	182
Options	182
Use with Options	182

Commands . . . . .	182
6.6.7 wrapfig Package . . . . .	182
usepackage . . . . .	183
Simple Use . . . . .	183
Options . . . . .	183
Use with Options . . . . .	183
Commands . . . . .	183
6.7 L <sup>A</sup> T <sub>E</sub> X Templates . . . . .	184
6.7.1 L <sup>A</sup> T <sub>E</sub> X Section Template . . . . .	184
6.7.2 L <sup>A</sup> T <sub>E</sub> X Subsection Template . . . . .	184
6.8 Python Tools . . . . .	189
6.8.1 File Rename with Python . . . . .	189
Purpose and Summary . . . . .	189
Purpose . . . . .	189
Summary . . . . .	189
Requirements . . . . .	189
Software . . . . .	189
Python(2.7) . . . . .	189
The Python Script . . . . .	189
6.8.2 PDF Optimizer . . . . .	190
Purpose and Summary . . . . .	190
Purpose . . . . .	190
Summary . . . . .	191
Requirements . . . . .	191
Software . . . . .	191
About ghostscript . . . . .	191
Python(2.7) . . . . .	191
The Python Script . . . . .	191
Windows batch file . . . . .	193
6.9 QGIS Tools . . . . .	194
6.9.1 QGIS Azimuth and Distance Plugin . . . . .	194
Tool Summary . . . . .	194
Background . . . . .	194
Why the Tool is Needed . . . . .	194
Who the Tool is For . . . . .	194

Takeaways . . . . .	194
Azimuth and Distance Plugin Installation . . . . .	195
6.9.2 COGO Tools in QGIS . . . . .	196
Tool Summary . . . . .	196
Background . . . . .	196
Why the Tool is Needed . . . . .	196
Who the Tool is For . . . . .	196
Takeaways . . . . .	196
Following are instructions for using QGIS for COGO . . . . .	196
To use COGO tools in QGIS, follow these steps . . . . .	197
6.9.3 Search Layers Plugin . . . . .	209
Tool Summary . . . . .	209
Background . . . . .	209
Why the Tool is Needed . . . . .	209
Who the Tool is For . . . . .	209
Takeaway . . . . .	209
Plugin Setup . . . . .	210
Install Search Layers Plugin . . . . .	210
Search Layers Plugin Tool is Added to the Toolbar	210
Using the Plugin . . . . .	211
<b>IV Resources</b>	<b>213</b>
<b>Reading Room</b>	<b>215</b>
ESRI Product Documentation . . . . .	215
ArcGIS Enterprise . . . . .	215
arcgis 10.5 Enterprise Functionality Matrix . . . . .	215
Geography 101 . . . . .	216
Terms and Abbreviations . . . . .	216
BLM Glossary of Terms . . . . .	216
Coordinate Systems . . . . .	216
Coordinate Systems for Michigan . . . . .	216
PLSS Resources . . . . .	216

PLSS Development Notes . . . . .	216
Theoretical Township Map . . . . .	216
US Public Land Survey System . . . . .	216
Printing Resources . . . . .	217
Page Sizes . . . . .	217
ANSI Size Illustration . . . . .	217
Standard Paper Size Guide . . . . .	217
State Resources . . . . .	218
State Tax Commission . . . . .	218
STC Legal Description Course . . . . .	218
Version Control Resources . . . . .	219
git Resources . . . . .	219
git Branching Model . . . . .	219
<b>Task Summaries</b>	<b>221</b>
Survey Plans . . . . .	221
Using Coordinates From Survey Plans . . . . .	221
How to use . . . . .	221
Use a Spreadsheet . . . . .	221
<b>References</b>	<b>223</b>
<b>Glossary</b>	<b>225</b>
<b>Index</b>	<b>227</b>

# Part I

# Brand



# — 1 —

## Awards

### 1.1 THE GIS CHAMPION AWARD

#### 1.1.1 GIS CHAMPION

An individual whose actions promote the use of GIS

#### GIS CHAMPION AWARD



Figure 1.1: Example GIS Champion Award

## Background

Though Allegan County has had a formal GIS department for over 20 years, few people have learned to use it.

## Statement of Problem

GIS is underutilized in Allegan County government. The county would benefit from more GIS use in its government. Currently there is no formal recognition of individuals that promote GIS.

## Analysis

The GIS Champion Award is a simple method of recognizing those that promote GIS in the county.

## Past GIS Award Recipients

- Ian Hanes
  - Karen
  - Brian Redmon
-

## GIS Champion Award Code

```
\documentclass[landscape]{article}
\usepackage{wallpaper}
\usepackage{niceframe}
\usepackage{xcolor}
\usepackage{ulem}
\usepackage{graphicx}
\usepackage{geometry}
%\geometry{tmargin=.75cm,bmargin=.25cm,
%lmargin=.8cm,rmargin=.2cm}
\geometry{tmargin=.25in,bmargin=.25in,
    lmargin=.25in,rmargin=.25in}
\usepackage{multicol}
\setlength{\columnseprule}{0.4pt}
\columnwidth=0.3\textwidth

\begin{document}
\centering
\scalebox{2.9}{
\color{green!30!black!60}
\begin{minipage}{.33\textwidth}
\font\border=umrandb
\generalframe
{\border \char113} % up left
{\border \char109} % up
{\border \char112} % up right
{\border \char108} % left
{\border \char110} % right
{\border \char114} % lower left
{\border \char111} % bottom
{\border \char115} % lower right
\centering
\includegraphics[height=1.5cm]{GIS_Logo_better.jpg}
\end{minipage}}

```

---

```
\vspace{-8mm}

\curlyframe[.9\columnwidth]{

\textrmcolor{green!10!black!90}{\small Allegan County GIS Services}
\vspace{.005in}

\textrmcolor{green!10!black!90}{\tiny Recognizes}\\
%\smallskip
\vspace{.005in}
\underline{\textrmcolor{green!30!black!60}{\textcolor{green!30!black!60}{Brian Redmond}}}
\\
\smallskip
\tiny Information Services Technician

%\smallskip
\textrmcolor{green!10!black!90}{\tiny for Excellence in}
}
\smallskip
\\
\textrmcolor{black}{\normalsize \textsf{Enabling
Employee Experiences}}}
\\
\vspace{.1in}
\textrmcolor{green!10!black!90}{\tiny on this day
\itshape September 21, 2018}
```

---

}

\vspace{.1in}

{\color{green!10!black!90}

\scalebox{.6}{

```
\begin{tabular}{ccc}
\cline{1-1}
\cline{3-3}
\\
Neil Besteman & & Bryan May \\
GIS Manager & & GIS Analyst \\
\end{tabular}

} % closes scalebox{.6} arg
} % closes blue!40!black
} % closes curlyframe arg
} % closes centering
\end{minipage}
} % closes scalebox{2.8} arg

\end{document}
```

## Part II

# Methods



# — 2 — *Documentation*

---

## 2.1 ABOUT DOCUMENTATION

### 2.1.1 HOW JALAPEÑO WORKS

#### PROBLEM AND ANALYSIS

#### Background

GIS Services has complicated and evolving workflows and uses everchanging technologies

lems with:

- version control
- finding the documentation
- disseminating the documentation

#### Statement of Problem

GIS documentation has traditionally been done in different formats and stored in many different files and folders in the county network. This has resulted in prob-

#### Analysis

The Jalapeño folder along with some open-source software provides a robust documentation tool for GIS documentation.

## Default sizes in Jalapeño

Element	Default Size
Paragraph Heading	Large
Paragraph text	normalsize
Subparagraph Heading	large
Subparagraph Text	normalsize

Table 2.1: Default Sizes

Examples:

Schema Change Procedure large size

large size type

Schema Change Procedure Default size

default size type

Schema Change Procedure Large size

Large size type space neg point 3in here

Schema Change Procedure Large size

LARGE size type

Schema Change Procedure Default size

default size type

Schema Change Procedure large size

large size type

Schema Change Procedure Large size

Large size type

Schema Change Procedure LARGE size

LARGE size type

## C O L O R S

### Blues

HeaderBlueA \_\_\_\_\_  
HeaderBlueB \_\_\_\_\_  
HeaderBlueC \_\_\_\_\_  
HeaderBlueD \_\_\_\_\_  
HeaderBlueE \_\_\_\_\_

### Golds

HeaderGoldA \_\_\_\_\_  
HeaderGoldB \_\_\_\_\_  
HeaderGoldC \_\_\_\_\_  
HeaderGoldD \_\_\_\_\_  
HeaderGoldE \_\_\_\_\_

### Oranges

HeaderOrangeA \_\_\_\_\_  
HeaderOrangeB \_\_\_\_\_  
HeaderOrangeC \_\_\_\_\_  
HeaderOrangeD \_\_\_\_\_  
HeaderOrangeE \_\_\_\_\_

---

## Greens

HeaderGreenA \_\_\_\_\_

HeaderGreenB \_\_\_\_\_

HeaderGreenC \_\_\_\_\_

HeaderGreenD \_\_\_\_\_

HeaderGreenE \_\_\_\_\_

## Others

HyperlinkBlue1 \_\_\_\_\_

graphicOrange \_\_\_\_\_

## PROJECT NOTES :

- jalapeno folder is a git package <https://github.com/nbesteman/jalapeno>
- Project is coded with relative paths and jalapeno can be located anywhere.

## Project File Structure:

*...\\jalapeno\\..*

folder	description
.git	versioning repository for Jalapeño
documentation	resources used in Jalapeño
processing	.tex documents and build folders
source	common image files
temp	untracked folder for temp storage

*...\\jalapeno\\documentation\\..*

folder or file	description
classDocs	TeX class documentation
DevNotes	Notes and Mind Maps for Jalapeño
latexamples	TeX example code
moduleTemplates	.tex templates
packageDocs	TeX package documentation
readingRoom	Resources linked in Jalapeño
unsorted	Unsorted documentation
gitnotes.txt	git commands notes

## ...\\jalapeno\\processing\\..

folder or file	description
archive	Processing backup folder
...Part	Folders of book <i>parts</i>
build	TEX folder for .pdf output and temp files
build\\referenceEntries.bib	Entries that appear in references
preamble.tex	preamble code for all documents
titlePages	Assortment of .tex title pages
compileFull.sh	pdflatex, bibtex, makeglossaries, makeindex, pdflatex, pdflatex
compileMainX2.sh	pdflatex, pdflatex
GISDocumentation.tex	Master document code
glossaryEntries.tex	Entries that appear in glossary
indexEntries.tex	Entries that appear in the index

## ...\\jalapeno\\processing\\preamble..

folder or file	description
chapterStyles.tex	Sets chapter title page attributes with Memoir Class
colorDefs.tex	Defines custom colors
graphicsPath.tex	Defines graphics variable
pageLayoutCommands.tex	Sets spacing and typeface for headings of Sections down to Sub-paragraphs in mainmatter
pageLayoutCommandsAlt.tex	Sets spacing and typeface for headings of Sections down to Sub-paragraphs in backmatter
pageStyles.tex	Sets header and footer properties
preamble.tex	Preamble used to compile main document
subSectionPreamble.tex	Preamble used to compile any subsection document

## U S I N G T H E G L O S S A R Y

# Glossary Requirements

Glossary commands require a Perl interpreter. Activeperl is a free Perl interpreter and can be downloaded from:

<https://www.activestate.com/activeperl/downloads> (A typical installation adds Perl to your path). Compiling the glossary requires running the makeglossaries command either in a L<sup>A</sup>T<sub>E</sub>X IDE or in command line as described here. PDFLatex must be run first to create a .aux file that is used by makeglossaries to create an .gls file. After the .gls file is created, PDFLatex must be run again to insert the glossary at the \printglossaries location.

## Creating a new glossary entry

To **create a new glossary entry**: Add an entry to glossaryEntries.tex. Save it there and then use the makeglossaries command to recompile the .gls file.

## Rebuilding the glossary

To **Recompile the .gls**. In the (main document)build folder:

- Launch command prompt
- enter command: **makeglossaries GISDocumentation\***

Note that this command reads the .aux file and creates the .gls file. The .aux file is created by compiling with PDFLatex. If there is no .aux file the command will fail

## Using glossary terms in a subdocument:

In the subdocument you must add code to input the glossaryEntries file.  
ie. After the line:

```
\input{.../.../.../preamble}
```

Add the line:

```
\input{.../.../.../glossaryEntries}
```

---

## To use a glossary term in the subdocument:

In place of the term, use code referencing the key (in the glossaryEntries file):

- \gls{key}

## To add the glossary to the subdocument:

- Add the line \makeglossaries to the preamble of the subdocument.
- Add the line \printglossaries to the subdocument.
- Run makeglossaries in command line on the subdocument similar to how is described above.

## U S I N G T H E B I B L I O G R A P H Y ( R E F E R E N C E S )

### Bibliography requirements

Compiling the bibliography requires running bibtex either in a  $\text{\LaTeX}$  IDE or in command line as described here. PDFLatex must be run first to create a .aux file that is used by bibtex to create a .bbl file. After the .bbl file is created, PDFLatex must be run again to insert the bibliography at the \bibliography location.

### Inserting the bibliography

In the  $\text{\LaTeX}$  code:

```
\bibliography\{referenceEntries}
```

Inserts a bibliography called referenceEntries.bib from the same folder as the project .aux file

### Creating a new bibliography entry

To **create a new bibliography entry**: Add an entry to referenceEntries.bib. Save it there and then use bibtex to recompile the .bbl file.

### Rebuilding the bibliography

To **Recompile the .bbl**. In the (main document)build folder:

- Launch command prompt
- Enter command: **bibtex GISDocumentation**

Note that this command reads the .aux file and creates the .bbl file. The .aux file is created by compiling with PDFLatex. If there is no .aux file the command will fail

### To cite a bibliography source in a subdocument

In the place that you want the citation In the  $\text{\LaTeX}$  code:

```
~\cite[pg.#]{key}
```

---

## U S I N G T H E I N D E X

### Index requirements:

Compiling the index requires running the makeindex command either in a  $\text{\LaTeX}$  IDE or in command line as described here. PDFLatex must be run first to create a .aux file that is used by makeindex to create an .idx file. After the .idx file is created, PDFLatex must be run again to insert the index at the \printindex location.

### Creating a new index entry

To **create a new index entry**: Add an entry to indexEntries.tex. Save it there and then use the makeindex command to recompile the .idx file.

### Rebuilding the index

To Recompile the .idx In the (main document)build folder:

- Launch command prompt
- enter command: **makeindex GISDocumentation\***

Note that this command reads the .aux file and creates the .idx file. The .aux file is created by compiling with PDFLatex. If there is no .aux file the command will fail. Run PDFLatex first

### Access the index from a subdocument

In the subdocument you must add code to input the indexEntries file. For example:

After the line:

```
\input{../../../../../preamble}
```

Add the line:

```
\input{../../../../../indexEntries}
```

### To use a index term in the subdocument:

In place of the term, use code referencing the key (in the indexEntries file):

- \index {key}
-

## To add the index to the subdocument:

- Add the line \makeindex to the preamble of the subdocument.
- Add the line \printindex to the subdocument.
- Run makeindex in command line on the subdocument similar to how is described above.

## U S I N G T H E A P P E N D I C E S

---

## 2.2 DOCUMENT STORAGE CONCEPTS

### 2.2.1 GIS FILE STANDARD

#### FOLDERS INSIDE THE PROJECT

##### FOLDER

- archive
- build
- delivered
- documentation
- processing
- source

# — 3 —

## *Team Concept*

---

### 3 . 1 T E A M S T R U C T U R E

#### 3 . 1 . 1 P A I R E D P R O G R A M M I N G

A paragraph about pp from Joy Inc.



# **— 4 —**

## *Learning Concept*

---

### 4 . 1    L E A R N I N G   A N D   G R O W T H

#### 4 . 1 . 1    L E A R N I N G   A N D   G R O W T H   P L A N

##### S T R E N G T H   T O   L E V E R A G E

*Area of Focus:* Professional Development

##### GISP Certification

##### Critical Behaviors Goals

What specific behaviors do I model or exhibit in this competency or skill?

##### Development Activities

(assignments, coaching, formal training)

##### Results

What is the Key Performance Indicator (KPI)? How have I succeeded in adapting my behavior or what new skill did I learn.

## S T R E N G T H   T O   L E V E R A G E

*Area of Focus: Documentation*

### Maintain Metadata

#### Critical Behaviors Goals

What specific behaviors do I model or exhibit in this competency or skill?

#### Development Activities

(assignments, coaching, formal training)

#### Results

What is the Key Performance Indicator (KPI)?

How have I succeeded in adapting my behavior or what new skill did I learn.

Keep track of metadata in a dataset table.

## S T R E N G T H   T O   L E V E R A G E

*Area of Focus:*

### SMART Goal

### Critical Behaviors Goals

What specific behaviors do I model or exhibit in this competency or skill?

### Development Activities

(assignments, coaching, formal training)

### Results

What is the Key Performance Indicator (KPI)? How have I succeeded in adapting my behavior or what new skill did I learn.

---

## D E V E L O P M E N T   O P P O R T U N I T Y

*Area of Focus: Customer Focus*

### Customer Focus SMART Goal

#### Critical Behaviors Goals

What specific behaviors do I model or exhibit in this competency or skill?

#### Development Activities

(assignments, coaching, formal training)

#### Results

What is the Key Performance Indicator (KPI)? How have I succeeded in adapting my behavior or what new skill did I learn.

## D E V E L O P M E N T   O P P O R T U N I T Y

*Area of Focus: Teamwork*

### Teamwork SMART Goal

#### Critical Behaviors Goals

What specific behaviors do I model or exhibit in this competency or skill?

#### Development Activities

(assignments, coaching, formal training)

#### Results

What is the Key Performance Indicator (KPI)? How have I succeeded in adapting my behavior or what new skill did I learn.

---

## D E V E L O P M E N T   O P P O R T U N I T Y

*Area of Focus: Outreach*

### GIS Promotion to Local Stakeholders

Acheived through improved communication and networking

### Critical Behaviors Goals

What specific behaviors do I model or exhibit in this competency or skill?

### Development Activities

(assignments, coaching, formal training)

### Results

What is the Key Performance Indicator (KPI)? How have I succeeded in adapting my behavior or what new skill did I learn.

## 4 . 1 . 2   L E A R N I N G   L O O P

### L E A R N I N G   L O O P

#### Disconnect All Users

# Part III

# Service



# — 5 — Applications

## 5.1 FOR TREASURER DEPARTMENT

### 5.1.1 FORFEITURE DATA COLLECTION

#### PROBLEM AND ANALYSIS

#### Background

Treasurer department has an annual responsibility to properly document the tax forfeiture process. The LIS Department built an application in MS Access and MapInfo that consumed a daily export from BSA and was deployed to the field on a laptop. A digital camera was used for site photos and later imported into the laptop.

#### Statement of Problem

The current Tax Forfeiture workflow is built on MapInfo software and MS Access and executed on a laptop pc. Both MapInfo and MS Access are no longer supported in county workflows. ESRI software can be used to rebuild the workflow. *Forfeiture Data Collector Application, (Forfeiture App)* must be recreated in the ESRI framework.

#### Analysis

**Forfeiture App** will facilitate: *Mobile data collection on a handheld device,:* (**Mobile Interface**) and an *in office workflow to complete data processing,* (**Pre and PostProcessing**)

#### Mobile Interface

- Synchronize with data in the office (online)
- Collect data and photos of forfeiture sites (offline)
- Synchronize the collected data with data in the office (online)

#### Pre & Post Processing

- Produce and print a form for each site visited with required data and images

## DESIGN OVERVIEW

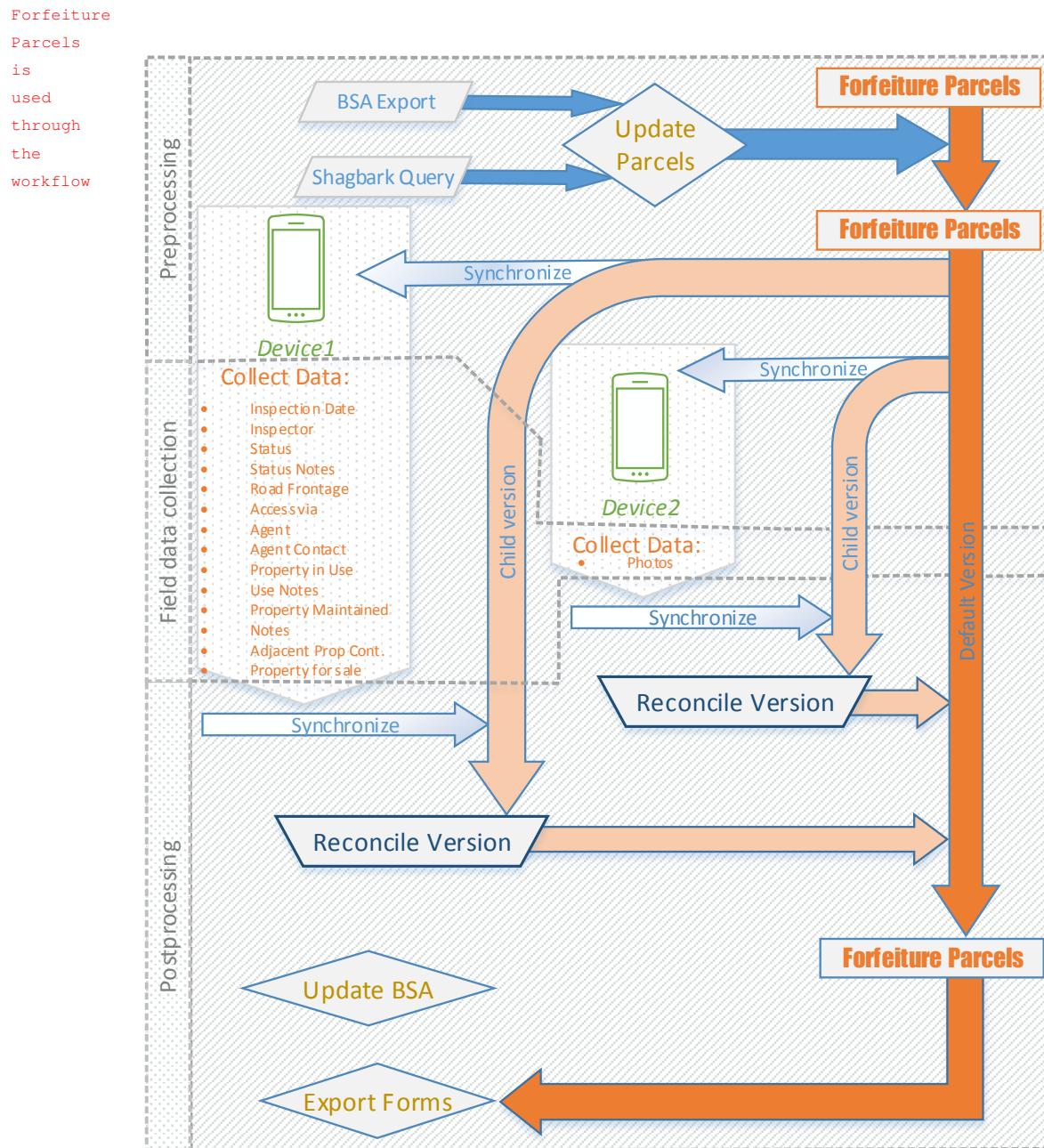


Figure 5.1: Project Design

## Forfeiture App Summary

There are **three parts** to the daily routine:

### 1. Preprocessing (in the office):

- Export current forfeiture list from BSA
- Update Forfeiture Parcels with BSA export
- Update Forfeiture Parcels with contaminated sites information
- Synchronize Forfeiture Parcels to Mobile Interface

### 2. Field data collection with Mobile Interface:

- Aids in navigation
- Provides a Checklist of data points for each site
- Attaches photos for each site
- Save results for synchronization in post-processing

### 3. Post-processing (in the office)

- Synchronize data and images collected in Mobile Interface to Forfeiture Parcels
  - Export form for each site
  - Print form for each site
  - Update BSA data
-

# Technologies Used in The Forfeiture App

## BSA Data

Details of parcels in the forfeiture process are managed in BSA Delinquent Tax.net. The Treasurer office does a BSA export of the parcels in need of a site visit in the pre-processing.

## ArcGIS Desktop

Tools are designed to preprocess and post-process forfeiture parcel data for fieldwork. The user will execute a preprocess script tool that prepares the data for field deployment. After fieldwork, a post process script tool synchronizes data from the fieldwork with the live data on the Allegan County network.

## ArcGIS Collector

A free mobile application developed and tested on Android is deployed to the field for data collection. The application is con-

figured to work offline (without an internet or cellular connection) by syncronizing before and after fieldwork. The user collects the necessary information on each forfeiture parcel in the field disconnected, and then uploads the changes when reconnected.

## Enterprise Geodatabase

Live data from a publishing geodatabase (ACPub), running on SQL Server database server (acintsql01) provides access to Forfeiture Parcels

## ArcGIS Portal

Forfeiture Parcels is served as a feature service (REST service) named TaxReversionParcels. A webmap on Portal, called the Forfeiture Field Map consumes the TaxReversionParcels exposing the data to editing. The Forfeiture Field Map is configured to work in the ArcGIS Collector App.

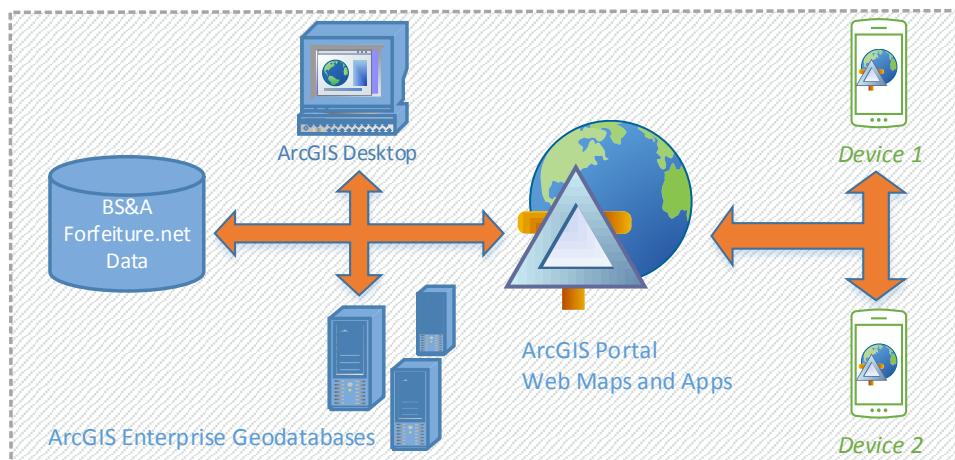


Figure 5.2: Technology Design

## DATA DETAILS

The data is located in a geodatabase called ACPUB. ACPUB is on SQL Server AC-INTSQL01.

Forfeiture Parcels Data

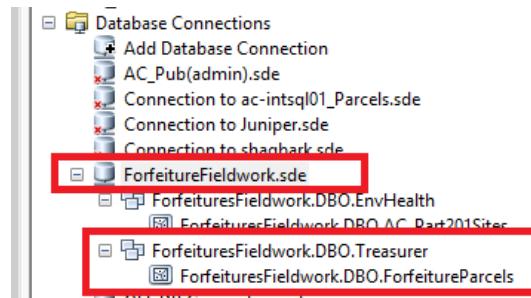


Figure 5.3: Live Data Location

Contamination Data

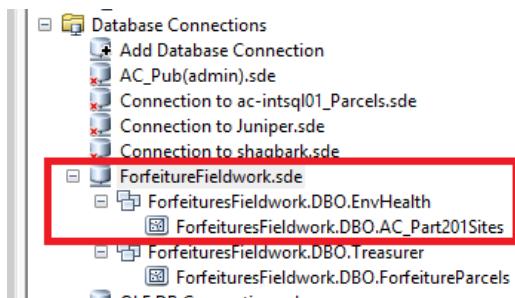


Figure 5.4: Contamination Feature Class

## ForfeitureParcels Feature Class Details

Attribute Details			
Field Name	Field Alias	Entry Type	Note
PropertyNumber	Property Number	Prefilled	NA
Need2Print	Print Today	Dropdown	Yes or No
InspectionDate	Inspection Date	Autofill or Dropdown	NA
Inspector	Inspector	Dropdown	NA
Address	Address	Prefilled	NA
Status	Status	Dropdown	NA
StatusNotes	Status Notes	Open Entry	120Char
Roadfrontage	Road Frontage	Dropdown	Yes or No
AccessVia	Access Via	Open Entry	30Char
Agent	Agent	Open Entry	30Char
AgentContact	Agent Contact	Open Entry	30Char
PictureComments	Picture Comments	Open Entry	50Char
PropertyInUse	Property In Use	Dropdown	Yes or No
UseNotes	Use Notes	Open Entry	120Char
PropertyMaintained	Property Maintained	Dropdown	Yes or No
PropMaintNotes	Property Maintained Notes	Open Entry	120Char
PropertyContaminated	Property Contaminated	Prefilled	Preprocessing
PropertyContaminatedNotes	PropertyContaminatedNotes	Prefilled	Preprocessing
AdjacentPropertyContaminated	Adjacent Property Contaminated	Prefilled	Preprocessing
AdjPropertyContaminatedNotes	Adj Property Contaminated Notes	Prefilled	Preprocessing
PropertyForSale	Property For Sale	Dropdown	Yes or No
GlobalID	GlobalID	NA	NA
PostedDate	Posted Date	Dropdown	Date
Posted	Posted	Prefilled	NA
InList	In List	Prefilled	Preprocessing
PostedInList	Posted In List	Prefilled	Preprocessing
Acres	Acres	Prefilled	NA
Class	Class	Prefilled	NA

Table 5.1: Dataset Details

## Webmap Details

The Forfeiture Field Map is made up of a feature layer and a basemap.

The screenshot shows the 'Forfeiture Field Map' details page. At the top, there's a blue header bar with the title 'Forfeiture Field Map' and a 'Edit' button. Below the header are two tabs: 'Overview' (which is selected) and 'Settings'. The main content area starts with a section titled 'Edit Thumbnail' containing a circular logo for 'ALLEGAN COUNTY MICHIGAN'. To the right of the logo, the text reads: 'Map for field data collection in annual tax forfeiture processing by bmay531 Last Modified: August 21, 2018'. Below this is a 'Web Map' link and a 'Add to Favorites' button. The next section is 'Description', which has a placeholder 'Add an in-depth description of the item...'. Under 'Layers', there are two listed: 'TaxReversionParcels' and 'World\_Street\_Map'. The 'Access and Use Constraints' section contains a placeholder 'Add any special restrictions, disclaimers, terms and conditions, or limitations on using the item's content.'

Figure 5.5: Web Map Details

## Feature Layer Details

TaxReversionParcels has been configured for offline use.

The screenshot shows the 'TaxReversionParcels' details page. It has a similar structure to Figure 5.5, with a blue header bar, 'Overview' tab selected, and a main content area. The 'Edit Thumbnail' section features a small thumbnail of a map with red and green areas. To its right, the text says: 'Map service exposing treasurer forfeiture data for edits by bmay531 Last Modified: August 20, 2018'. A yellow 'Feature Layer' icon is present. Below is an 'Add to Favorites' button. The 'Description' section has a placeholder. The 'Layers' section shows 'Tax Reversion Parcels' with options to 'Open In' or 'Service URL'. The 'Access and Use Constraints' section has a placeholder.

Figure 5.6: Feature Layer Details

## Basemap Details

- A tiled basemap service is used
- The infoserv user credentials are used for sharing
- The url for the shared service is:

[https://tiledbasemaps.arcgis.com/arcgis/rest/services/World\\_Street\\_Map/MapServer](https://tiledbasemaps.arcgis.com/arcgis/rest/services/World_Street_Map/MapServer)

The screenshot shows the ArcGIS Online interface for a specific map layer. At the top, there's a navigation bar with links for ArcGIS, Pricing, Map, Scene, Help, Sign In, and a search bar. Below the header, the title "World Street Map (for Export)" is displayed, with a "Overview" tab selected. To the right of the title, there are three buttons: "Open in Map Viewer" (highlighted in blue), "Open in Scene Viewer", and "Open in ArcGIS Desktop".

The main content area contains a brief description of the layer: "This layer presents highway-level data for the world and street-level data for many areas around the world. This layer is designed to support export of basemap tiles for offline use. ArcGIS Online Subscription required." It also shows a thumbnail image of a map snippet, a "Tile Layer by Esri" badge, and metadata: "Created: Oct 15, 2013 Updated: Aug 15, 2018 View Count: 39,772". Below this, there are two buttons: "Authoritative" and "Subscriber".

On the left side, there's a "Description" section with detailed information about the layer's purpose and capabilities. It mentions that the layer supports exporting small volumes of basemap tiles for offline use, including highways, major roads, minor roads, one-way arrow indicators, railways, water features, cities, parks, landmarks, building footprints, and administrative boundaries. It also notes that the map service supports exporting up to 150,000 tiles in a single request.

Below the description, there's a note stating that the layer is not intended to be used to display live map tiles for use in a web map or web mapping application. Instead, it should be used with the "World Street Map" service.

The "Service Information for Developers" section provides instructions for exporting tiles from the layer, mentioning the need to use the "Export Tiles" operation and referencing the "tiledbasemaps.arcgis.com" server.

On the right side of the page, there are sections for "Details" (listing source as "Map Service", size as "1 kB", and a five-star rating), "Owner" (listing "Esri"), "Managed by" (listing "esri"), and "Tags" (listing "World, Global, Europe, North America, United States, Southern Africa, Asia, South America, Australia, streets, street map, tile package, basemap, highways, roads, transportation, landmarks, parks, community, community basemap, map, AFA250\_base, current, esri\_basemap, general availability, export").

Figure 5.7: Basemap Source Description

## HARD COPY RECORD

screenshots: arcmap map arcmap tools portal screenshots sql server mgt screen  
shots phone screenshots

## ArcGIS Server

## ADMINISTRATIVE MANUAL

### Annual Setup

A new dataset for forfeiture parcels must be created each year.

The forfeiture information comes from BSA Forfeitures.net.

Parcel geometry and other attributes comes from ACParcelsCombined.

### To Connect to the Forfeiture Dataset

To Add a new database connection:

- Right Click on Add Database Connection
  - Enter these values into the tool

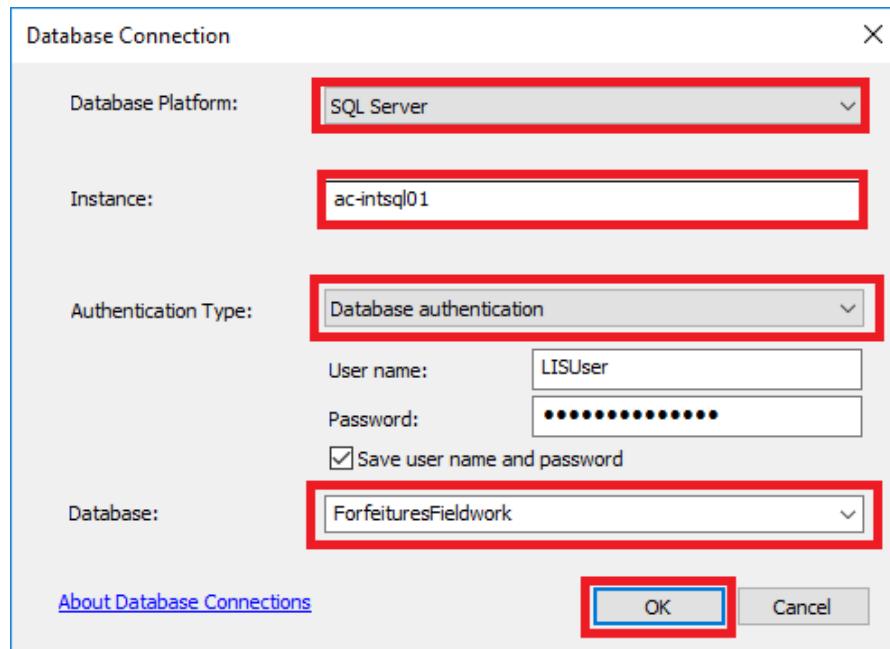


Figure 5.8: Add New Connection

Push **OK**

## Update the Forfeiture Dataset

To clear the features from the existing dataset:

- Use the Delete Feature Tools
- For Input Features:
  - ForfeituresFieldwork.DBO.ForfeitureParcels

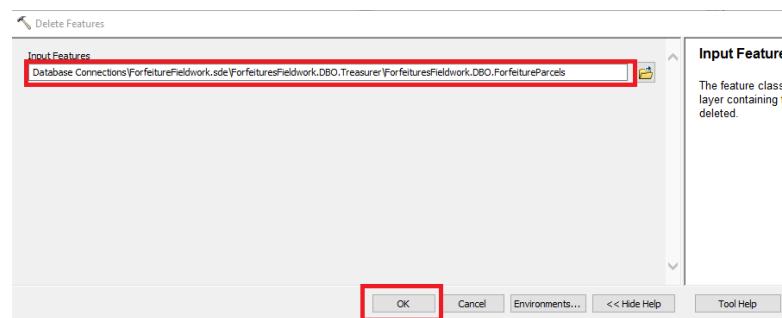


Figure 5.9: Annual Delete Features

Push **OK**

## Delete the attached table

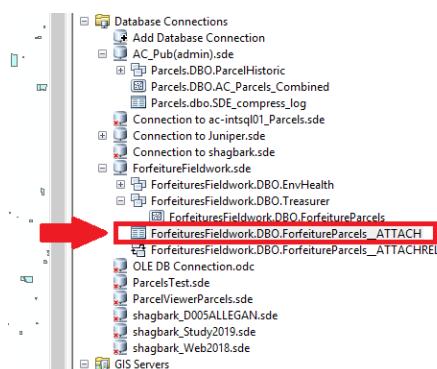


Figure 5.10: Delete Attached Table

## Create new connection to BSA server

A connection to BSA is used to get the latest forfeiture information.

### To Connect to the BSA Server

To Add a new database connection:

- Right Click on Add Database Connection
  - Enter these values into the tool

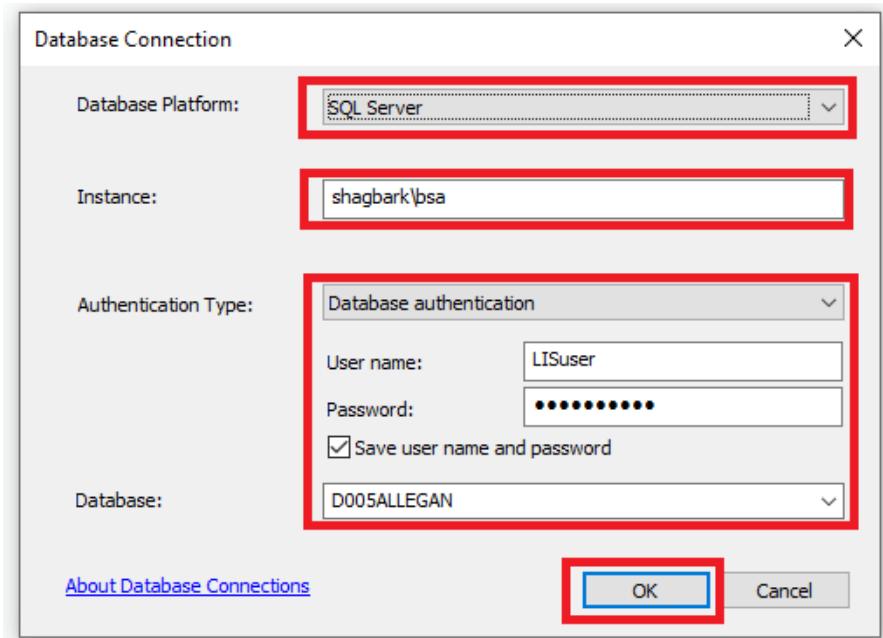


Figure 5.11: Connect to BSA Server

Push **OK**

## Create a Table Query For the New Data

- File ➔ Add Data ➔ Add Query Layer
- Select your connection (*shagbark\_D005ALLEGAN.sde*)

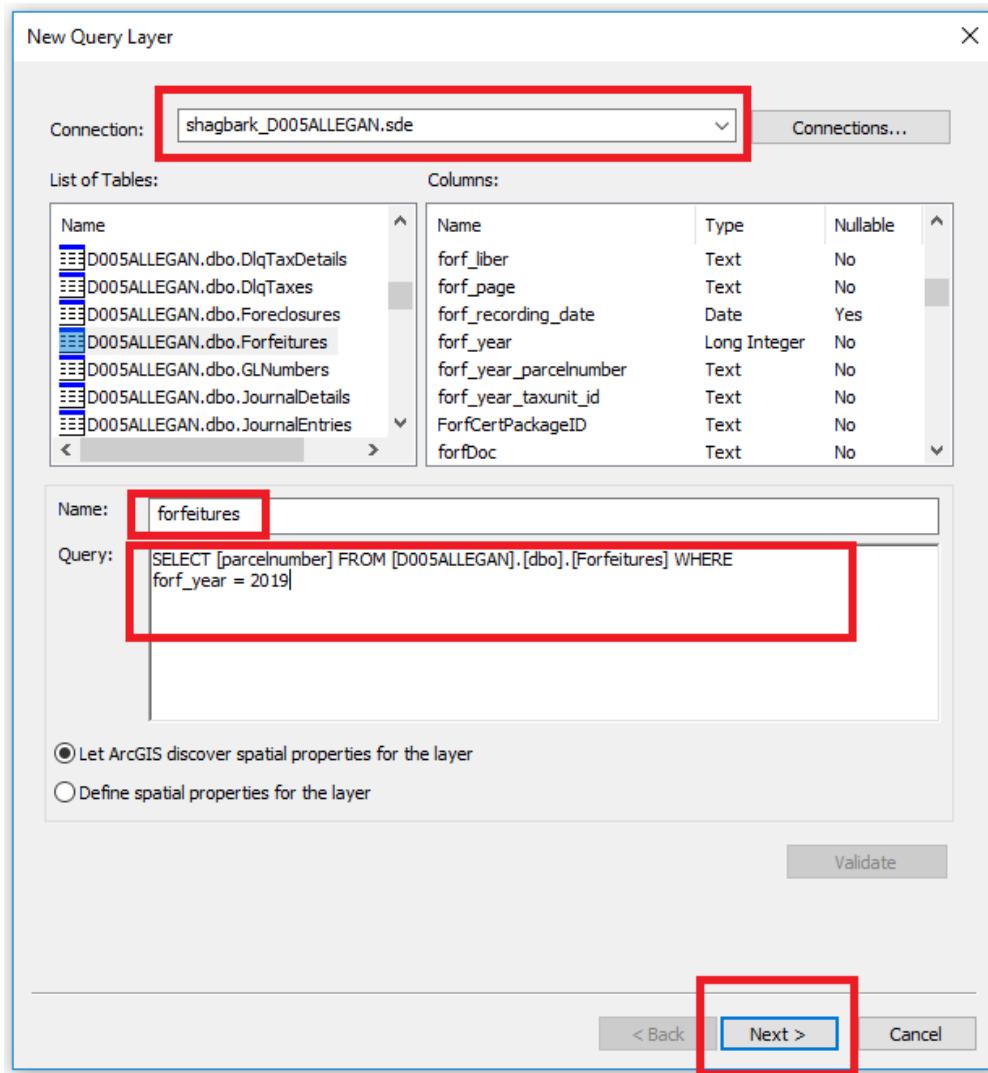


Figure 5.12: New Query Layer Dialog

Edit Query Text for current Year:

```
SELECT [parcelnumber] FROM [D005ALLEGAN] . [dbo] . [Forfeitures]
WHERE forf_year = 2020
```

## Select a Unique Identifier

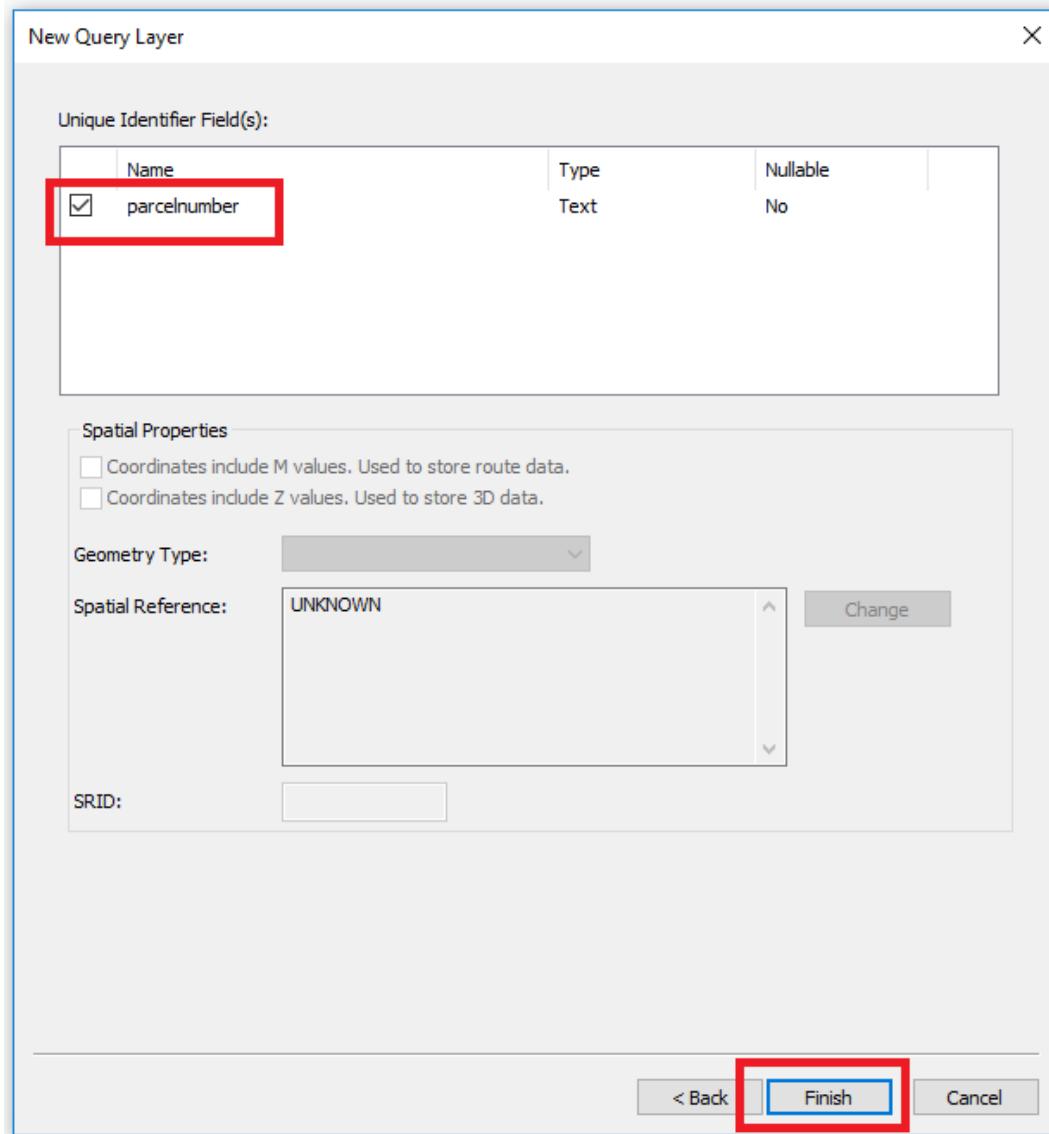


Figure 5.13: Query Layer Unique ID

Push **Finish**

## Table is added to the map

The screenshot shows the ArcGIS Pro interface. On the left, the 'Table Of Contents' pane displays a tree view of layers. A red box highlights the 'D005ALLEGAN' folder, which contains a sub-layer named 'D005ALLEGAN.DBO.forfeitures'. This layer is checked in the tree view. To the right, a 'Table' viewer window is open, showing the contents of the 'D005ALLEGAN.DBO.forfeitures' table. The table has two columns: 'parcelnumber' and 'ESRI\_OID'. The data consists of 905 rows of parcel numbers, each followed by its corresponding ESRI OID value. The table viewer includes standard navigation controls at the bottom.

parcelnumber	ESRI_OID
01-006-014-10	1
01-007-012-00	2
01-013-031-10	3
01-013-031-20	4
01-017-001-20	5
01-018-038-00	6
01-019-001-13	7
01-019-005-97	8
01-019-027-00	9
01-020-024-00	10
01-026-020-00	11
01-030-014-10	12
01-030-019-00	13
01-032-033-00	14
01-034-087-00	15
01-034-108-00	16
01-035-020-20	17
01-035-030-00	18
01-035-044-00	19
01-035-044-10	20
01-035-044-11	21
01-035-049-00	22
01-036-008-00	23
01-120-013-00	24
01-120-029-00	25
01-120-031-00	26
01-120-032-00	27
01-240-003-00	28
01-250-001-00	29
01-300-004-00	30
01-320-020-00	31
01-320-021-00	32
01-370-016-00	33
01-610-025-00	34
01-610-026-00	35
02-001-010-20	36
02-003-018-00	37
02-004-013-00	38
02-005-004-20	39
02-007-025-00	40
02-010-012-20	41
02-011-007-00	42
02-011-022-20	43
02-016-007-00	44
02-017-011-20	45
02-018-000-00	46

Figure 5.14: Forfeiture Table Added

## Add Parcels Layer to the Map

- Parcels are added to the map to provide parcel geometry and attributes
- Parcel year is = current year - 2
- I.E. Use ACParcelsCombHistoric2018 in 2020

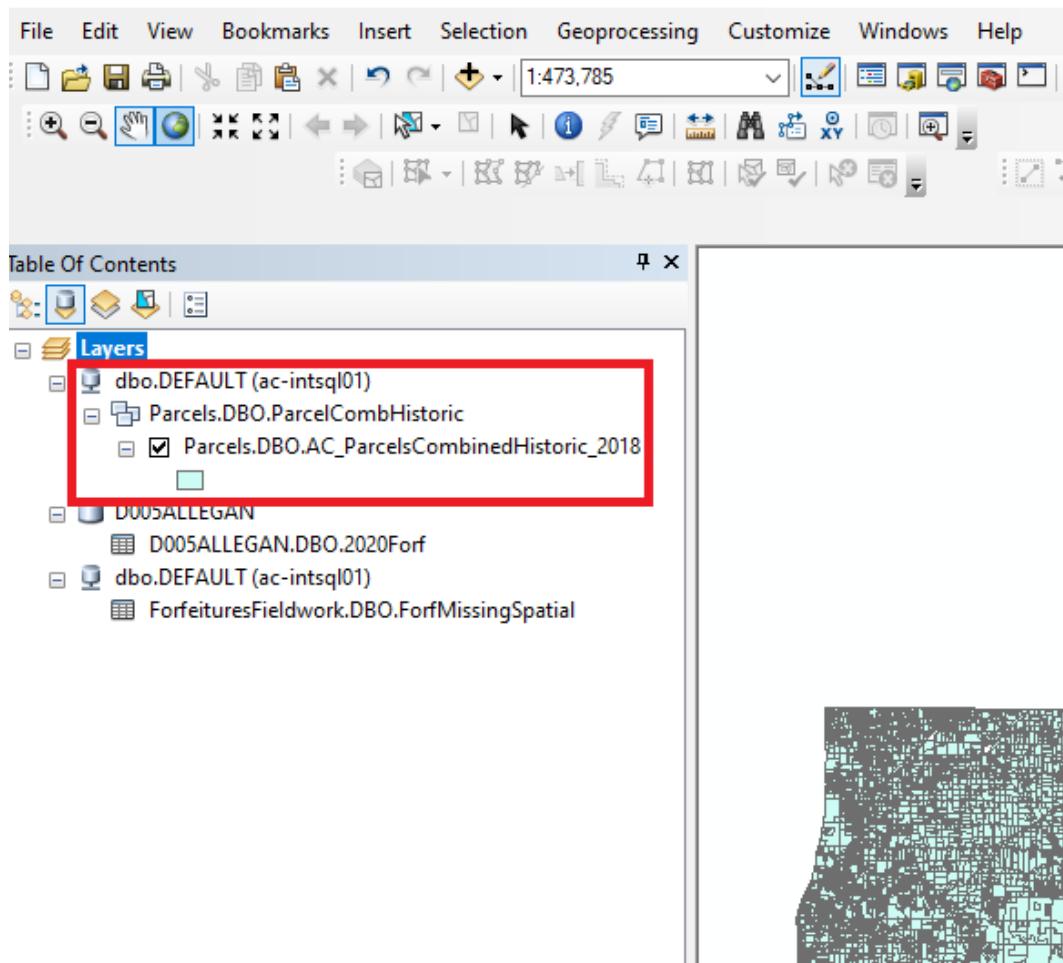


Figure 5.15: Parcels Layer Added

# Forfeiture parcel missing spatial data

A temporary join, selection, and export will save these

➤ Join Parcels to Forfeiture table

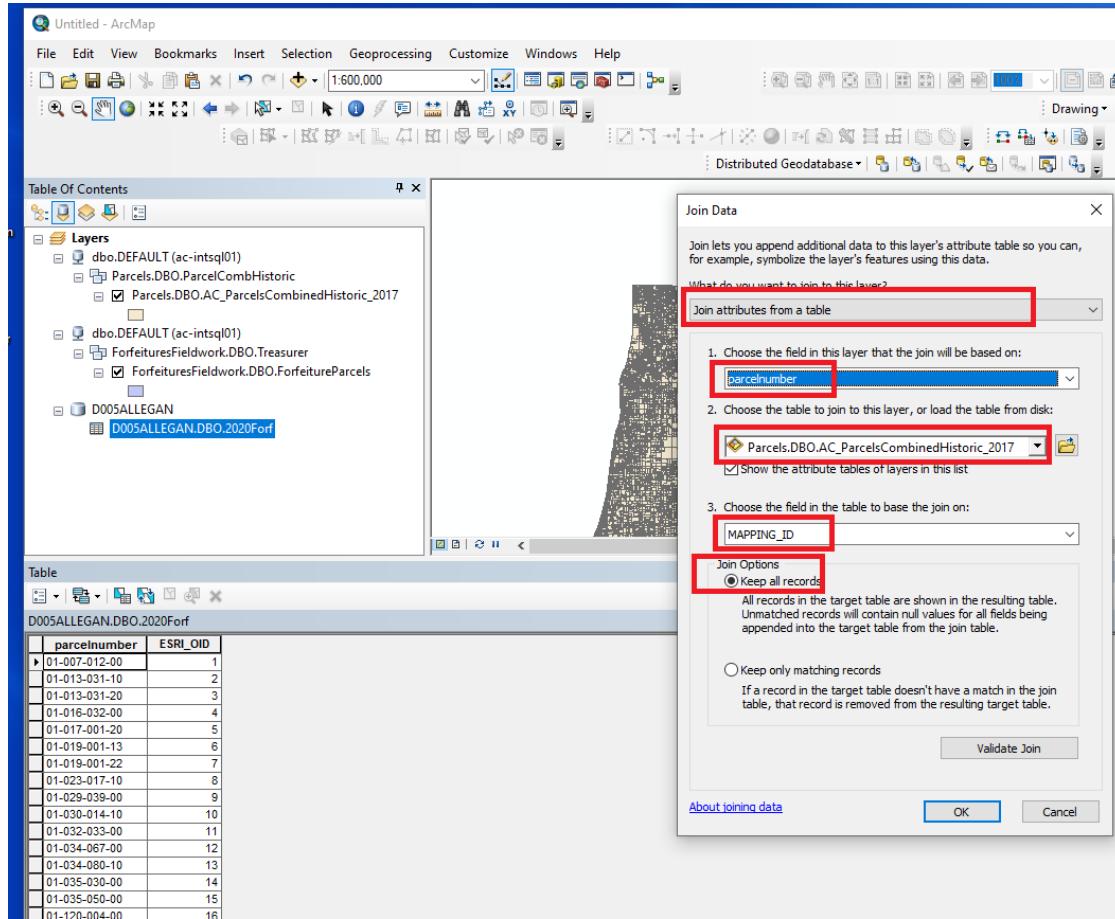
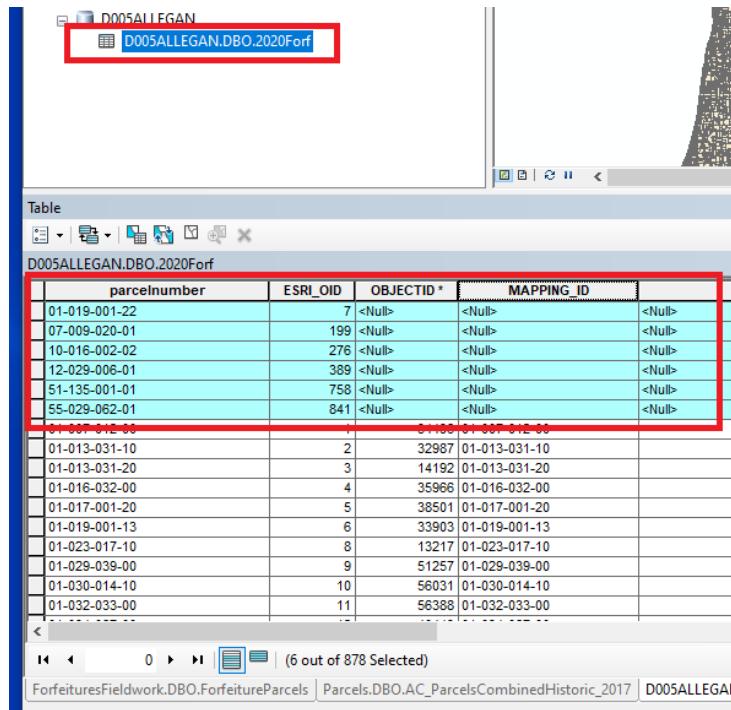


Figure 5.16: Join to Forfeiture Table

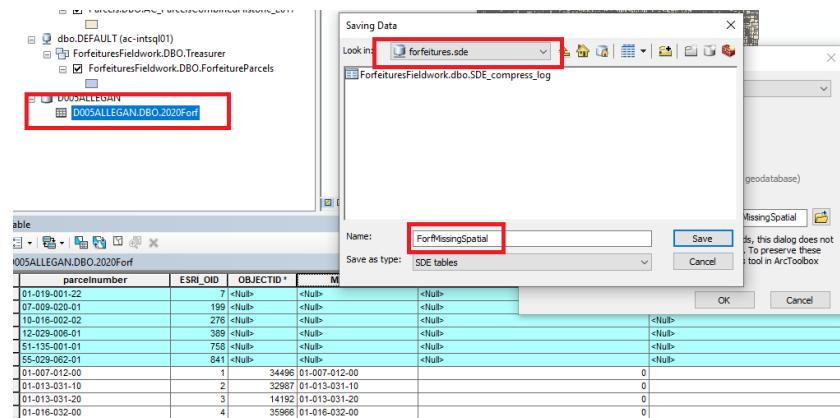
- Select any parcels missing spatial data



parcelnumber	ESRI_OID	OBJECTID *	MAPPING_ID
01-019-001-22	7	<Null>	<Null>
07-009-020-01	199	<Null>	<Null>
10-016-002-02	276	<Null>	<Null>
12-029-006-01	389	<Null>	<Null>
51-135-001-01	758	<Null>	<Null>
55-029-062-01	841	<Null>	<Null>
01-007-012-00	1	34496	01-007-012-00
01-013-031-10	2	32987	01-013-031-10
01-013-031-20	3	14192	01-013-031-20
01-016-032-00	4	35966	01-016-032-00
01-017-001-20	5	38501	01-017-001-20
01-019-001-13	6	33903	01-019-001-13
01-023-017-10	8	13217	01-023-017-10
01-029-039-00	9	51257	01-029-039-00
01-030-014-10	10	56031	01-030-014-10
01-032-033-00	11	56388	01-032-033-00

Figure 5.17: Select for Missing Spatial

- Export Parcels missing spatial to a table in the GDB



parcelnumber	ESRI_OID	OBJECTID *	MAPPING_ID	geodatabase
01-019-001-22	7	<Null>	<Null>	
07-009-020-01	199	<Null>	<Null>	
10-016-002-02	276	<Null>	<Null>	
12-029-006-01	389	<Null>	<Null>	
51-135-001-01	758	<Null>	<Null>	
55-029-062-01	841	<Null>	<Null>	
01-007-012-00	1	34496	01-007-012-00	0 1
01-013-031-10	2	32987	01-013-031-10	0 0
01-013-031-20	3	14192	01-013-031-20	0 0.4
01-016-032-00	4	35966	01-016-032-00	0 2.4

Figure 5.18: Export Missing Spatial

# Create current year Forfeiture dataset

## Create Join

- Create new join to *ACParcelsCombHistoricXXXX* of forfeitures on parcel numbers

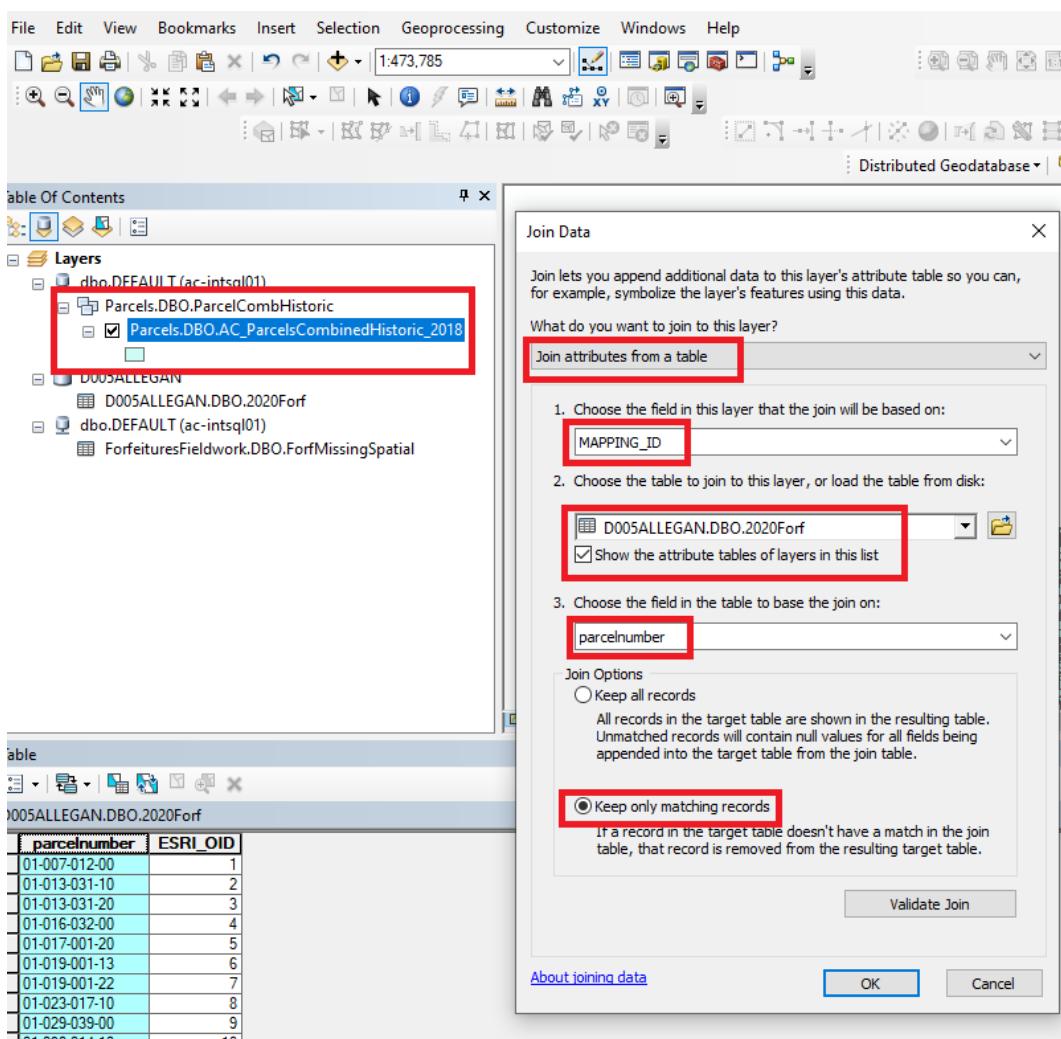


Figure 5.19: Join Parcels

## Export Joined Features to a temp location

- Right click  on joined feature class in TOC and choose export

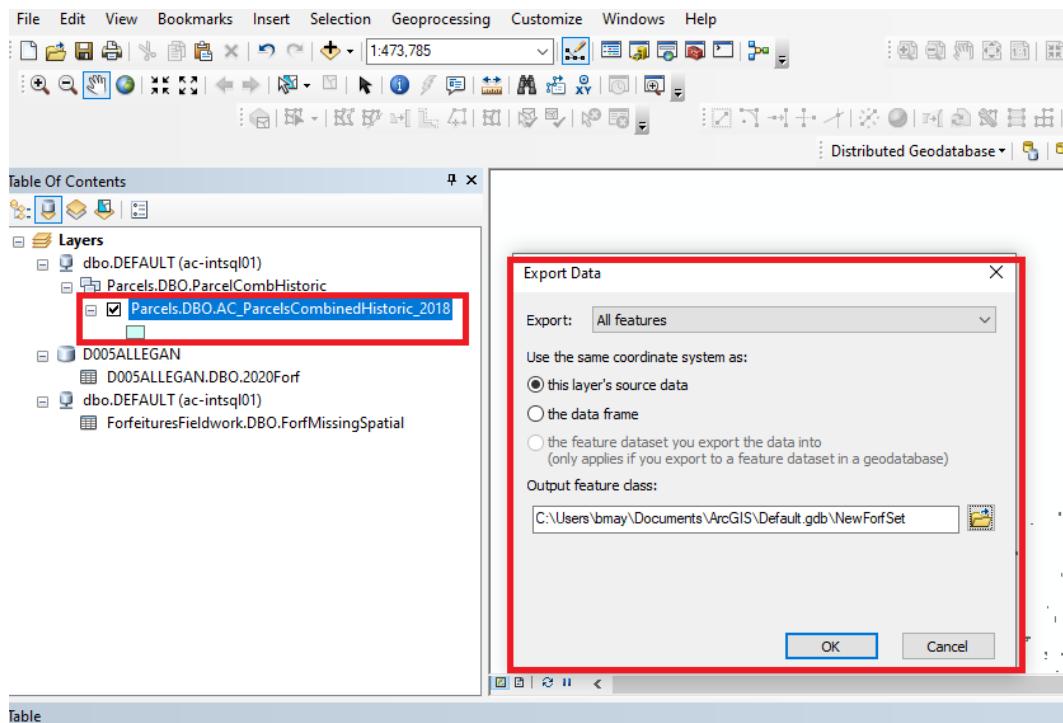


Figure 5.20: Export Joined Features

choose location and Push 

## Load data from temp location to forfeitureParcels

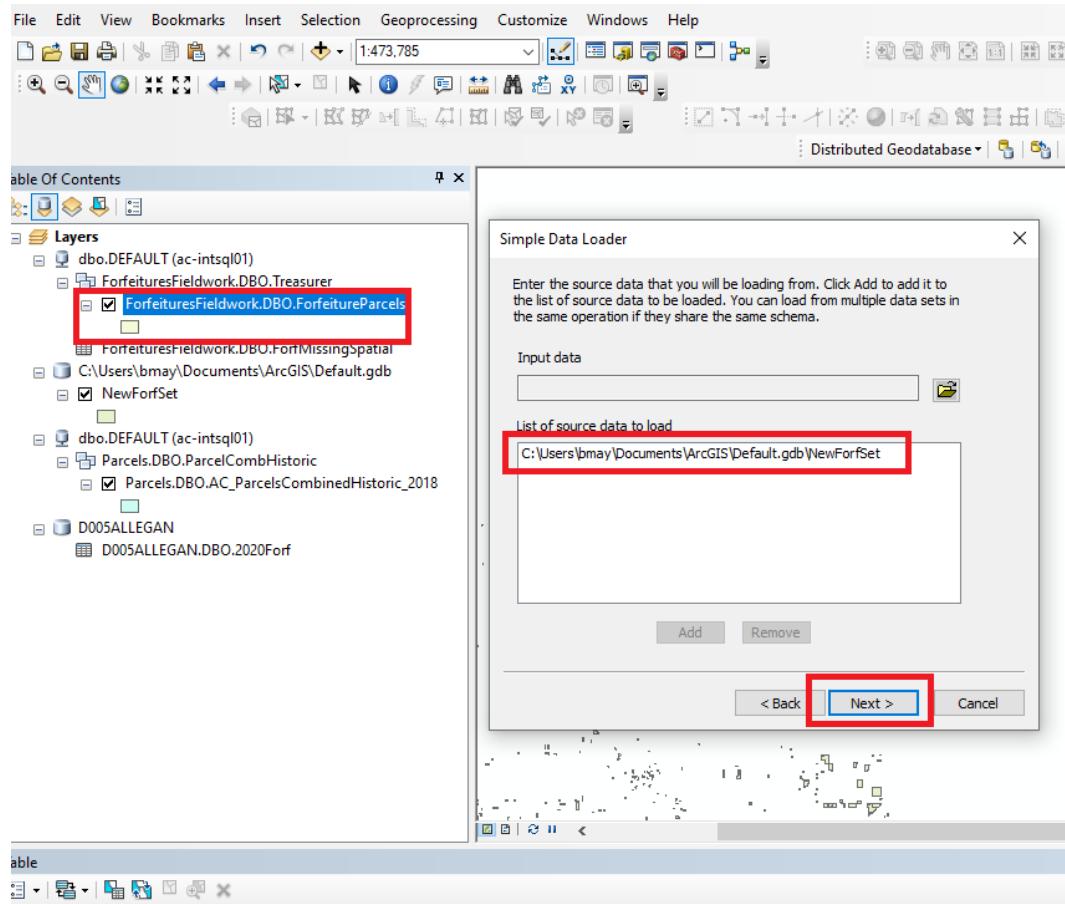


Figure 5.21: Load Data 1

choose features from a temp location

Push **Next**

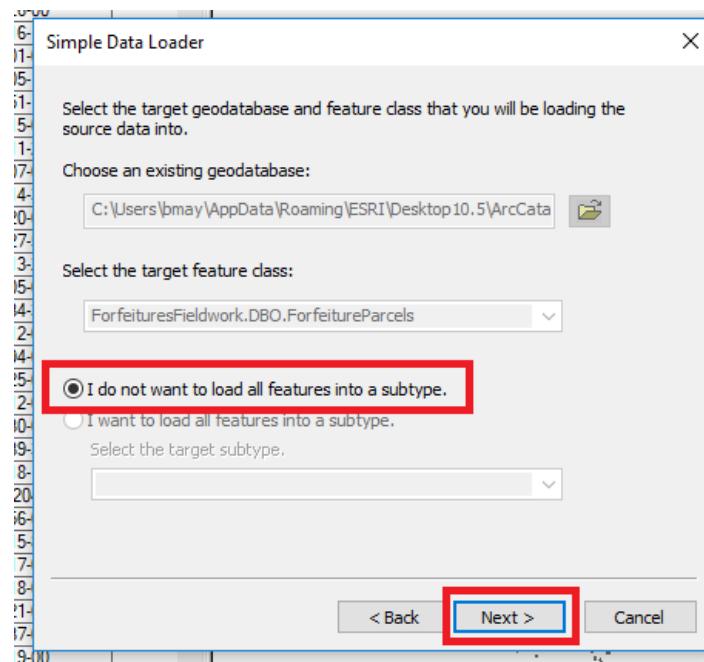


Figure 5.22: Load Data 2

---

## Match these fields

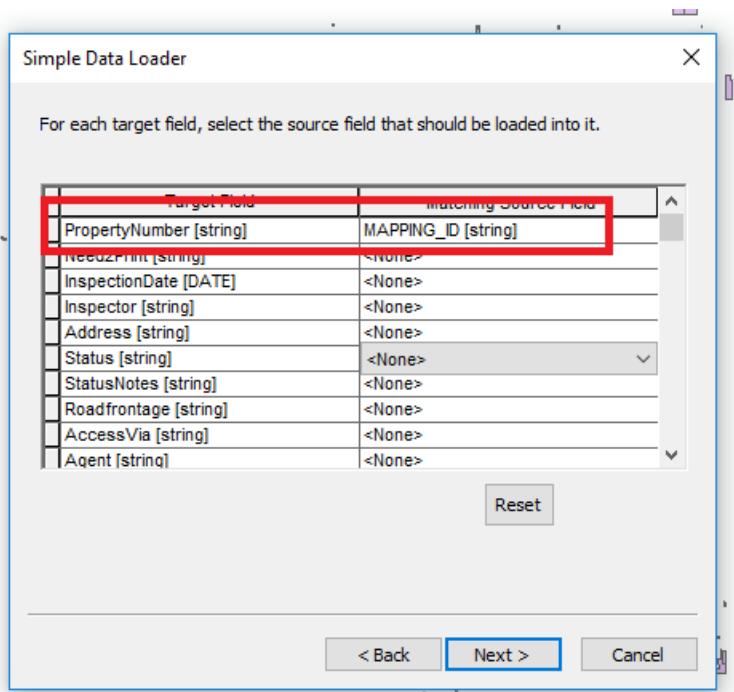


Figure 5.23: Match Fields 1

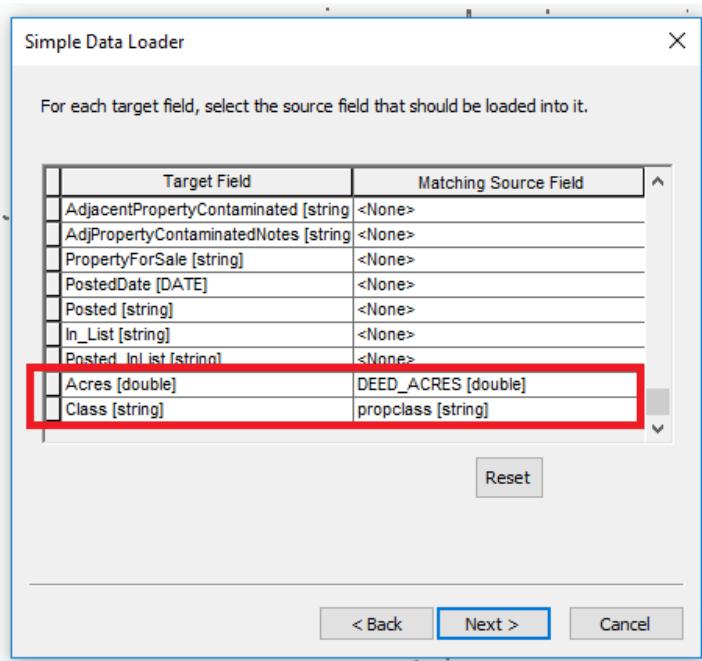


Figure 5.24: Match Fields 2

Push **Next**

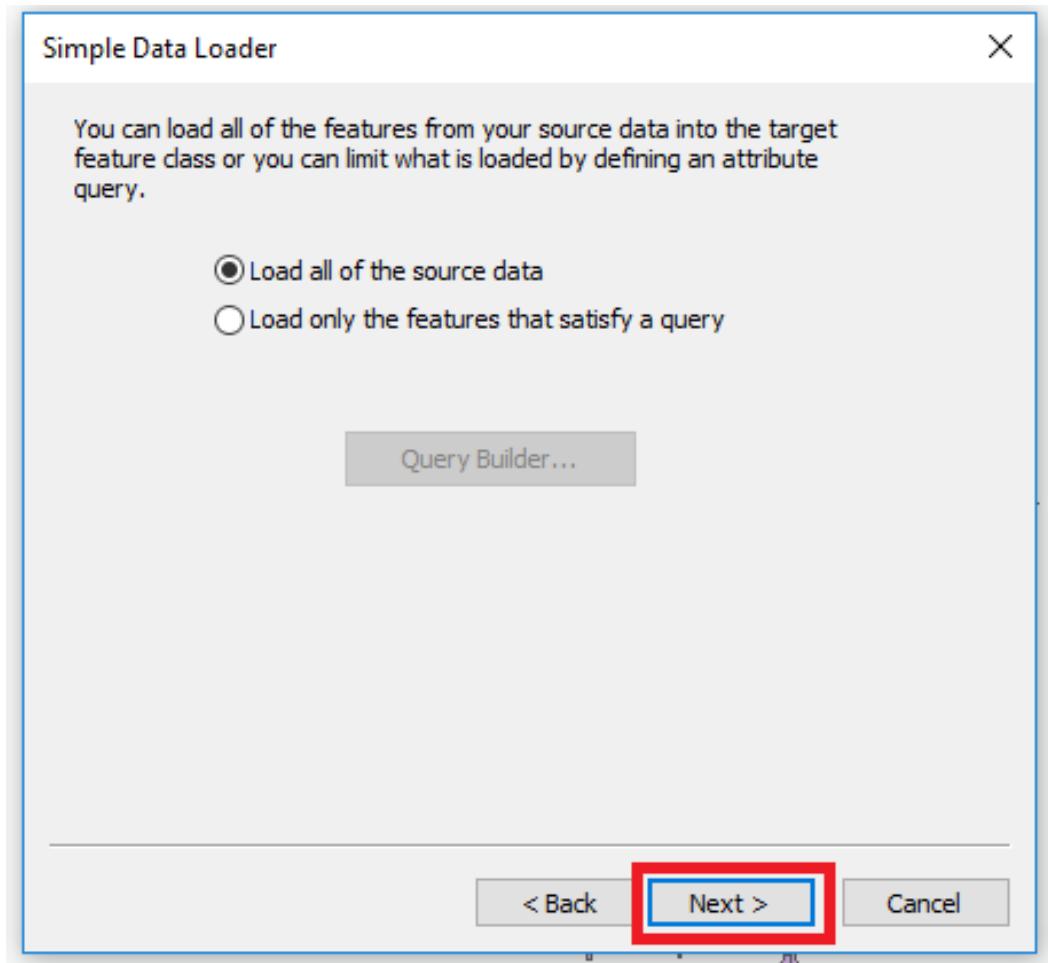


Figure 5.25: Load Data 3

Push **Finish**

# Calculate Initial Values

## Calculate In List value

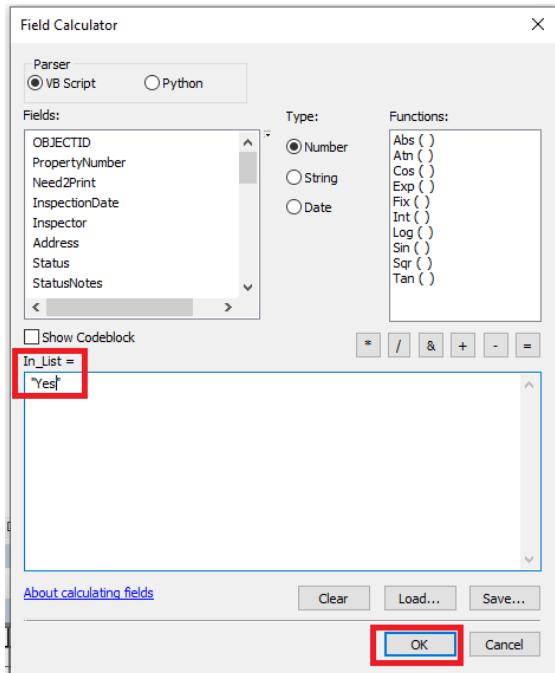


Figure 5.26: Calculate In List

## Calculate Posted Value

## Calculate Posted InList Value

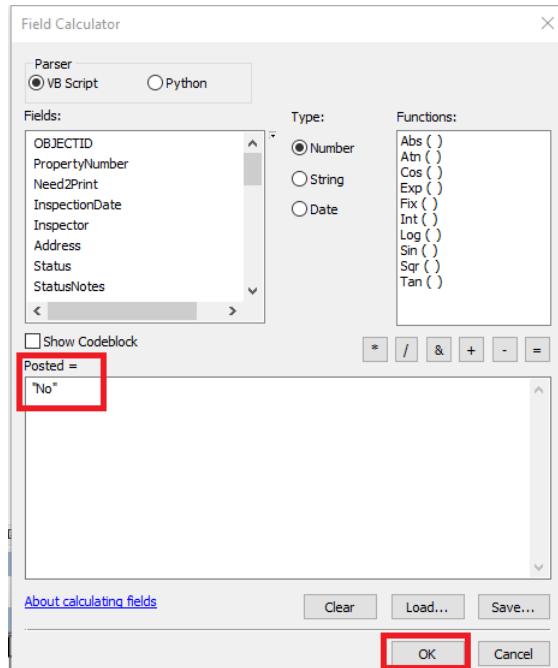


Figure 5.27: Calculated Posted

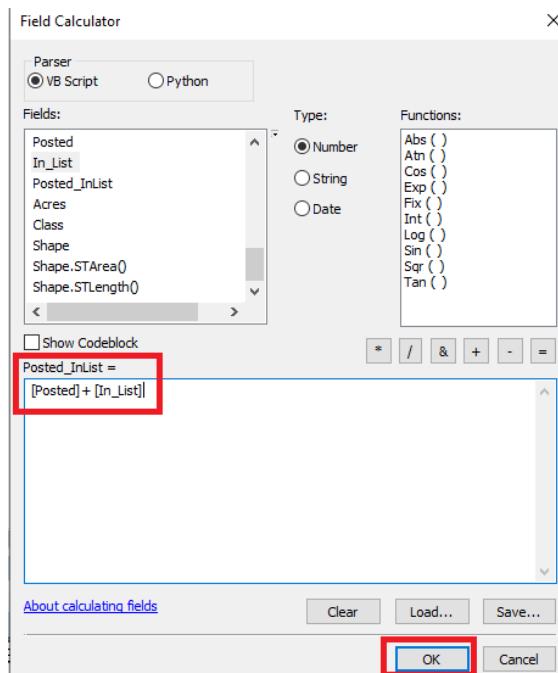


Figure 5.28: Calculate Posted in List

---

## Data Setup

### Register as versioned and Add Global IDs

Right Click ➔ Manage ➔ Register as Versioned

and

Right Click ➔ Manage ➔ Add Global IDs

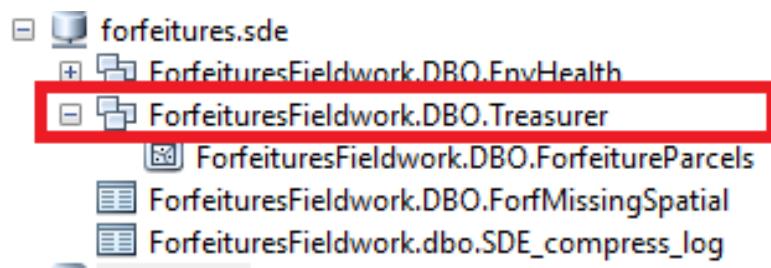


Figure 5.29: Setup Data

## Create Attachments

Attachments is for storing the photos for each feature.

Right Click ➔ Manage ➔ Add Attachments

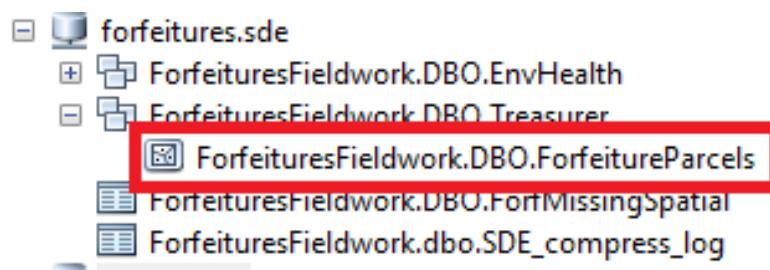


Figure 5.30: Create Attachments

## Calculate Acres in ForfeitureParcels

Right Click ➔ Acres Column ➔ Calculate geometry (acres)

## Setup Users in ArcGIS

Users that will run Pre and Post processing scripts must be created and given privileges on Treasurer Feature Data Set.

For any new users of the geoprocessing tools:

Use the create Database User tool

or

In Catalog ➔ Right click on ForfeituresFieldwork ➔ Administration ➔ Add User

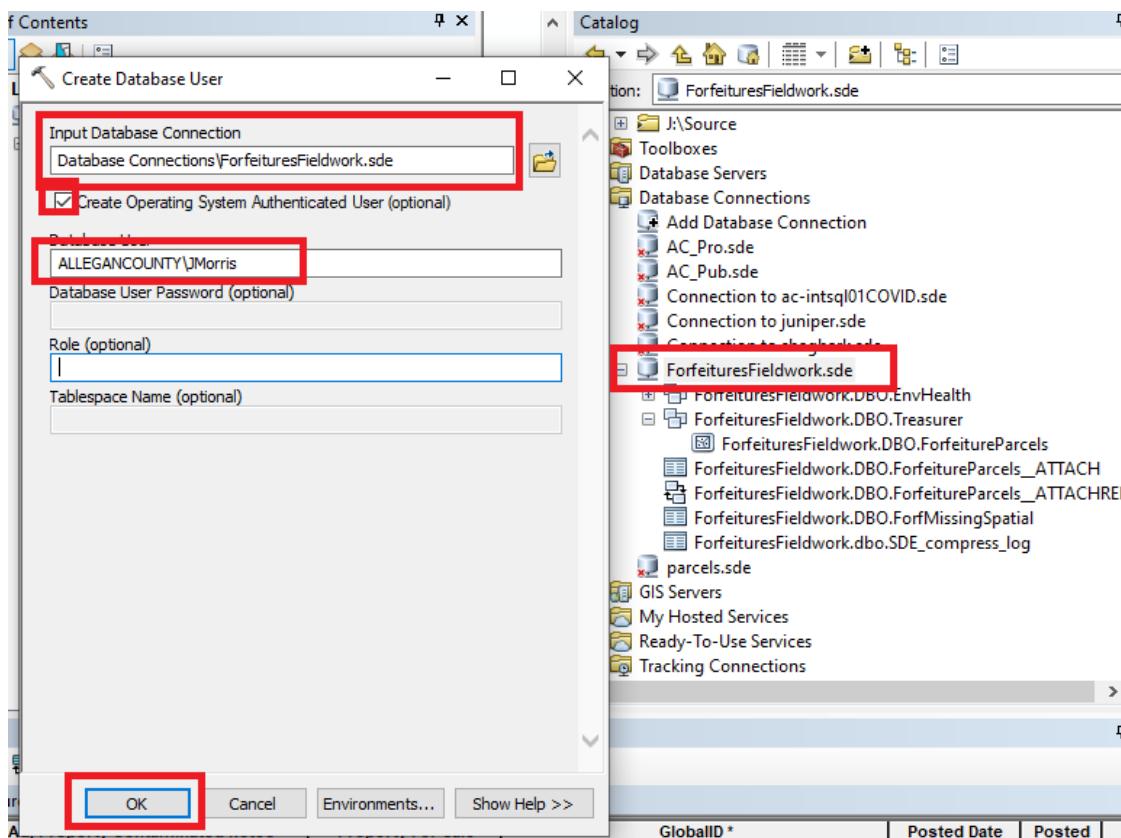


Figure 5.31: Add Db User

## Add New User to Feature Dataset

In Catalog, right click on Treasurer Feature Data Set

Manage Privileges Add Type new user

Push

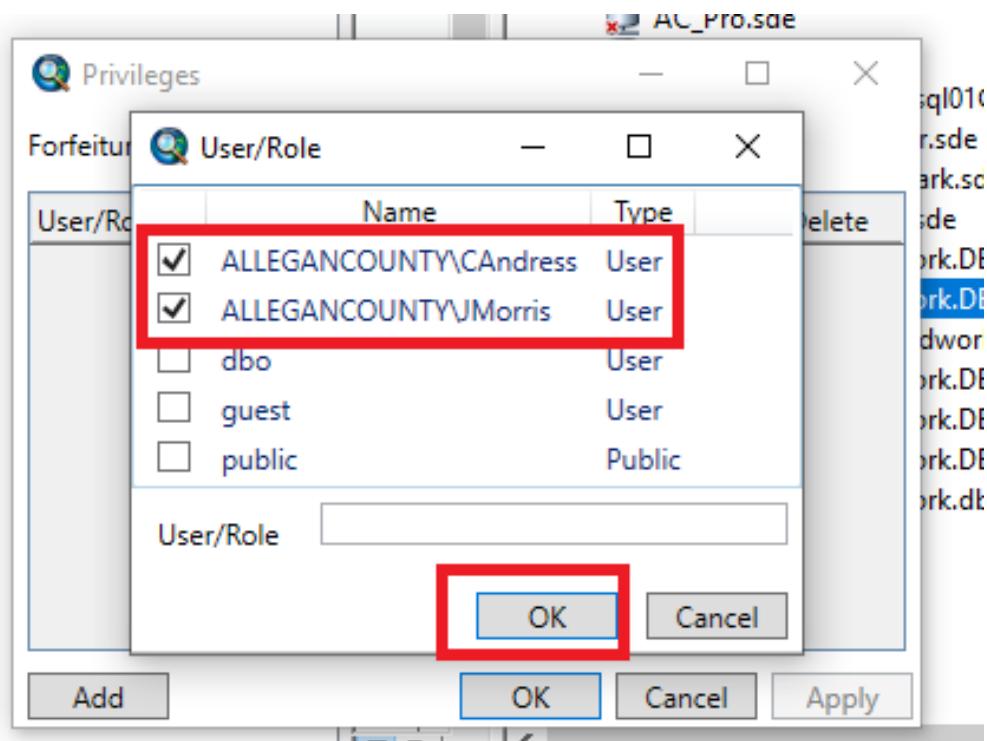


Figure 5.32: Add Feature Dataset User

## Extend Privileges for New User

In Catalog ➔ right click on Treasurer FDS ➔ Manage ➔ Privileges ➔ check boxes

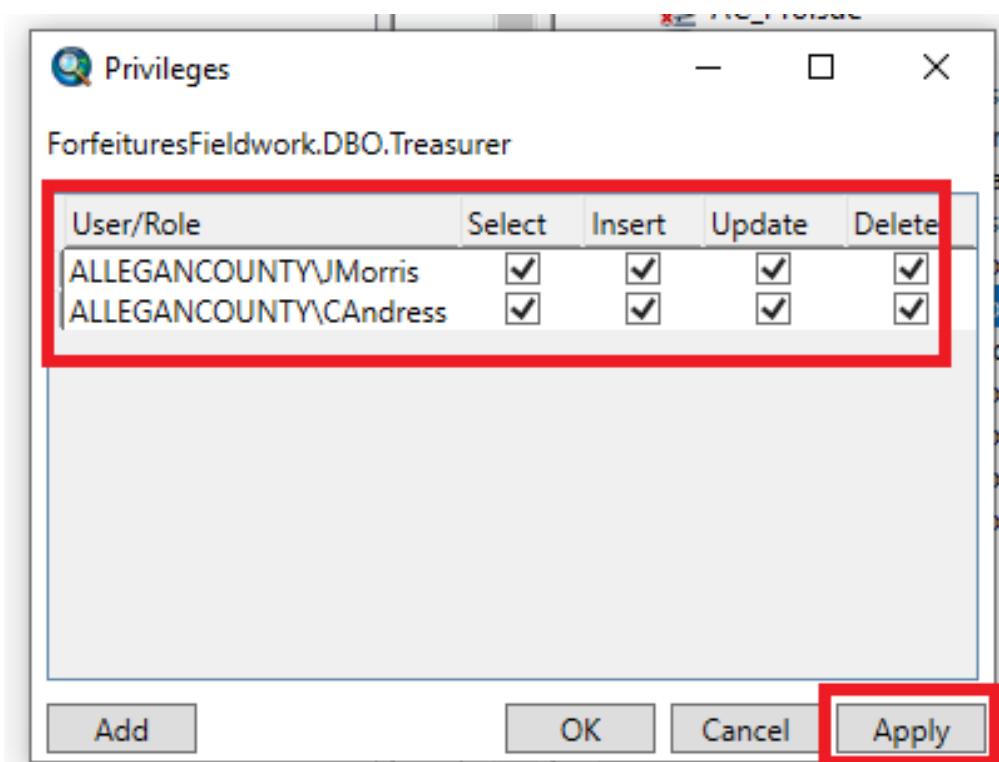


Figure 5.33: Extend Feature Dataset Privileges

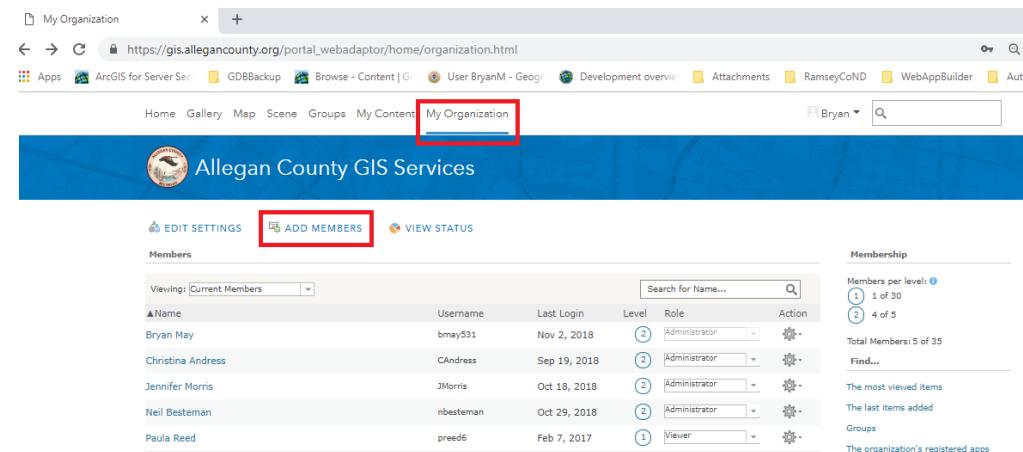
## Portal Setup

### Setup Users in Portal for ArcGIS

Users that will use the Collector for ArcGIS must have profiles added to and managed in the Allegan County GIS Portal site.

In Portal,  My Organization

Push Add Members



The screenshot shows the 'My Organization' page of the Allegan County GIS Services portal. At the top, there is a navigation bar with links for Home, Gallery, Map, Scene, Groups, My Content, and a search bar. Below the navigation bar is a banner for 'Allegan County GIS Services'. Underneath the banner, there are three buttons: 'EDIT SETTINGS', 'ADD MEMBERS' (which is highlighted with a red box), and 'VIEW STATUS'. A table titled 'Members' lists five users: Bryan May, Christina Andress, Jennifer Morris, Neil Besteman, and Paula Reed. Each user has columns for Name, Username, Last Login, Level, Role, and Action. On the right side of the page, there is a sidebar titled 'Membership' with sections for 'Members per level', 'Total Members', and 'Find...'. There are also links for 'The most viewed items', 'The last items added', 'Groups', and 'The organization's registered apps'.

Figure 5.34: Portal Add User 1

## Add Members to Portal

Select Built in Member 

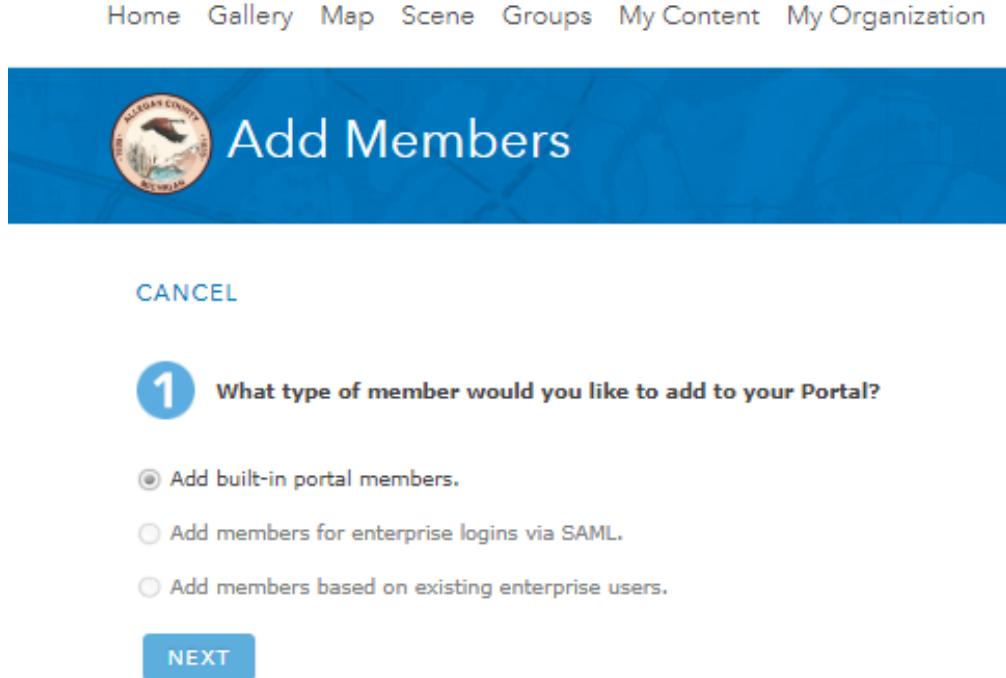


Figure 5.35: Portal Add User 2

Push  **Next**

Enter required info for new member

**Add Members**

**2** Create new Allegan County GIS Services logins one at a time or in batch from a file.  
Select any role for the member to be a part of. You must inform the member of their user name and password. If you do not have an email address for a particular user, use the administrator's email address.

Password may not be less than 8 characters.

One at a time    From a file

Email: \_\_\_\_\_

First Name: \_\_\_\_\_

Last Name: \_\_\_\_\_

Username: \_\_\_\_\_

Password: \_\_\_\_\_

Level     1     2

Role: Publisher

BACK    ADD ANOTHER    REVIEW ADDITIONS

Figure 5.36: Portal Add User 3

## Manage Treasurer Group

In Portal  Go to groups  Invite new user to the group

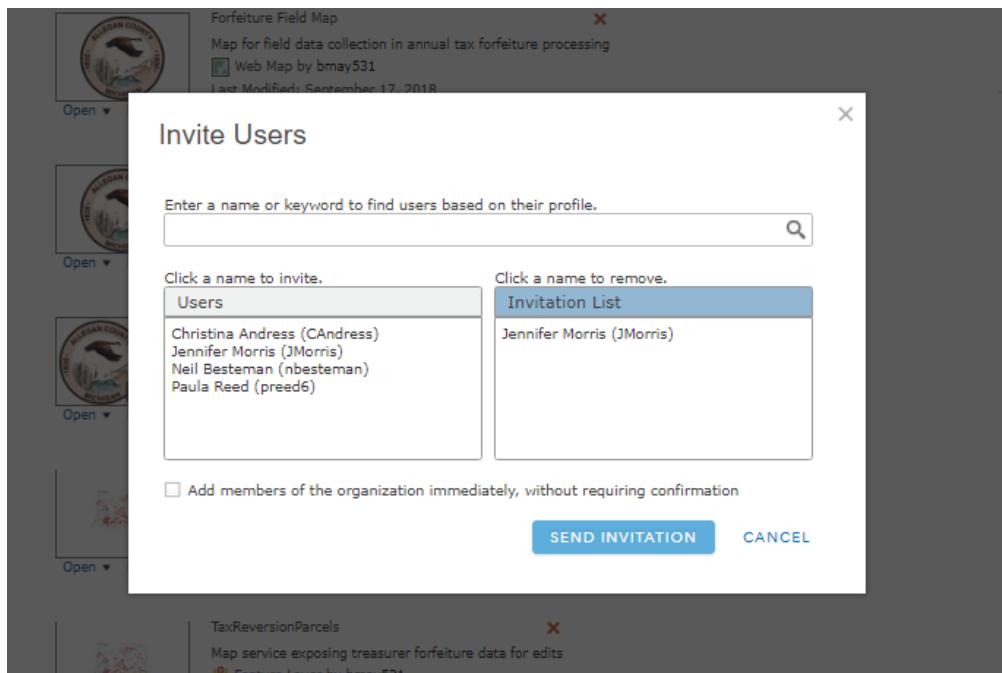


Figure 5.37: Portal Add User 4

## Share Portal Content with the group

Any content used by the group needs to be shared to the group

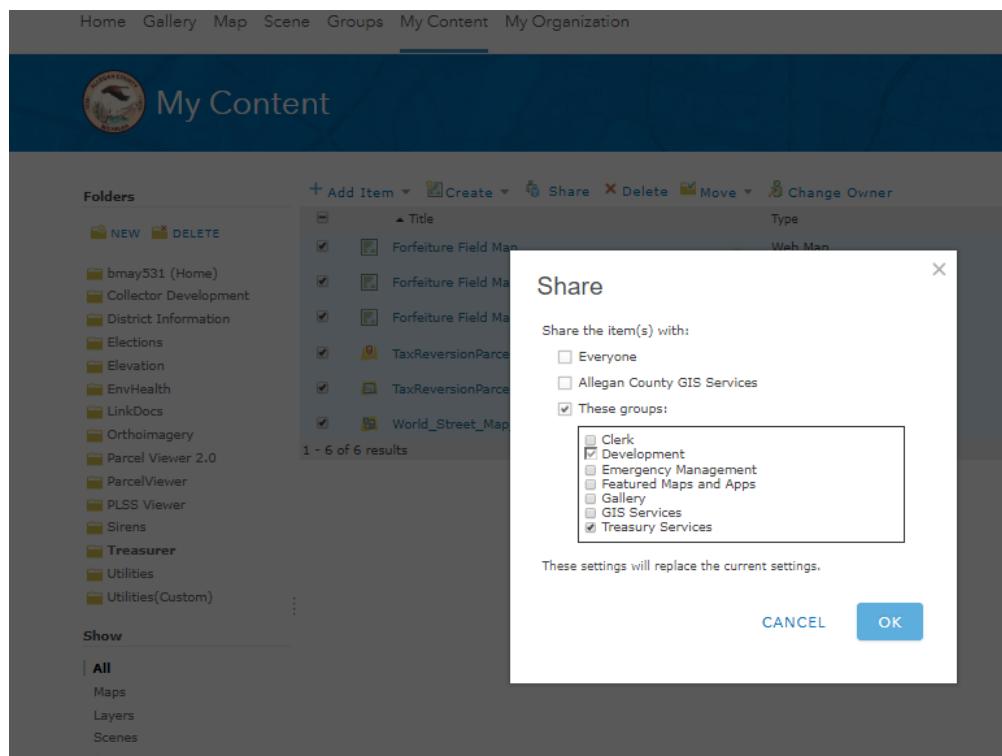


Figure 5.38: Portal AddUser 5

## Start services and webmap

### Find published MXD

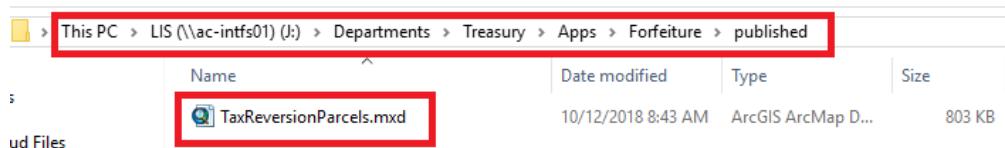


Figure 5.39: Published Mxd

## Publish Forfeiture Parcels Map Service

### General

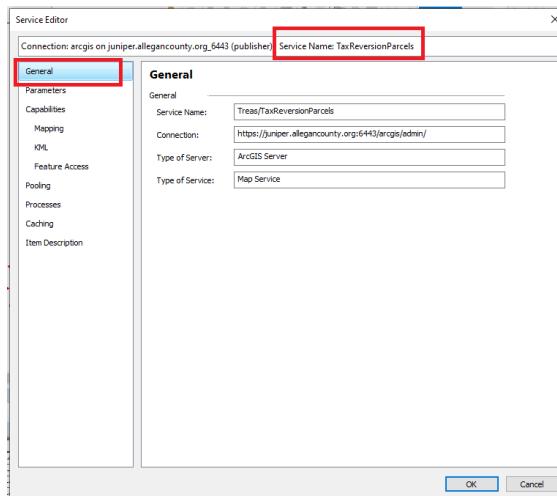


Figure 5.40: General

### Capabilities

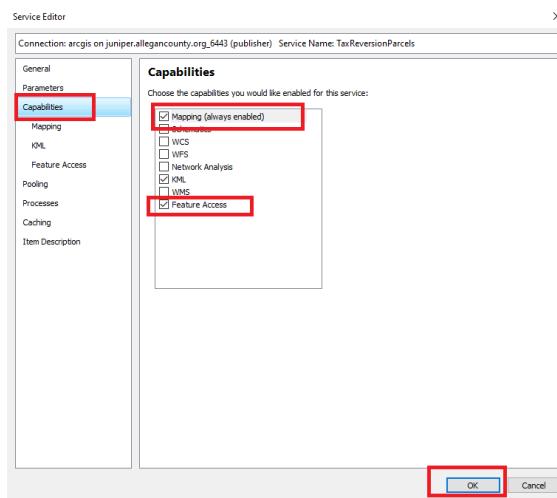


Figure 5.41: Capabilities

### Feature Access

---

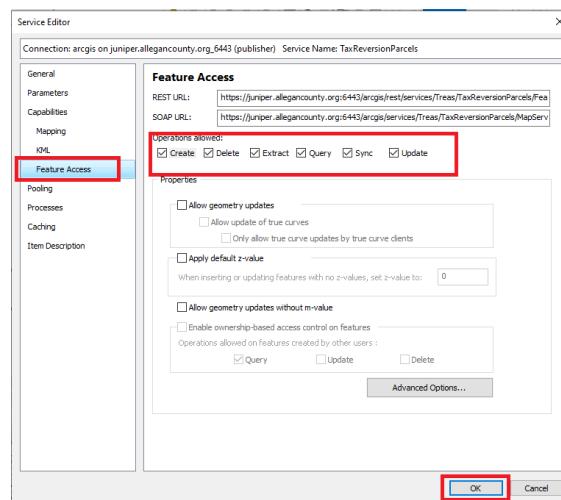


Figure 5.42: Feature Access

## Publish Service



Figure 5.43: Publish Service

## Schema Change Procedure

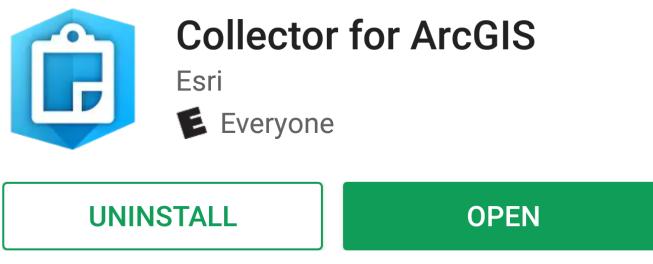
## Form Edits Procedure

## USER MANUAL

## Collection Device Setup

## Install Collector for ArcGIS

- Available from the Google Play Store



Accurate Data Collection Made Easy

**WHAT'S NEW**

- Various bug fixes and improvements

[READ MORE](#)

Figure 5.44: Download the App

## Configure Collector

for Organization Website, Type:

`https://gis.allegancounty.org/  
portal_webadaptor`

Push **Continue** 

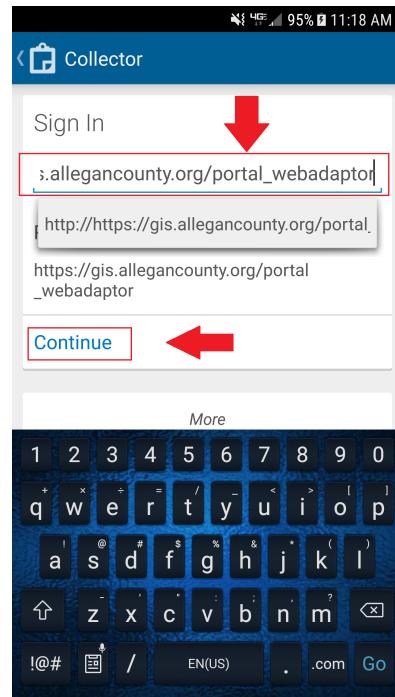


Figure 5.45: Collector Connection

## Enter Credentials

Push **SIGN IN** 

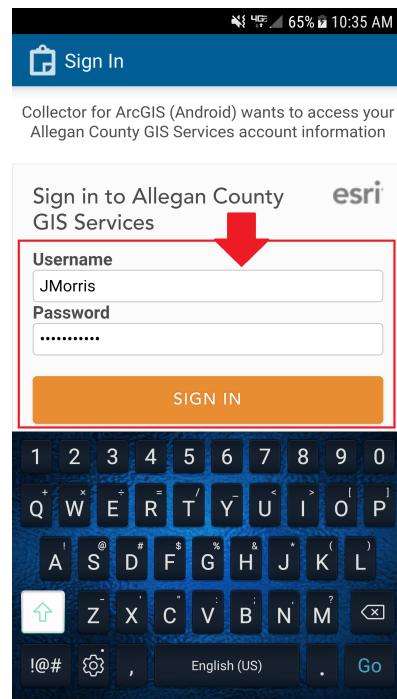


Figure 5.46: Enter Credentials

## Download the Forfeiture Field Map

There are 3 different versions of the map

- Forfeiture Field Map
- Forfeiture Field Map For Photos
- Forfeiture Field Map For Attributes

The Download option indicates it is not on the device but is available for offline use

### Choose a Map

Push **DOWNLOAD** ➡

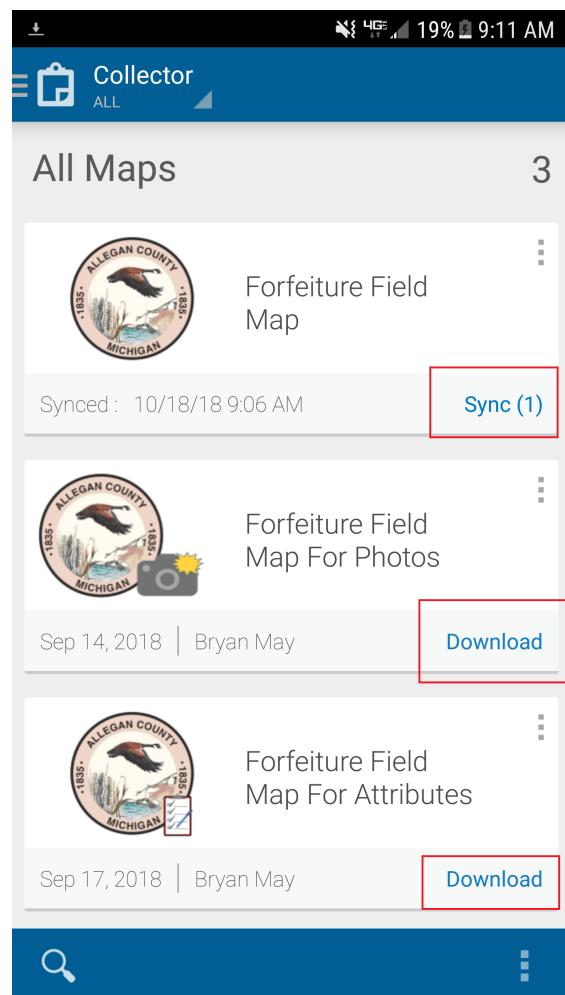


Figure 5.47: Collector Maps Menu

## Specify work area

Choose Map Detail 

Note that a larger area takes longer to download  
but the basemap only needs to be downloaded  
once

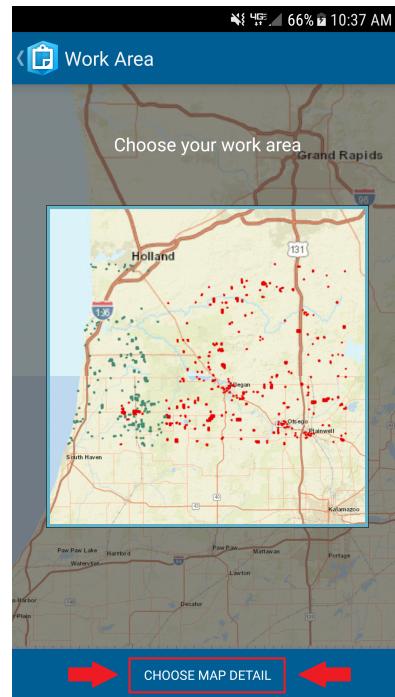


Figure 5.48: Choose Work Area (large)

## Choose Map Detail

Zoom into the level of detail desired.

Push **DOWNLOAD** 

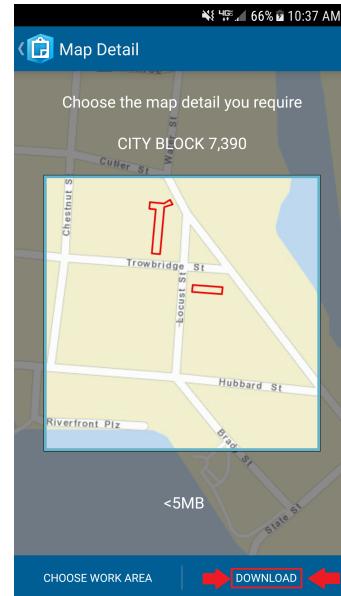


Figure 5.49: Choose Map Detail

This area is ready for field data collection 

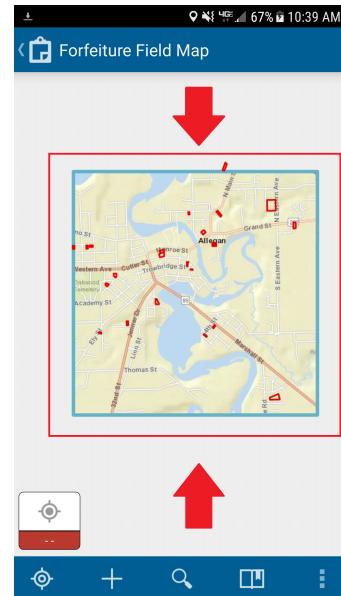


Figure 5.50: Map on Device

---

# Open Camera Application Setup Details

## Install Open Camera

- Available from the Google Play Store

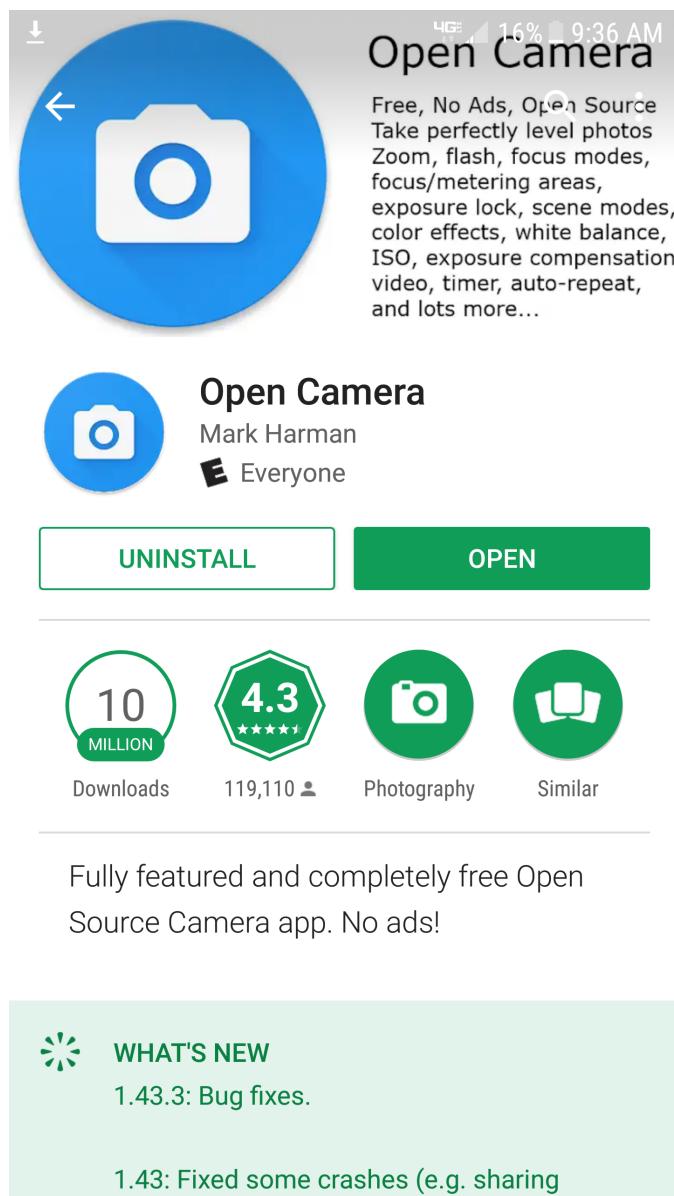


Figure 5.51: Open Camera from Google Play Store

## Configure Open Camera

In the Open Camera App:

Settings 

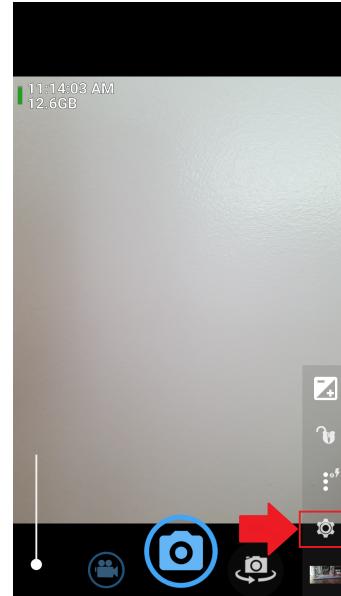


Figure 5.52: Find Settings Menu

Photo Settings 

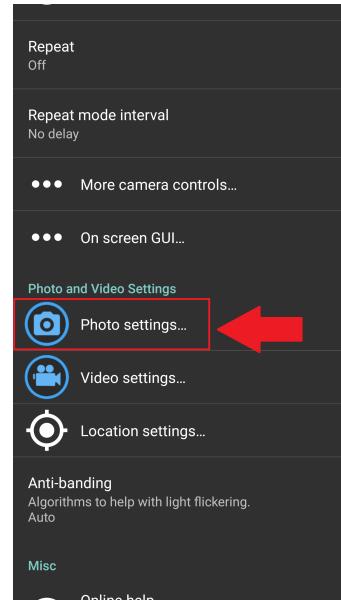


Figure 5.53: Setting Screen

---

## Set Photo Resolution

In the Open Camera App:(cont.)

**Camera Resolution** ↗

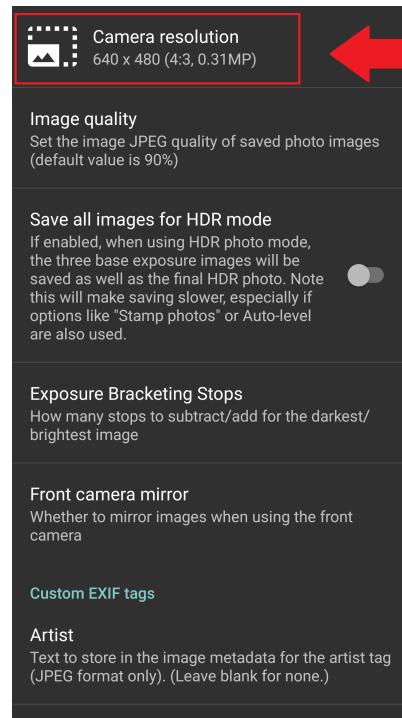


Figure 5.54: Photo Settings Menu

**640 x 480** ↗

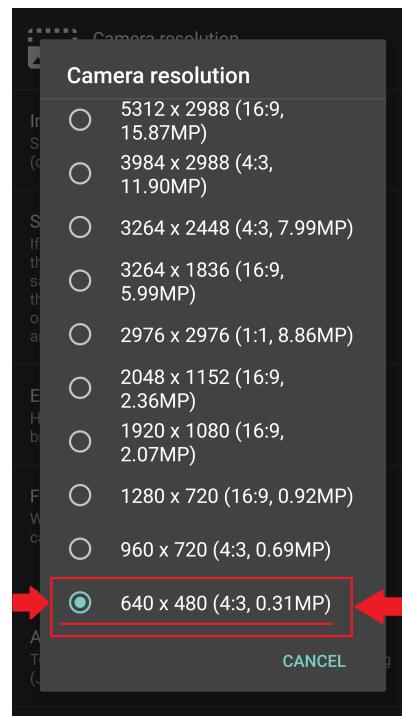


Figure 5.55: Camera Resolution Setting

## Preprocessing Routine

Each day the data must be prepared by executing the tool:

### 1. Preprocess

#### What the tool does:

- Exports current forfeiture list from BSA
- Updates webmap layers with results from BSA export

To use the preprocess tool:

In the Catalog window, navigate to:

J:\Departments\Treasury\Apps\Forfeiture\processing\ForfeitureToolbox.tbx

.

Open the toolbox ➔

1.Preprocess ➔

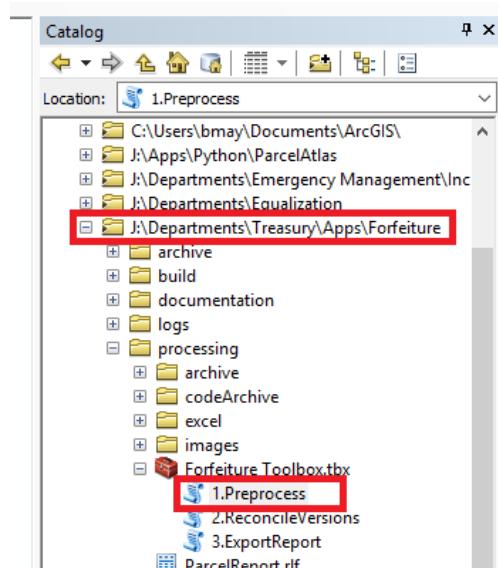


Figure 5.56: Processing Tools

## Synchronize the Forfeiture Field Map

Note the date and time

Sync 

Note the date and time

Map is synchronized 

---

## Field Data Collection

### Data Entry Details

Attributes are of four entry types:

- Prefilled (in preprocessing)
- Autofill
- Dropdown
- Text box

### Mobile Device Summary

For each site visited,

- Select the desired parcel
- Push **Edit**
- Collect attributes or photos

## Device 1 Field Operation

Select a Parcel ➔

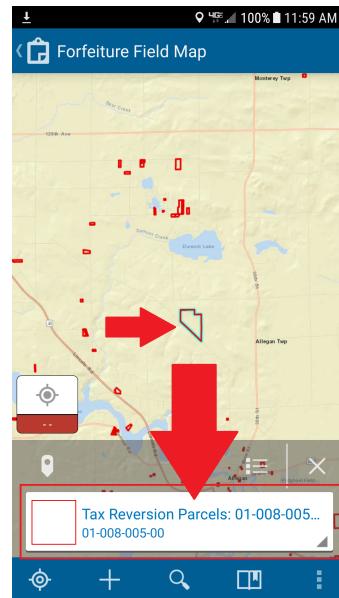


Figure 5.59: Select a Parcel

Edit ➔

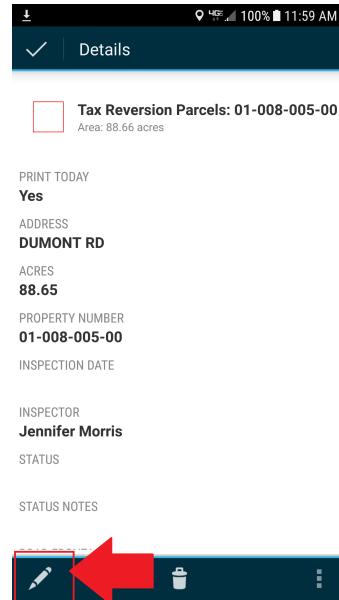
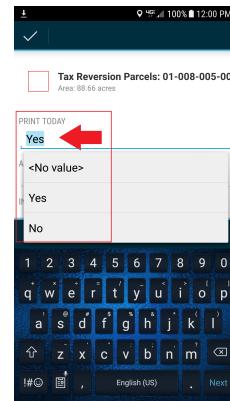


Figure 5.60: Push Edit

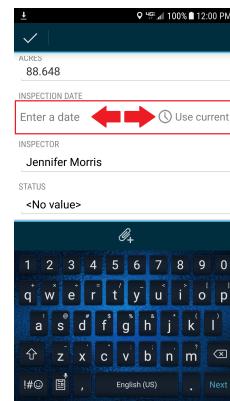
## Device 1 Field Operation

(cont.)

**Print Today** ➔



**Date** ➔



**Inspector** ➔

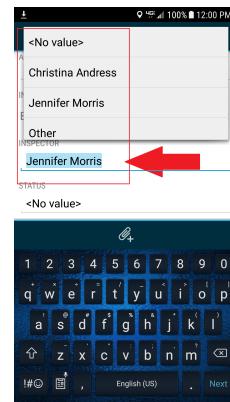


Figure 5.61: Yes or No

Figure 5.62: Enter Date

Figure 5.63: Select Inspector

## Device 1 Field Operation

(cont.)

Status ➔

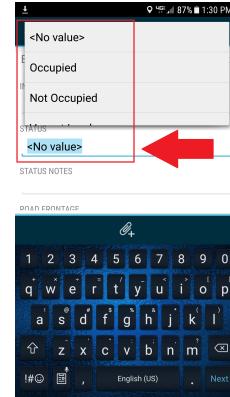


Figure 5.64: Occupied or Not

Status Notes ➔

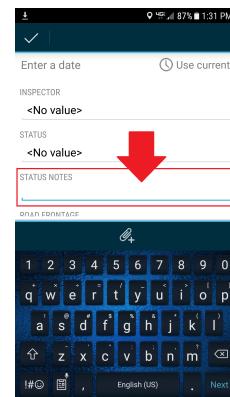


Figure 5.65: Enter Text

Road Frontage ➔

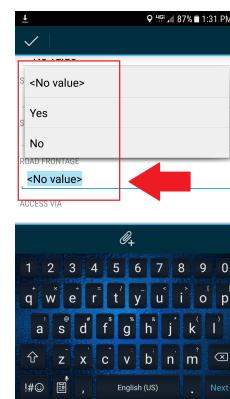
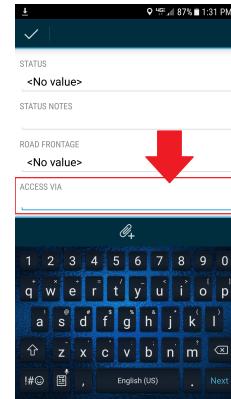


Figure 5.66: Yes or No

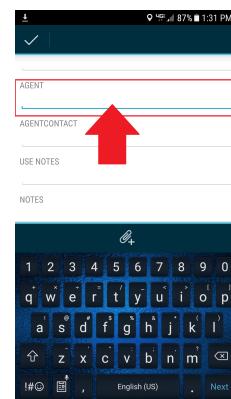
## Device 1 Field Operation

(cont.)

Acces Via ➔



Agent ➔



Agent Contact Info ➔

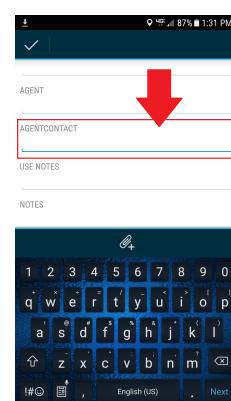


Figure 5.67: Enter Text

Figure 5.68: Enter Text

Figure 5.69: Enter Text

## Device 1 Field Operation

(cont.)

**Property in Use** ↗

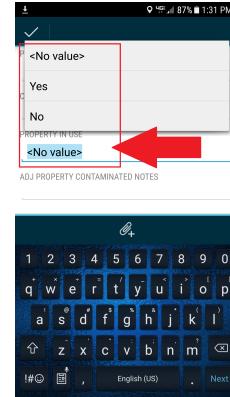


Figure 5.70: Yes or No

**Use Notes** ↗

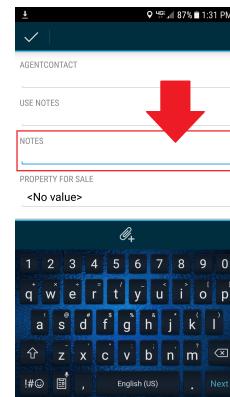


Figure 5.71: Enter Text

**Property Maintained** ↗

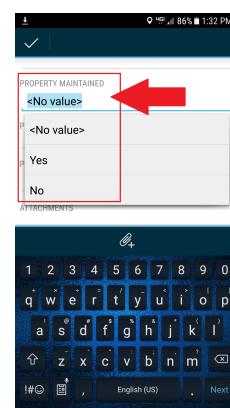


Figure 5.72: Yes or No

## Device 1 Field Operation

(cont.)

Maintenance Notes ➔

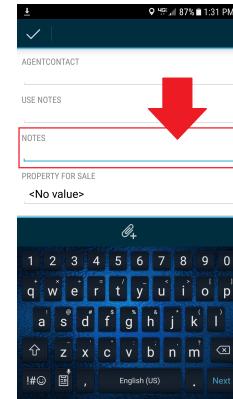


Figure 5.73: Enter Text

Property Contaminated ➔

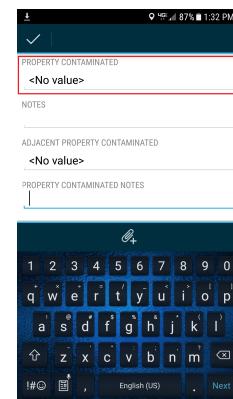


Figure 5.74: Prefilled

Property Contaminated Notes ➔

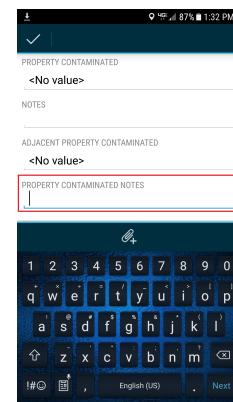


Figure 5.75: Enter Text

## Device 1 Field Operation

(cont.)

**Forfeiture Posted** ➔

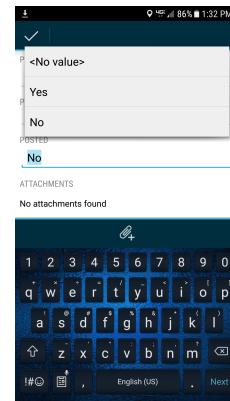


Figure 5.76: Yes or No

**Adjacent Property Contaminated** ➔

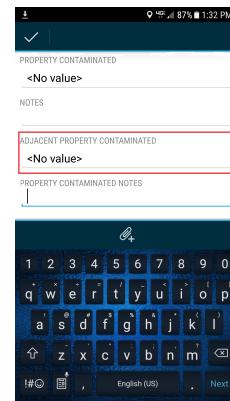


Figure 5.77: Prefilled

**Adjacent Property Contaminated Notes** ➔

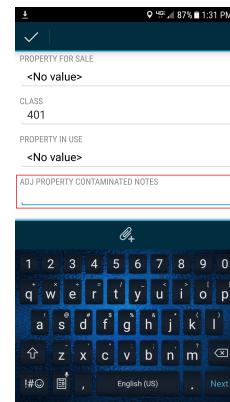


Figure 5.78: Prefilled

## Device 1 Field Operation

(cont.)

Adjacent Property For Sale



Figure 5.79: Yes or No

## Device 2 Field Operation

Select a Parcel 



Figure 5.80: Select Parcel

Attachment 

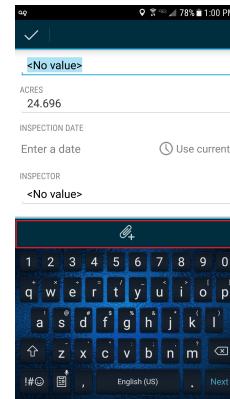


Figure 5.81: Add Attachment

Gallery 

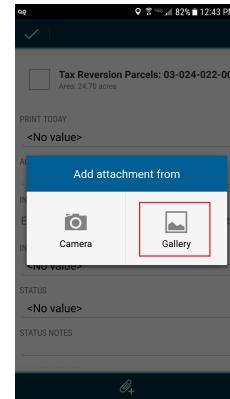


Figure 5.82: From Gallery

## Device 2 Field Operation

(cont.)

**Open Camera Folder** ➔

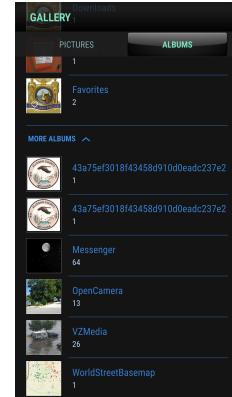


Figure 5.83: Camera Folder

**Select Image** ➔

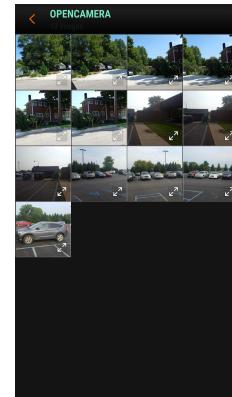


Figure 5.84: Select Image

**Attach Image** ➔

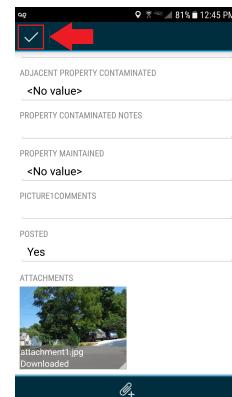


Figure 5.85: Push Check Mark

## DAILY POST PROCESSING ROUTINE

### Synchronize Data

Any devices that were used for field data collection must be synchronized with the network production data.

### Synchronize the Field Collection Devices

So, if two devices were used:

On Device 1:

Sync Attributes 

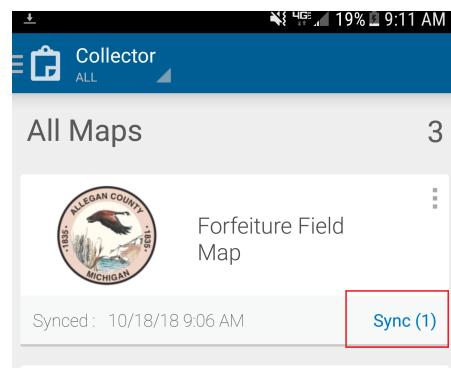


Figure 5.86: Sync

On Device 2:

Sync Photos 

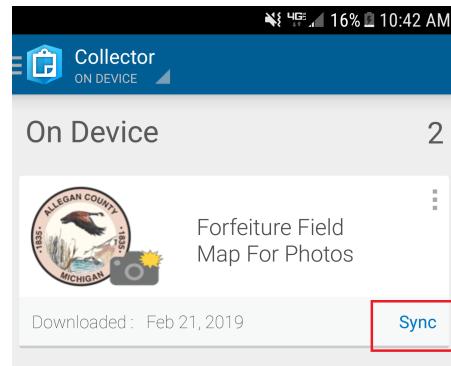


Figure 5.87: Sync Photos

## Reconcile Versions and Print Report

Each device that is synchronized corresponds to a version within the geodatabase.

The versions must be reconciled with the tool:



Reconcile Versions tool

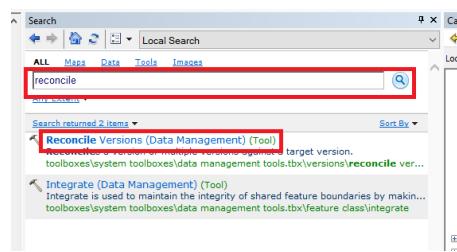


Figure 5.88: Search for Reconcile tool

Setup tool like

## Reconcile Tool Setup

The tool uses these settings” ➔

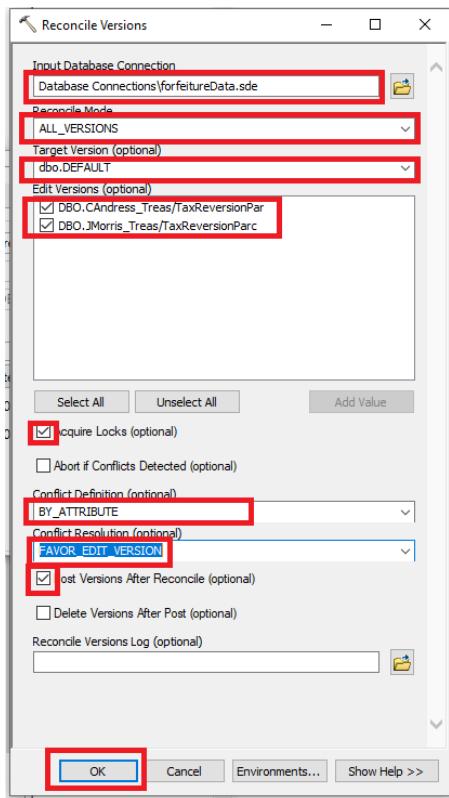


Figure 5.89: Reconcile Settings

## Reconcile Versions and Print Report (cont.)

Inspection reports are generated by running the tool:

### 3. Export Report

## Print Reports

3. Export Report →

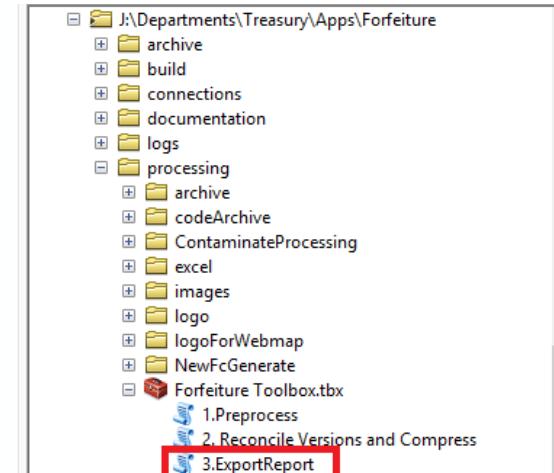


Figure 5.90: Double Click

## S O F T W A R E

### ESRI Licensed Products

#### ArcDesktop

(Users need a license to ArcGIS Standard level)

#### Enterprise ArcGIS Deployment

(This app uses ArcGIS Server and ArcGIS Portal)

#### Collector for ArcGIS

ArcGIS Collector is available at the Google Play Store.

(Developed and tested on Android(7.0))

### Other Software

#### Open Camera for Android

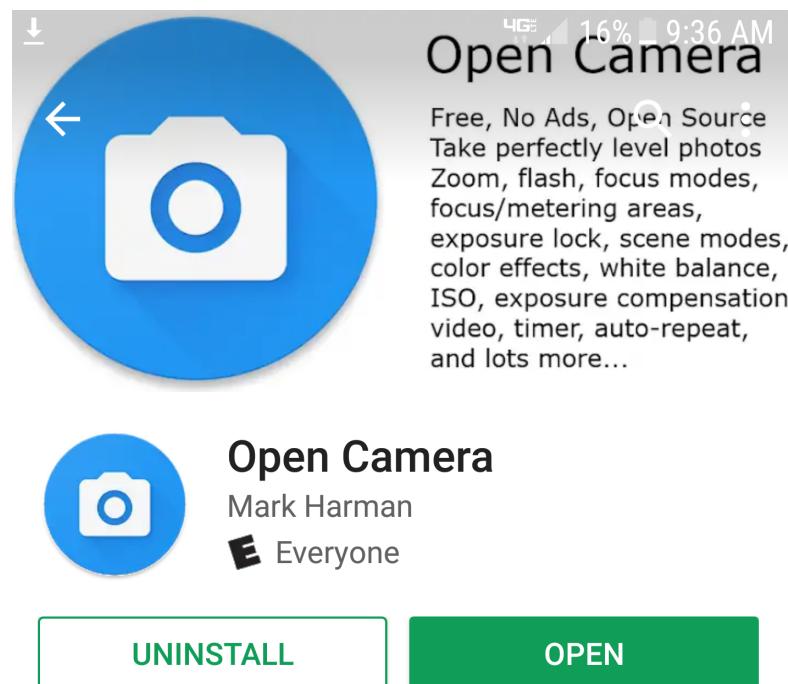


Figure 5.91: Open Camera from Google Play Store

## 5 . 2 F O R E Q U A L I Z A T I O N D E P A R T M E N T

### 5 . 2 . 1 T A X M A P P R O D U C T I O N

#### P R O B L E M A N D A N A L Y S I S

##### Background

Equalization department (EQ) has an annual responsibility to produce a printed version of maps that show all of the tax parcels in the county for every tax year. The GIS Services Department(GIS) has traditionally provided this as a service to Equalization.

##### Analysis

**Tax Map Production Workflow** will facilitate: Creation of new tax maps for each new tax year.

##### People Involved in the Workflow

- GIS Analyst
- EQ Mapper

##### Statement of Problem

Annually, after March Board of Review, a tool is needed to create updated parcel maps for printing by Equalization and the local units.

##### Stages of the Workflow

- Data Updates
- Map Production Testing
- Map Style Refinement
- Map Production

# Tax Map Production Summary

The Four Stages of the workflow:

## 1. Data Updates Tax Roll Rollover:

- Update ACParcelsPublishing FDS from ACParcelsEditing FDS
- Prepare ACParcelsEditing FDS for the next year of use
- Add or delete quarter section index frames

## 2. Map Production Testing:

- Execute Tax Map Builder ArcPy Script on test units
- QA QC to verify updates

## 3. Map Refinement

- Symbols
- Labels
- Layer Order

## 4. Map Production:

- Execute Tax Map Builder ArcPy Script on all units
  - QA QC results
-

## Technologies Used in The Tax Map Workflow

### ArcGIS Enterprise

SQL Server Source Data:

- ACPo.SDE

### ArcGIS Desktop

ArcPy tools produce map pages using Data Driven Pages (DDP) functionality

### Production Data

- ACCadastral.gdb (File GDB Created From ACPo.SDE)

### Python

A Python interpreter to tune the TaxMap-Tool.py script

### Adobe Acrobat

Combine pdf pages into books by unit

## DATA UPDATE PROCEDURE

### Updates to AC\_Pro.sde

Datasets involved:

- ParcelEditing
- ParcelPublishing
- TaxMapIndexFrames
- TaxMapLayers
- TaxMapUnitBounds

### Update Procedure

#### Parcel Editing and Parcel Publishing

Annually, the ParcelEditing feature dataset (FDS) is used to update the ParcelPublishing FDS. For each FC in ParcelPublishing:

- Delete all features
- Load all features from corresponding FCs

Data Update Relation	
FC in ParcelEditing	FC in ParcelPublishing
AC_COGO_LnEdits	AC_COGO_Ln
AC_DimensionsEdits	AC_Dimensions
AC_PointsEdits	AC_Points
AC_Splits	AC_Parcels
AC_SubBlocksEdits	AC_SubBlocks
AC_SubdivisionsEdits	AC_Subdivisions
AC_SublotsEdits	AC_Sublots
AC_TiebarsEdits	AC_Tiebars

## TaxMapIndexFrames

As this is the index layer for the DDP, Quarter Quarter Section frames must be added or removed to account for added or removed subdivision features.

## TaxMapLayers

Layers that are derived from other fcs for cartography purposes

- AC\_M\_Rd\_Lbl is a subset of AC\_Roads used only for less busy labeling
- AC\_MapID\_RR is a subset of AC\_Parcels used only for Railroad Labeling
- AC\_Road\_ROWS\_Tax is an aggregation of AC\_Road\_ROWS by unit

## TaxMapUnitBounds

Layers extracted from AC\_Units for bounding polygons in the locator Data Frame

## Workspace Folder Setup

Inside of J: Apps Python TaxMaps:

Copy the folder: **TaxMapsWorkspaceTemplate**

Into the years folder and rename to: **YYYY**

## Production Data Creation

In the source folder, create a new file GDB named AC\_Cadastral. Import the following FDSs from AC\_Pro.sde:

- AdministrativeArea
- CadastralReference
- Hydrology
- ParcelPublishing
- Roads
- TaxMapIndexFrames
- TaxMapLayers
- TaxMapUnitBounds

## Map Production Setup

In the new workspace folder:

### ArcGIS Desktop

Use ArcMap Catalog to navigate to:

workspace folder  $\Rightarrow$  processing  $\Rightarrow$  Toolbox  $\Rightarrow$  TaxMapTools.tbx

Double click on the **TaxMapBuilder** script

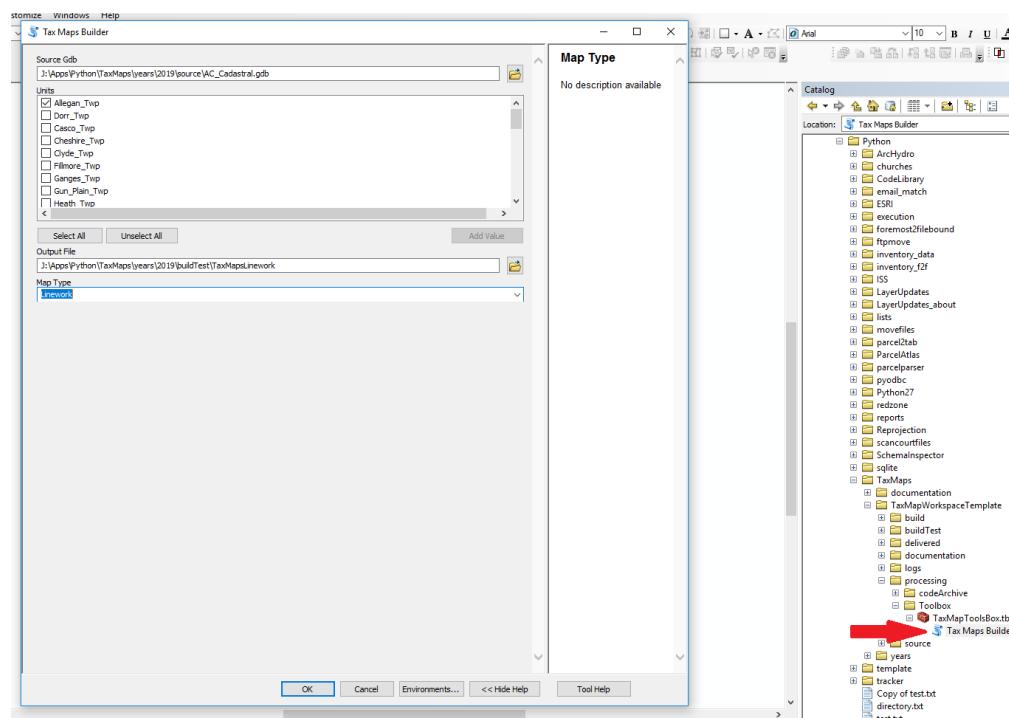


Figure 5.92: Tax Map Builder UI

To execute the tool:

Make selections in the tool from the appropriate locations in the workspace folder.

## Map Refinement

Test groups of maps should be produced.

Any style improvements that can be made should be done at this time.

## Map Production

Use ArcMap Catalog to navigate to:

workspace folder → processing → Toolbox → TaxMapTools.tbx

Double click on the **TaxMapBuilder** script

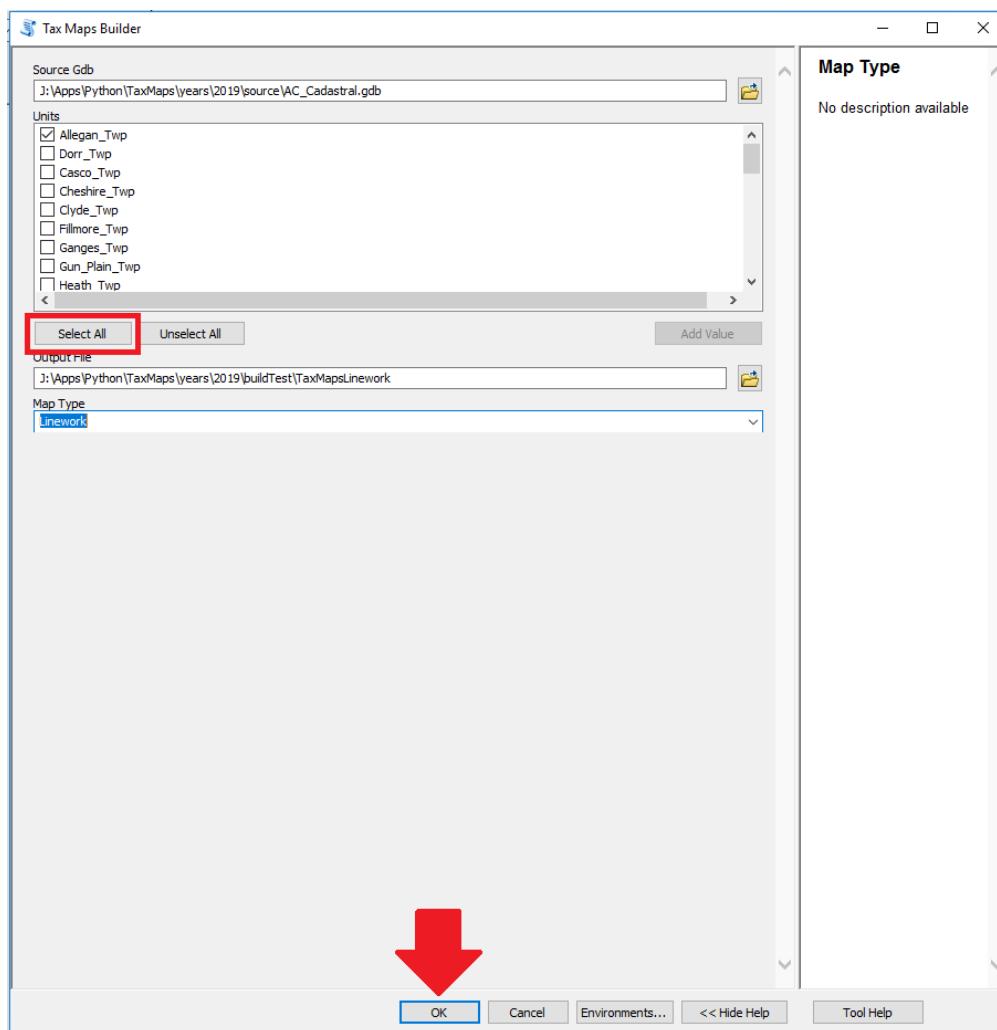


Figure 5.93: Tax Map Builder UI

Select All Units and Press OK

## Create Books from Pages

For each unit, organize the pages into the TaxMapUnitFolders.

Move the pages to the appropriate pdf folders inside the delivered folder of the workspace.

Combine all of the individual map pages into books using Adobe Acrobat and save to the PDF\_Book folder.

## Share the map books with Equalization

Copy the entire TaxMapUnitsFolder to:

J:  Departments  Equalization  TaxMaps  TaxMap Archive

# — 6 — *Tools*

## 6.1 BSA SUPPORT

### 6.1.1 ADDING A LAYER TO THE BSA GIS

#### TOOL SUMMARY

##### Background

B S And A features a GIS toolset that requires data layers to be added to map documents for visualization.

B S AND A is used within Equalization and by local assessors throughout the county.

##### Why the Tool is Needed

B S And A Users often ask ACGIS for data and assistance in using the data.

##### Who the Tool is For

User knowledge of B S And A.

B S And A installed.

GIS data source files on the local machine.

##### Takeaway

With the necessary data files, any B S And A user can add layers to a map within B S And A GIS

## ADD AN IMAGERY LAYER

### Step 1: Edit GIS Settings

In **Program Setup** ⇒ Select **GIS Settings...**

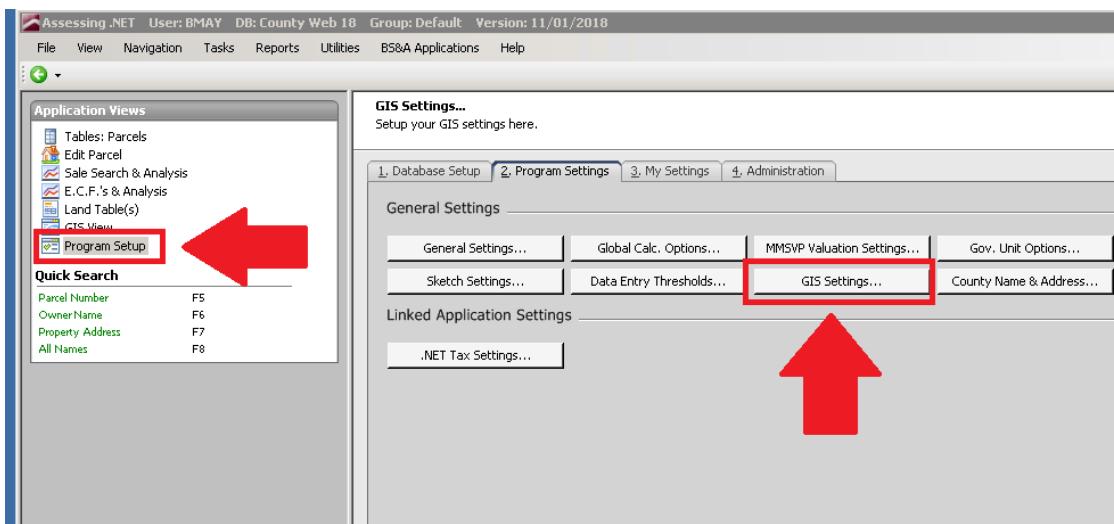


Figure 6.1: BSA Program Setup

## Step 2: Select Map To Edit

In **GIS Settings** ⇒ **Map Collections** ⇒

Double click on the map that you want to add a layer to

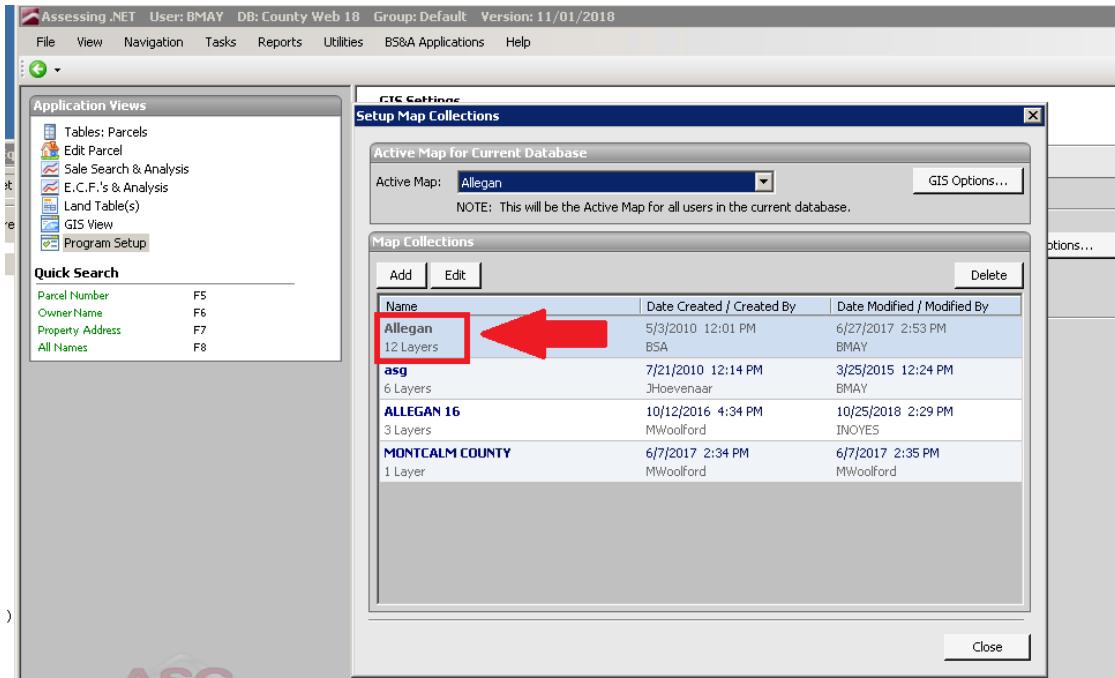


Figure 6.2: GIS Setup

## Step 3: Add Layer

Setup Layers ⇒ **Add**

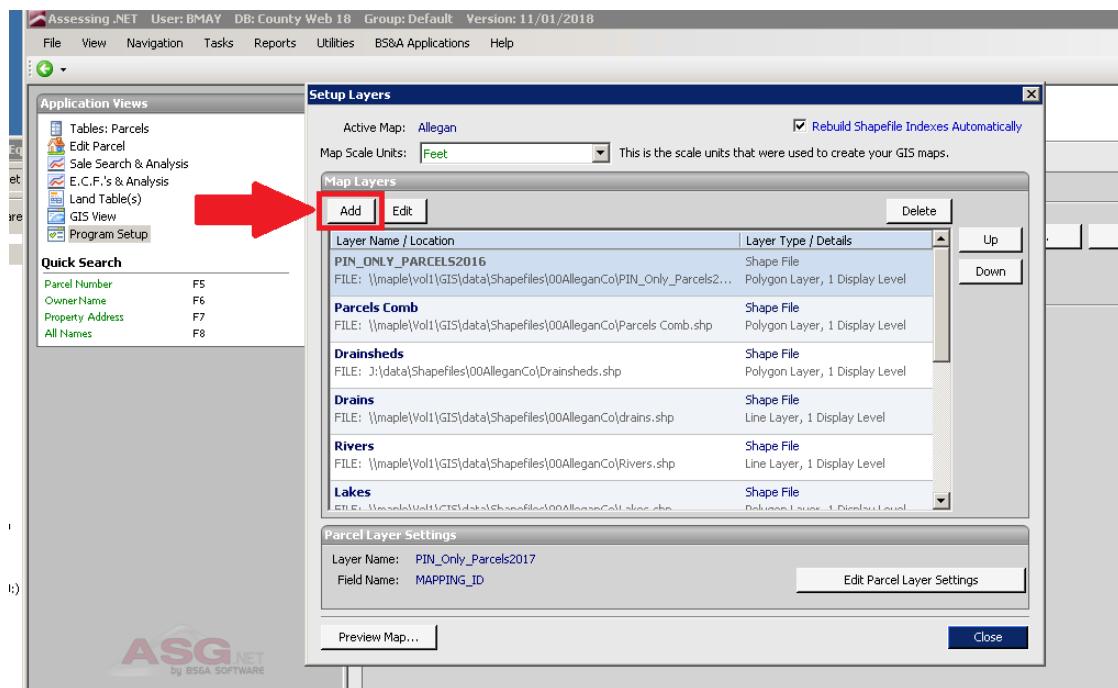


Figure 6.3: Layers Setup

## Step 4: Select Layer Type

Setup Layers → **Image** → **OK**

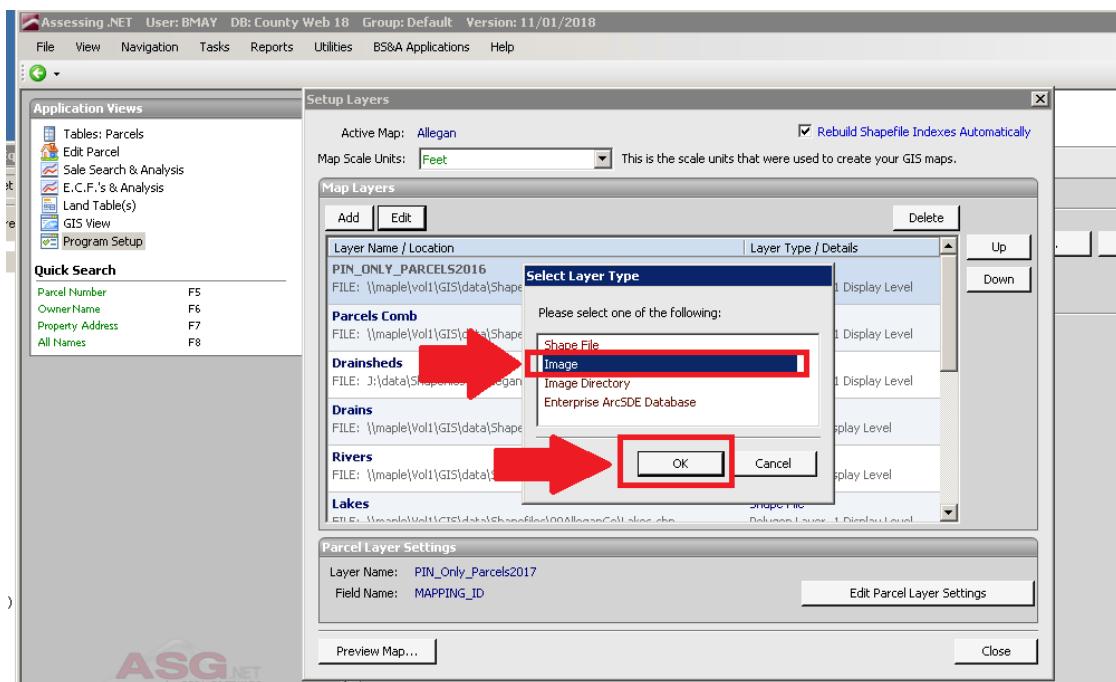


Figure 6.4: Select Layer Type

## Step 5: Add Layer From Local Drive

Navigate to Image File ⇒ **Open**

\*image files are often file type .sid

\*layer files are often file type .shp

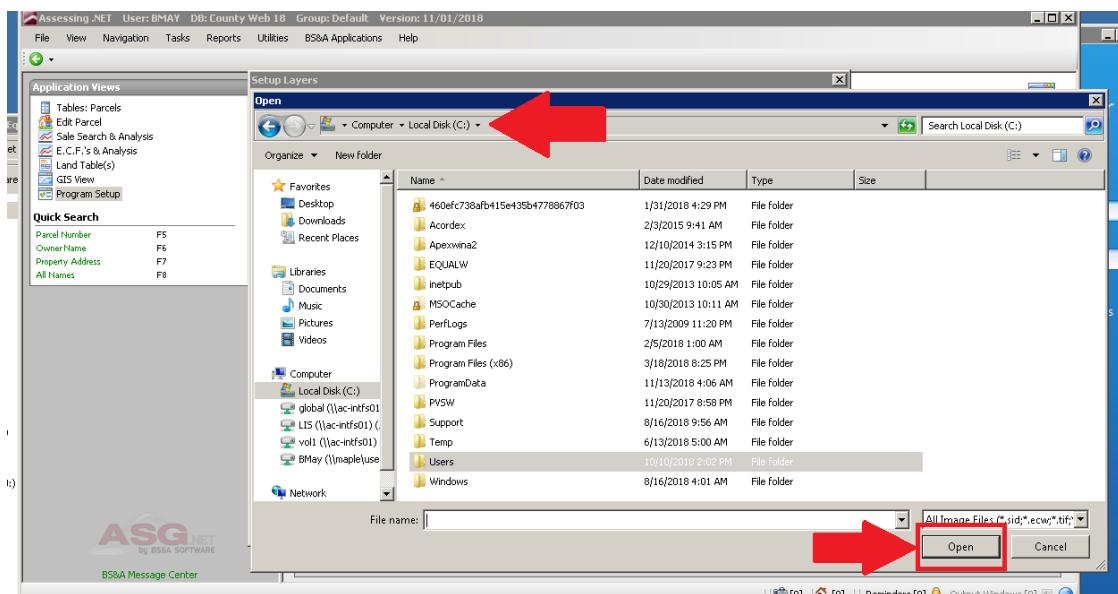


Figure 6.5: Add Layer From Drive

The new image should now be in the map

## 6.2 CORE DATA

### 6.2.1 GIS DATA MAINTENANCE

#### TOOL SUMMARY

## Background

Allegan County GIS Services works with various stakeholders to maintain authoritative data. Often mapping requests involve data maintenance and sometime require data schema alterations.

## Why is the Tool Needed

Though the variety of GIS data input and maps output required of the different stakeholders varies and is extensive, general workflow details can be synchronized. It is important that this workflow be platform in-

dependent and therefore may be described in somewhat general terms.

## Who is the Tool For

Allegan County GIS Services staff.

## Takeaways

This general workflow can be used to maintain authoritative data and fulfill mapping requests efficiently. This documentation will assist in evaluating and executing mapping requests that involve any core data edits.

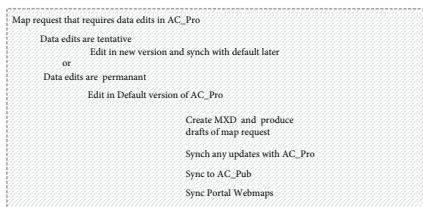


Figure 6.6: Workflow Summary

## O V E R V I E W

### Inputs

- Map request requiring edits in ACPro

### Outputs

- Maps
- Updates to ACPro
- Updates to ACPub
- Updates to Portal Maps

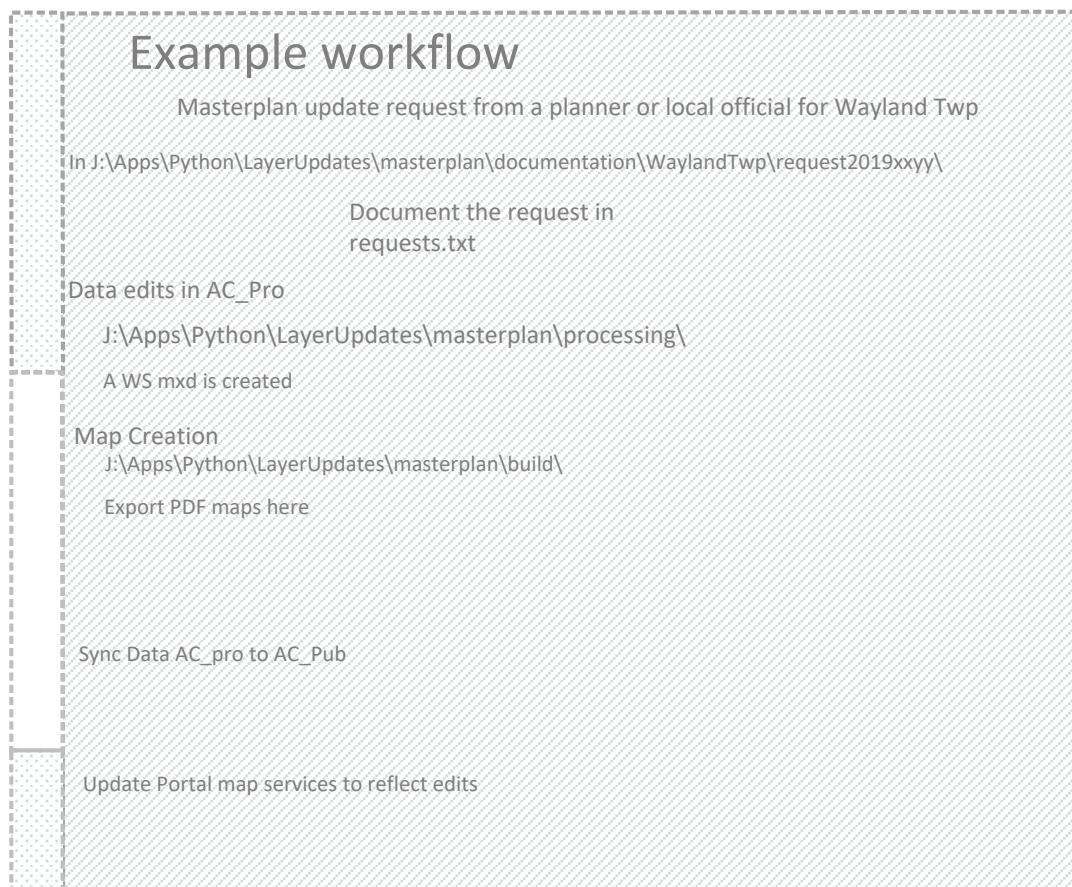


Figure 6.7: Workflow Overview

⇒ Push the Configure Button

#### 6.2.2 CONTROL POINTS

### M A I N T A I N I N G C A D A S T R A L C O N T R O L P O I N T S

## Install the Fabric Point Move to Feature Addin

⇒ Push the Configure Button

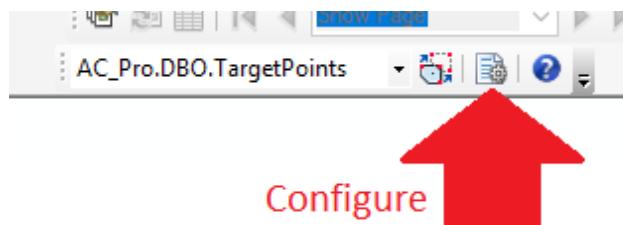


Figure 6.8: Fabric Point Move to Feature Addin

## Configure Addin

- Set Reference Feature Layer to TargetPoints
- Use point to point matching
- Use point layer field: PointID

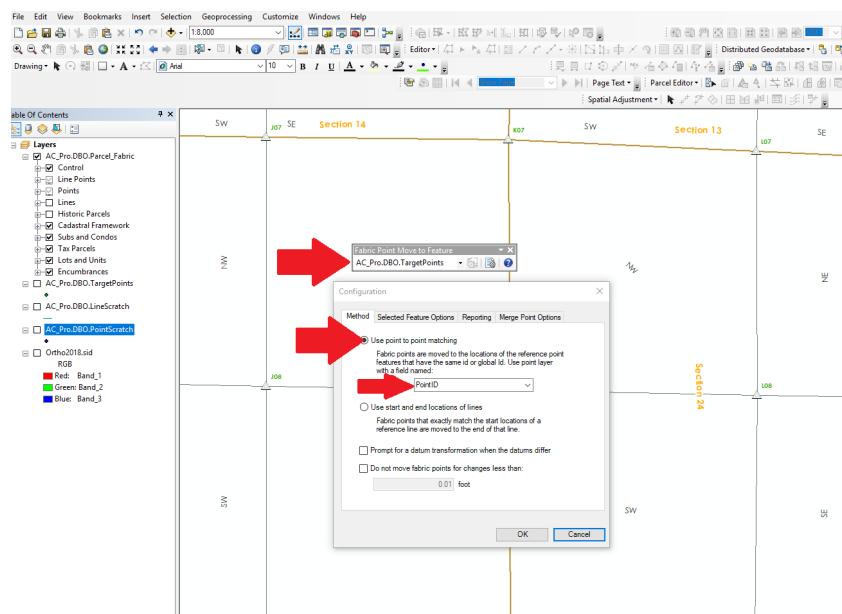


Figure 6.9: Addin Configuration Method

2

Configure Fabric Point Move to Feature addin Selected Feature Options

Move Fabric Points of the Selected Parcels

Push OK

FabricPointMoveToFeatureConfigSelectedFeatures.png

3

Identify position of new control point

Select TargetPoints in Create Features Templates

Create Target Point at location for new Control Point

createTargetPoint.png

4

Use Identify tool to find ObjectId of Control Point that is to be moved

Select the Target point PointID of the point its moving to

Edit Target Point pointID attribute to match associated fabric control point OID

updateTargetPointPointID.png

4.5

Push move point button

moveControlPoint.png

5

Open maintain control point tool

Select control Point

push edit button

maintainControlPointTool.png

6

Use Identify Tool to View X and Y vals for the point

copy x and y value from point(attribute window) to Control (maintain control tool)

push update

Save Edits

transferCoordinates.png

---

Identify position of new control point

Place Target Point

Update Target Point attributes to associated fabric point OID

Push move point button

Zoom to Control point

Open maintain control point tool

Select control Point

Edit button

Copy x and y value from

Identify tool x and y of points

Update button

## 6 . 3 C O R E D A T A S C H E M A

### P R O B L E M A N D A N A L Y S I S

#### Background

Allegan County GIS Services builds and maintains the geographic dataset used in workflows in and out of county government.

#### Statement of Problem

Geographic data must be both maintained and shared. Data is maintained

by Equalization and GIS Services. Data is shared with EH, EQ, Dispatch and the public.

#### Analysis

Here is where analysis of this problem goes

## DESIGN

## Overview

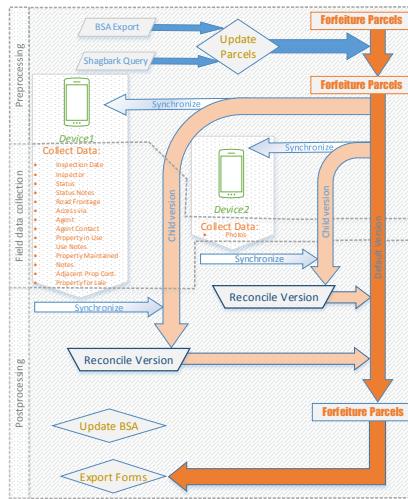


Figure 6.10: Project Design

### 6.3.1 PRODUCTION DATA AC PRO

#### DOMAINS

## Directory Location

Managed at this location:

File Explorer			
		Organize	New
This PC > LIS (\ac-intfs01 (J:) > Apps > Python > LayerUpdates > AC_ProDevelopment > domains			
Name	Date modified	Type	
domainTables	1/22/2019 11:48 AM	File folder	
DomainMaintenance.txt	1/22/2019 10:14 AM	Text Document	
MasterStreetNamesDev.xlsx	1/16/2018 4:57 PM	Microsoft Excel	
ProDomainsDev.xlsx	1/22/2019 11:23 AM	Microsoft Excel	
README.txt	12/18/2017 8:37 AM	Text Document	
roadTYPE.txt	12/29/2017 1:27 PM	Text Document	

Figure 6.11: Directory Location of Workspace

## Domain Documentation

This is where...

⇒ Push the Configure Button

## 6.4 ESRI TOOLS

### 6.4.1 COGO TOOLS IN ARCGIS

TEXT

---

## 6.5 GIS ADMINISTRATION

### Register a server with ArcGIS Server

#### Site Settings in Server Manager

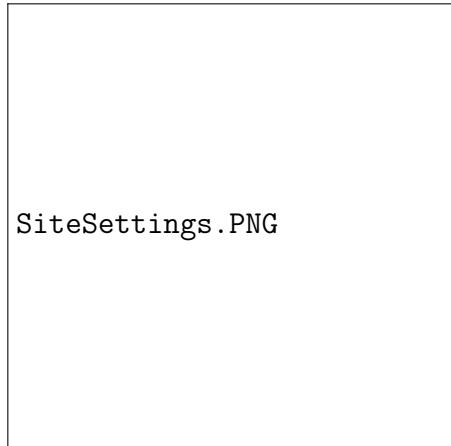


Figure 6.12: Site Settings

## Add Fieldwork to Registered Databases

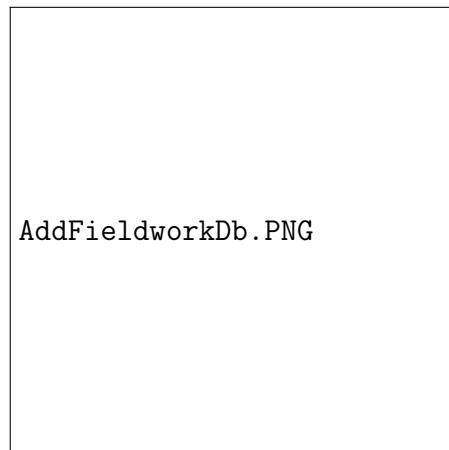


Figure 6.13: Add Fieldwork Database

## Register Database



Figure 6.14: Details of Registered Database

## 6.5.1 CONNECTING TO ARCGIS SERVER ADMIN DIRECTORY

### GENERATE A PORTAL TOKEN

#### Run the Python Script

```
import urllib, urllib2, json, ssl

username ="bmayxxx"
password = "gisRxxxxxxxxx"

tokenURL = 'https://gis.allegancounty.org/portal_webadaptor/sharing/#'
           'rest/generateToken/'

params = {'f': 'json', 'username': username, 'password': password, 'referer': '#'
          'https://portal.allegancounty.org'}
req = urllib2.Request(tokenURL, urllib.urlencode(params))
try:
    response = urllib2.urlopen(req)
except:
    gcontext = ssl.SSLContext(ssl.PROTOCOL_TLSv1)
    response = urllib2.urlopen(req, context=gcontext)
data = json.load(response)
token = data['token']
print(token)
```

[Copy the Portal Token](#)

---

## A R C G I S S E R V E R A D M I N L O G I N

### Login to Juniper

Windows R ➔ mstsc ➔ Juniper

### Connect to ArcGIS Server localhost

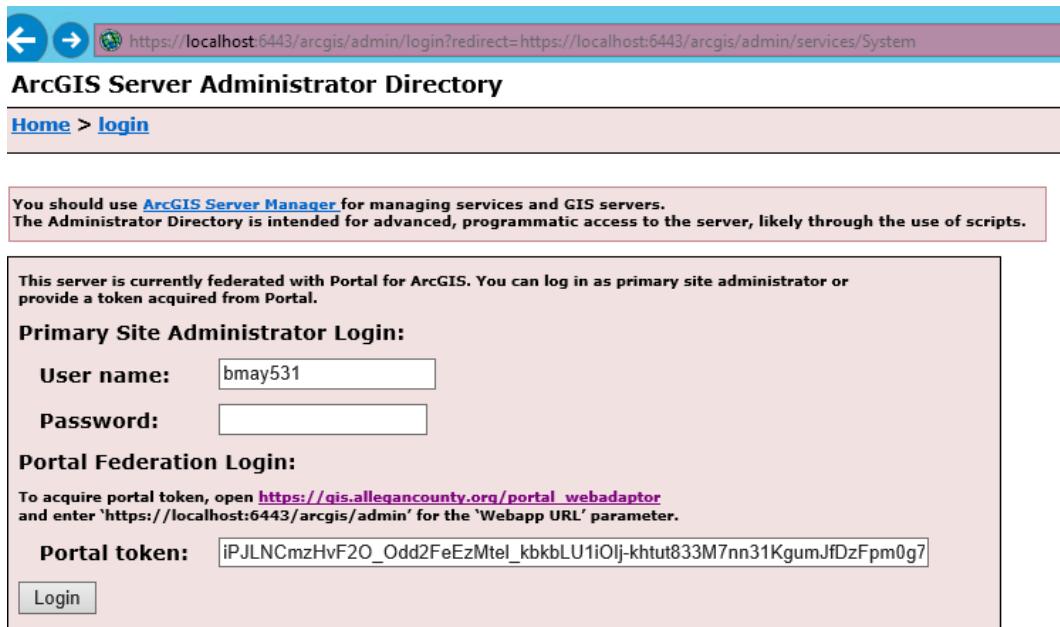
In a browser go to:

<https://localhost:6443/arcgis/admin/services/System>

UN: bmaxxxx

PW: gisRxxxxxxxxx

Paste in the Portal Token



Invalid credentials.

Figure 6.15: Login to Server Admin Directory

Push **Login**

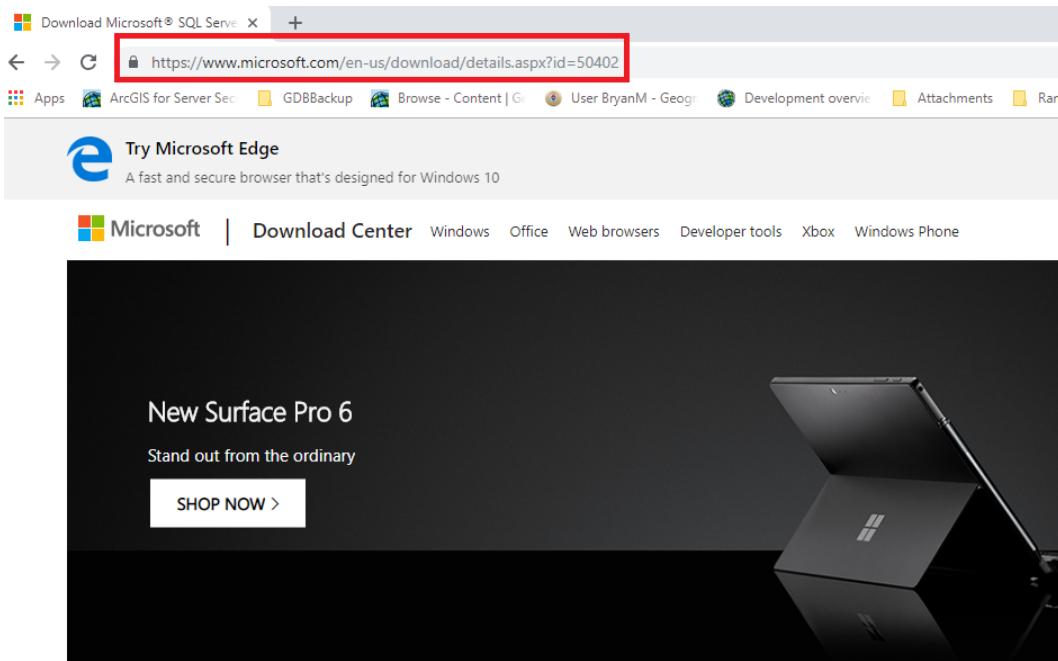
## 6.5.2 NEW CONNECTIONS IN ARCCATALOG

### INSTALL SQL SERVER ON CLIENT MACHINE

On client machine:

For any machine to connect to the Enterprise Geodatabase, SQL Server Native Client must be installed locally.

Search for sql server native client download on the internet



Microsoft® SQL Server® 2012 Native Client - QFE

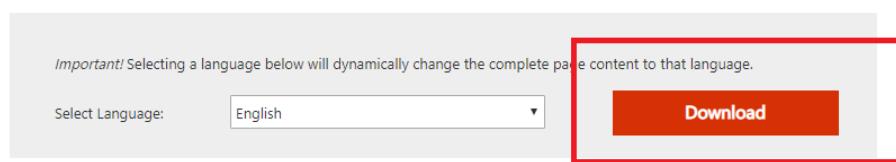
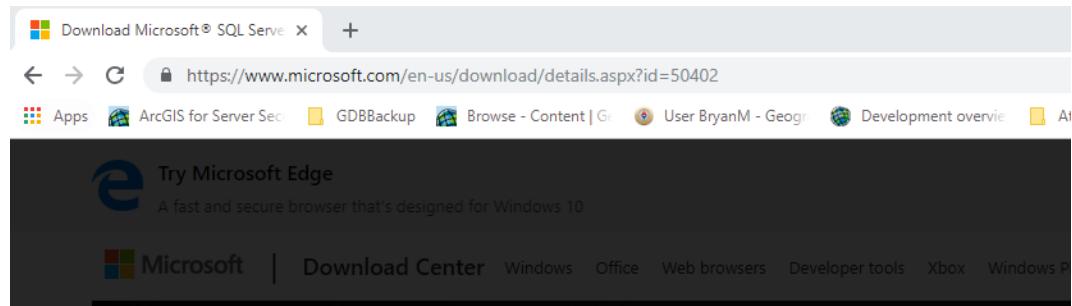


Figure 6.16: SQL Server Client Search

## Select appropriate Version

Decide whether to get the 32bit or 64bit version



Choose the download you want

File Name		Size
ENU\x64\sqlIncli.msi	For 64bit OS	4.8 MB
ENU\x86\sqlIncli.msi	For 32 bit OS	3.0 MB

Figure 6.17: SQL Server Client Search Choose

Download and Install

## CONNECT ARCGIS TO A SQL SERVER DATABASE

### In Catalog:

Double click on add database connection

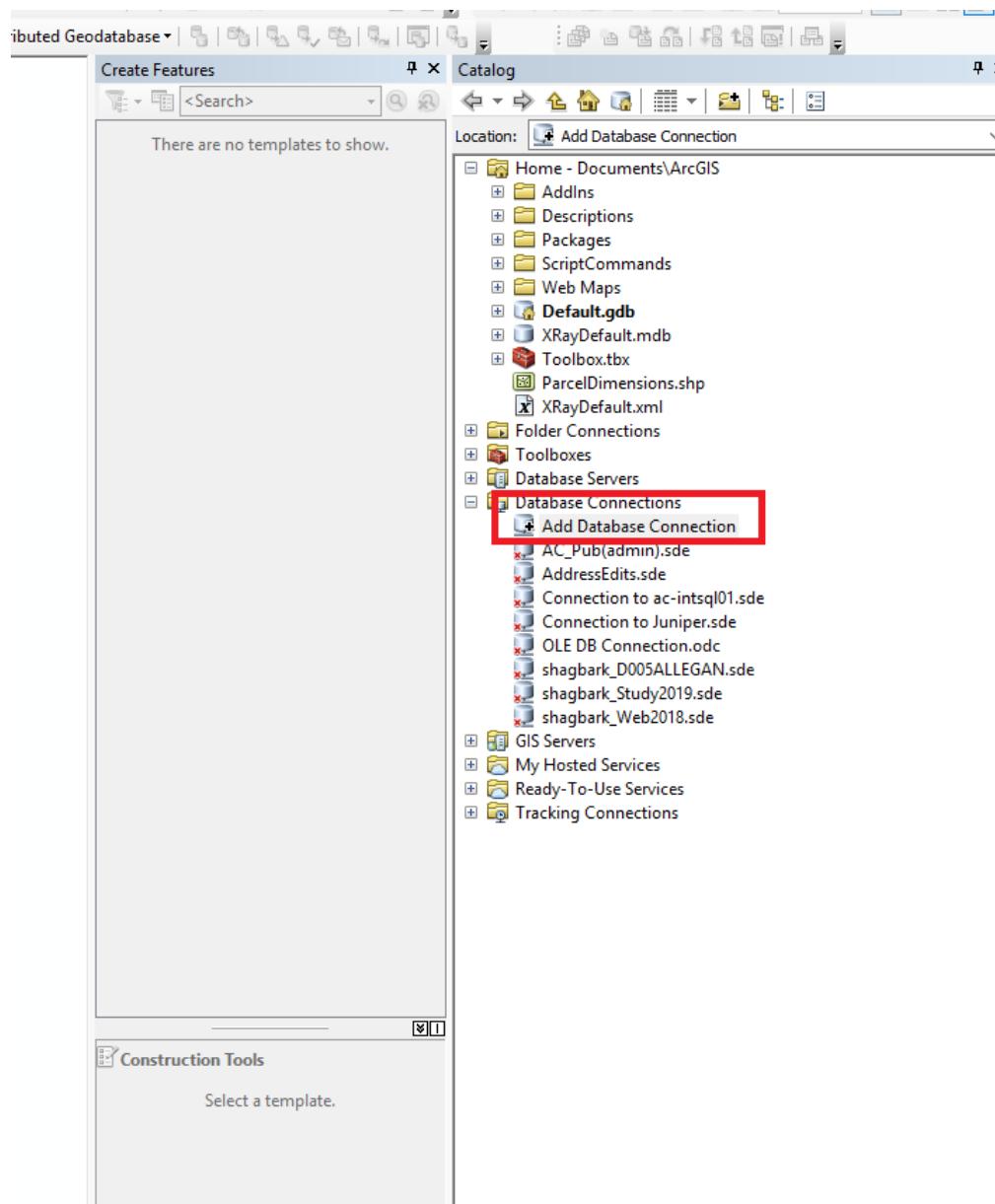


Figure 6.18: Catalog Add Db Connection

---

## NEW CONNECTION DIALOG

## Enter into the tool

- Select Database Platform
- Enter Instance Name
- Enter user name and password
- Check Save user name and password
- Select Database in dropdown

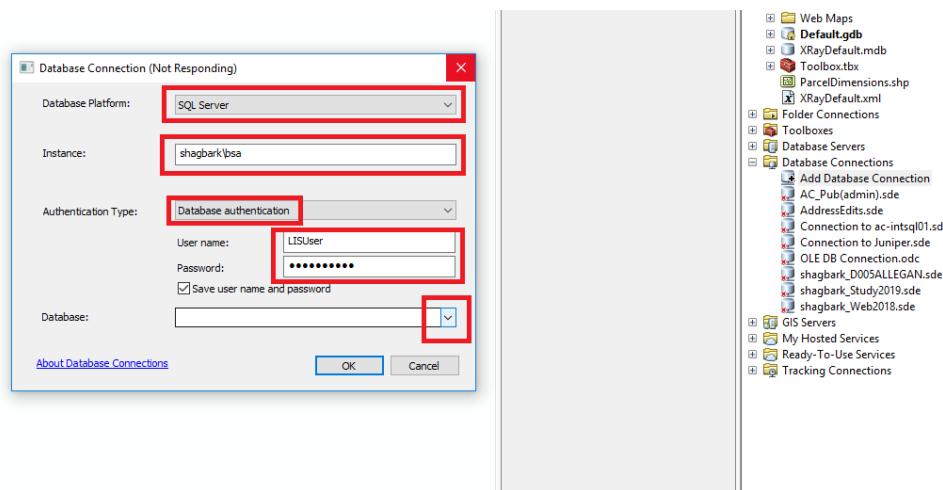


Figure 6.19: Catalog Add Database Connection

### 6.5.3 CREATE QUERY TO SQL DATABASE IN ARCGIS

#### ADD QUERY LAYER

In ArcMap:

Open the New Query Layer Dialog

Go to  $\Rightarrow$  File  $\Rightarrow$  Add Data  $\Rightarrow$  Add Query Layer In the connection dropdown select your connection

NOTE

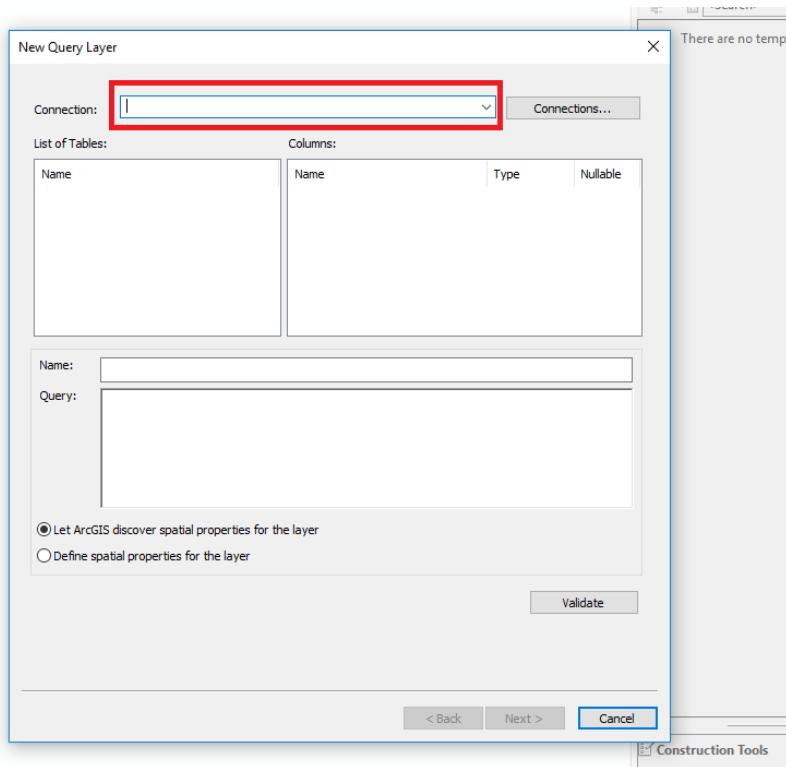


Figure 6.20: New Query Layer Dialog

## DETAILS OF THE QUERY LAYER

### Enter into the tool

- Choose connection
- Name the query
- Enter SQL query
- Press Next

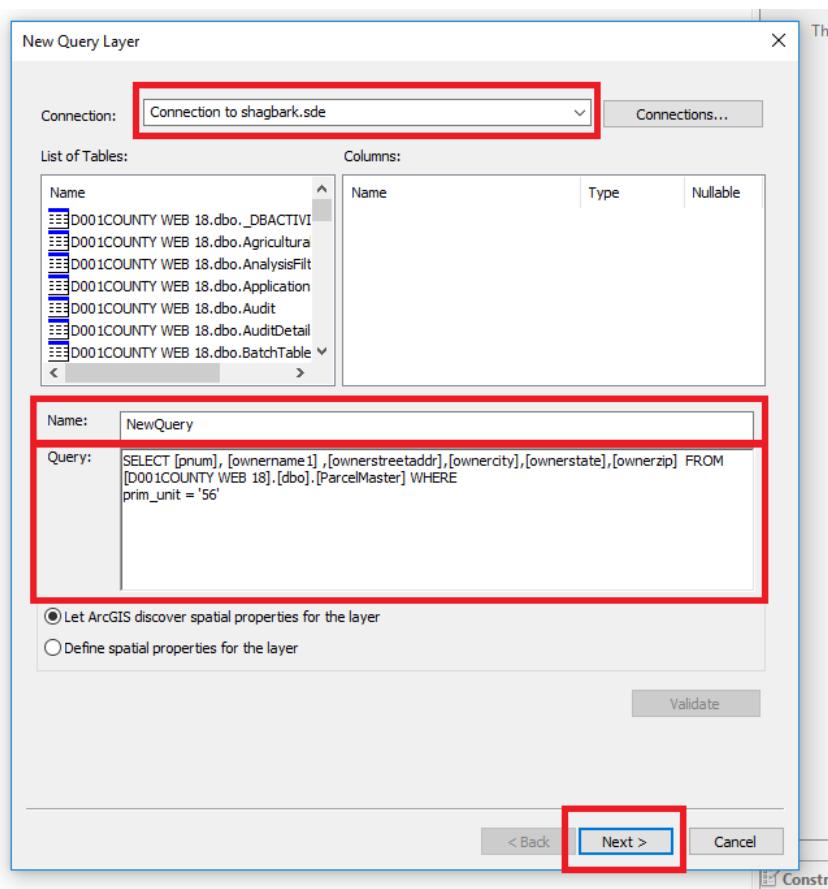


Figure 6.21: Query Layer Dialog Filled

## M O R E D E T A I L S O F T H E Q U E R Y L A Y E R

### Enter into the tool

- Select unique identifier field
- Click Finish

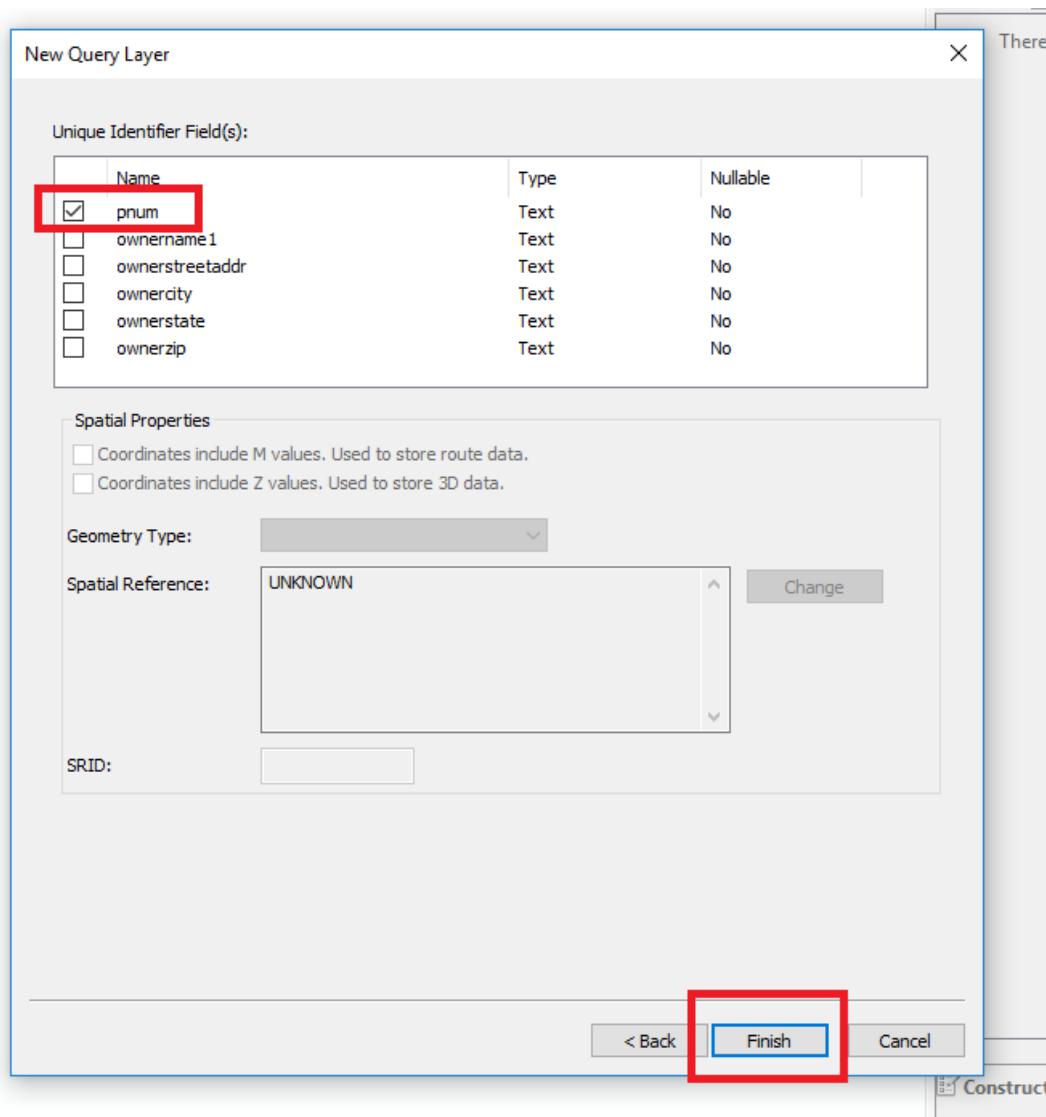


Figure 6.22: Select Unique Identifier

## OPEN RESULTS TABLE

### Verify the Query by Looking at the Table

The screenshot shows the ArcGIS Pro interface with a 'Table Of Contents' pane on the left and a 'Table' view on the right. The 'Layers' section in the TOC has a red box around it, highlighting the 'D001COUNTY WEB 18' folder which contains 'D001COUNTY WEB 18.DBO.NewQuery'. The 'Table' view displays a query results table with the following columns:

pnum	ownername1	ownerstreetaddr	ownercity	ownerstate	ownerzip	ESRI_OID
56-004-001-00	WAGNER LONNIE J & EMMA	792 135TH AVE	WAYLAND	MI	49348	1
56-004-001-10	GUN LAKE COMMUNITY CHURCH	12200 WEST M-179	WAYLAND	MI	49348	2
56-004-002-20	WAYLAND UNION SCHOOLS	850 E SUPERIOR ST	WAYLAND	MI	49348	3
56-004-003-00	CITY OF WAYLAND	103 S MAIN ST	WAYLAND	MI	49348	4
56-005-001-00	CITY OF WAYLAND	103 S MAIN ST	WAYLAND	MI	49348	5
56-005-002-00	MAAS WAYLAND LLC	1845 BIRMINGHAM DR	LOWELL	MI	49331	6
56-005-002-10	ELLIOTT BAY HEALTHCARE REALTY II	6171 EASTLAKE AVE E	SEATTLE	WA	98109	7
56-005-002-20	CITY OF WAYLAND	103 S MAIN ST	WAYLAND	MI	49348	8
56-005-002-30	RIPARIAN PROPERTIES LLC	879 E SUPERIOR ST	WAYLAND	MI	49348	9
56-005-002-40	RIPARIAN PROPERTIES LLC	879 E SUPERIOR ST STE A	WAYLAND	MI	49348	10
56-005-002-50	VS VENTURES WAYLAND LLC	235 140TH AVE	WAYLAND	MI	49348	11
56-005-002-60	CITY OF WAYLAND	103 S MAIN ST	WAYLAND	MI	49348	12
56-005-004-00	ATHROP WOODORE W & JUDITH	845 E SUPERIOR ST	WAYLAND	MI	49348	13
56-005-005-00	SCHAFER SUSANNE M	841 E SUPERIOR ST	WAYLAND	MI	49348	14
56-005-006-00	STORA RODERICK M & MELISSA K	841 E SUPERIOR ST	WAYLAND	MI	49348	15
56-005-006-10	ARY DOUGLAS & JULE	104 MARLO LN	WAYLAND	MI	49348	16
56-005-006-20	DUBAY DOUGLAS	102 MARLO LN	WAYLAND	MI	49348	17
56-005-007-00	CONNOR MOLLY	815 EAST SUPERIOR	WAYLAND	MI	49348	18
56-005-007-10	BENNETT JILL & CARROB BIANCE	2514 BRIDGEPORT LN	GRAND RAPIDS	MI	49508	19
56-005-007-20	VILLELLA MATTHEW	101 MARLO LN	WAYLAND	MI	49348	20
56-005-007-21	JENSEN KRISTEN S	103 MARLO LN	WAYLAND	MI	49348	21
56-005-008-00	WAYLAND CHRISTIAN REF CHURCH	303 E ELM STREET	WAYLAND	MI	49348	22
56-005-009-00	CITY OF WAYLAND	103 S MAIN ST	WAYLAND	MI	49348	23
56-005-010-00	FINANCING VI HEALTHCARE PROPERTY/LLC	8181 WORTHINGTON ROAD	WESTERVILLE	OH	43082	24
56-005-011-00	CITY OF WAYLAND	103 S MAIN ST	WAYLAND	MI	49348	25
56-005-011-20	FERGUSON ROBERT K	5770 VENTURE PARK	KALAMAZOO	MI	49009	26
56-005-012-00	REDSTONE LAND DEVELOPMENT LLC	3330 GRAND RIDGE DR NE	GRAND RAPIDS	MI	49525	27
56-005-012-10	VANDEROVORD JOHN C & NANCY L	542 FORREST ST	WAYLAND	MI	49348	28
56-005-013-00	L AND M LLC	2645 24TH AVE	HUDSONVILLE	MI	49426	29
56-005-013-10	JESTER LLC	137 124TH AVE	SHELBYVILLE	MI	49344	30
56-005-014-00	OPPERMAN JOHN C	125 OAK ST	WAYLAND	MI	49348	31
56-005-015-00	REDSTONE LAND DEVELOPMENT LLC	3330 GRAND RIDGE DR NE	GRAND RAPIDS	MI	49525	32
56-005-016-00	WALKER MICHAEL	131 OAK ST	WAYLAND	MI	49348	33
56-005-017-00	FLUIT MARK & MARYELLEN	137 OAK ST	WAYLAND	MI	49348	34
56-005-018-00	GUTIERREZ SAUL & ORTIZ CHRISTINA	119 OAK ST	WAYLAND	MI	49348	35
56-005-019-00	MICHIGAN STATE POLICE #58	544 N MAIN ST	WAYLAND	MI	49348	36
56-005-020-00	WILLIAMS TERESA A	540 N MAIN ST	WAYLAND	MI	49348	37
56-005-021-00	KEMP HOLDINGS LLC	304 108TH ST	CALEDONIA	MI	49316	38
56-005-022-00	SLOAN JOHN L & AMY L	329 WILLOW RUN DR	WAYLAND	MI	49348	39

(0 out of 1666 Selected)

D001COUNTY WEB 18.DBO.NewQuery

Figure 6.23: Query Results Table

## 6.5.4 ENTERPRISE GEODATABASE MAINTENANCE

### ENTERPRISE GEODATABASE COMPRESSION ROUTINE

#### Disconnect All Users

To disconnect the GIS Server, stop all services

- In ArcGIS Server Manager ⇒ Site ⇒ GIS Server ⇒ Machines ⇒ Stop all Services

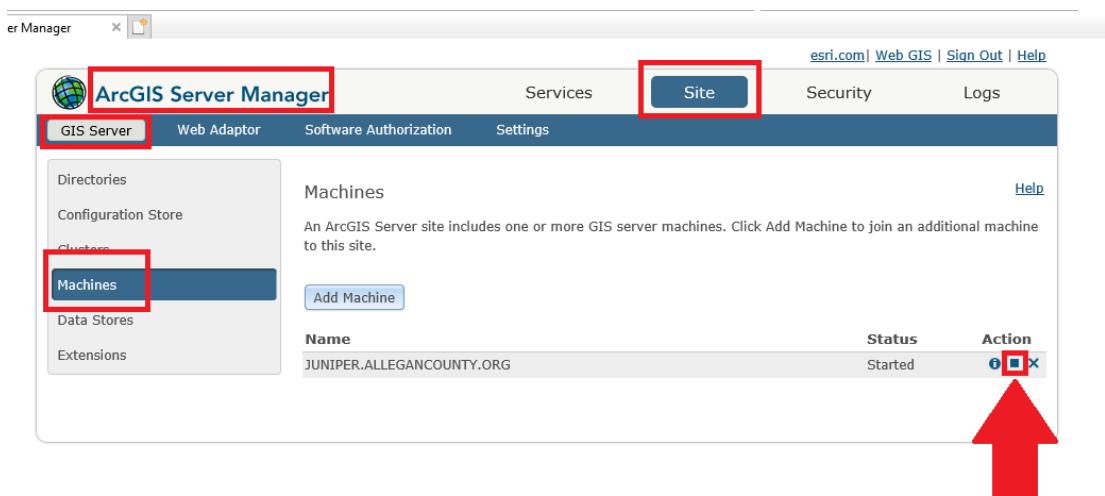


Figure 6.24: Stop ArcGIS Server

Use the Search tool to find the Rebuild Indexes Tool

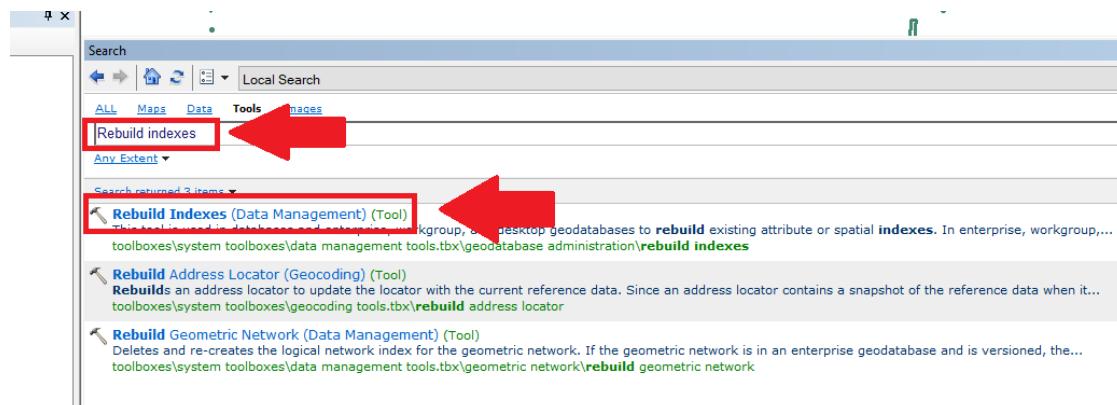


Figure 6.25: Find Rebuild Indexes Tool

## Rebuild Indexes

Select Connection ⇒ Include System Tables ⇒ Select All ⇒ Press OK

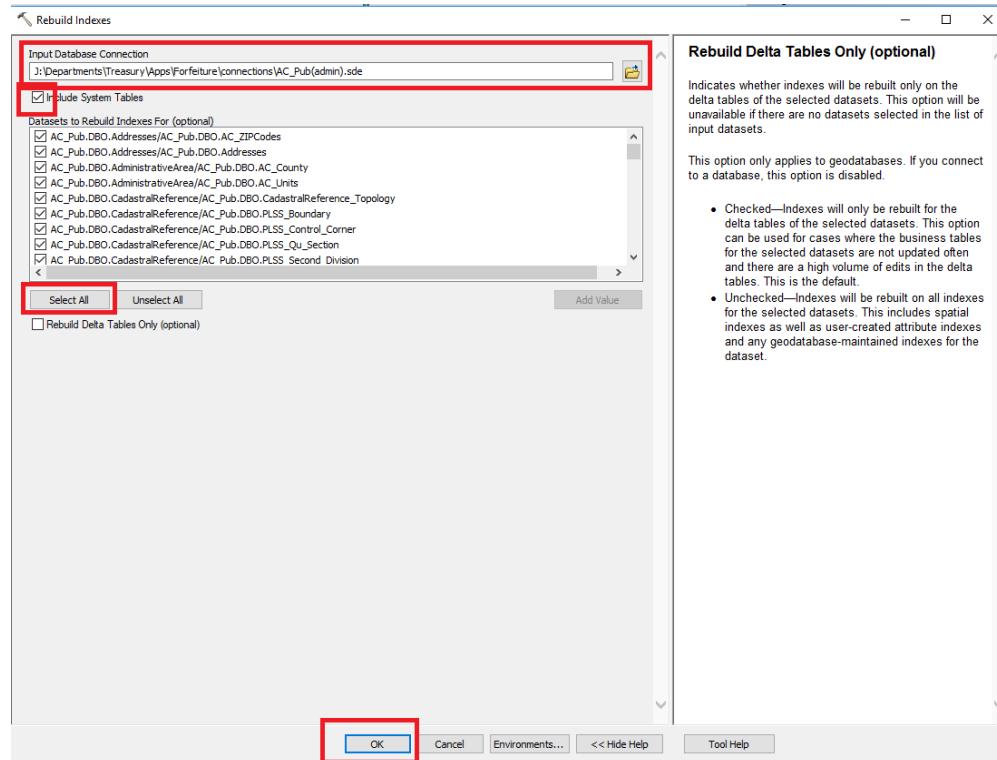


Figure 6.26: Rebuild Indexes Tool Operation

## Recalculate Statistics

In the Analyze Datasets Tool:

Select Connection ⇒ Include System Tables ⇒ Select All ⇒ Press OK

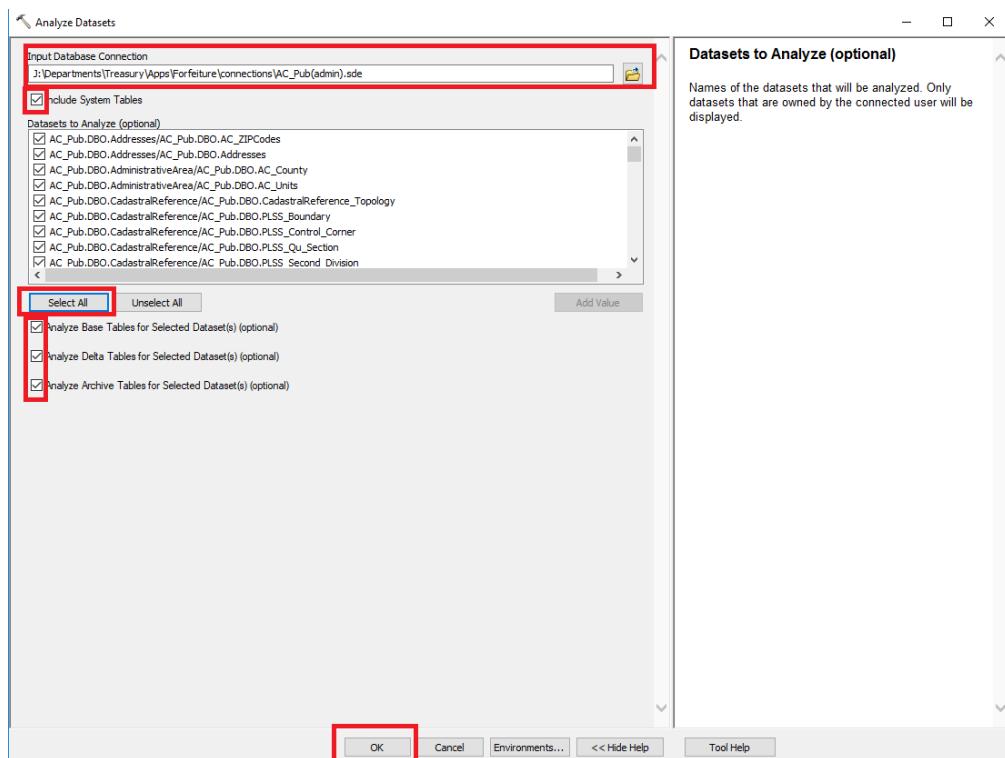


Figure 6.27: Recalculate Statistics

## Compress

Select Connection ⇒ Press OK

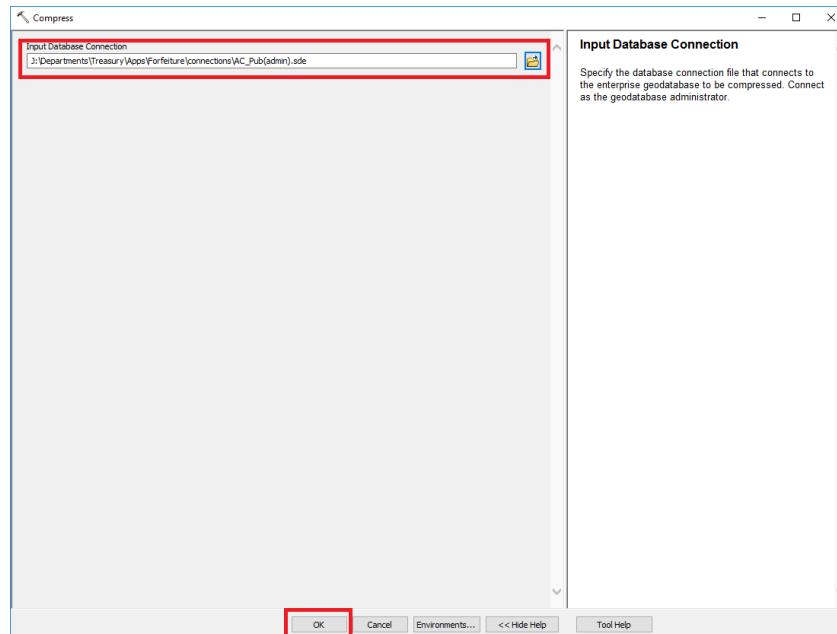


Figure 6.28: Compress

## Rebuild Indexes Again

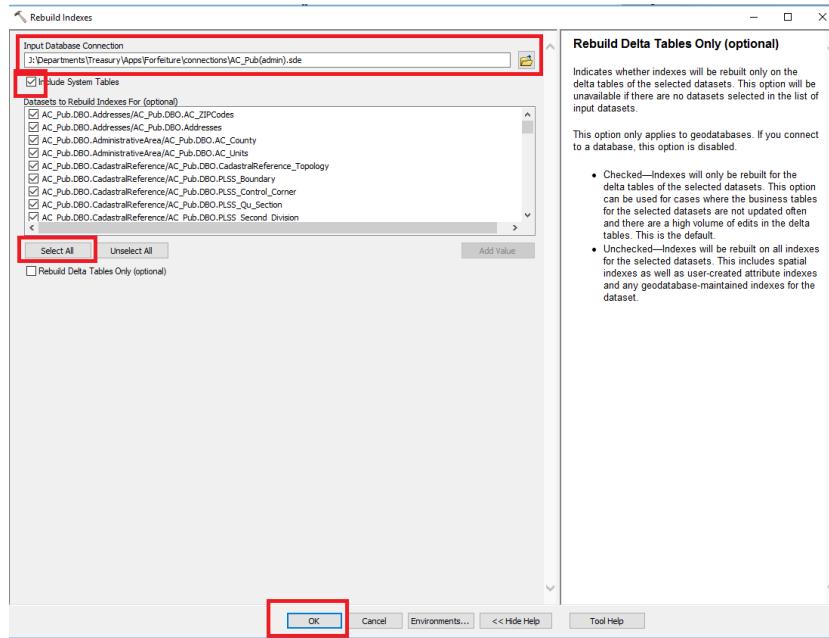


Figure 6.29: Rebuild Indexes Tool Operation

## Recalculate Statistics Again

In the Analyze Datasets Tool:

Select Connection ⇒ Include System Tables ⇒ Select All ⇒ Press OK

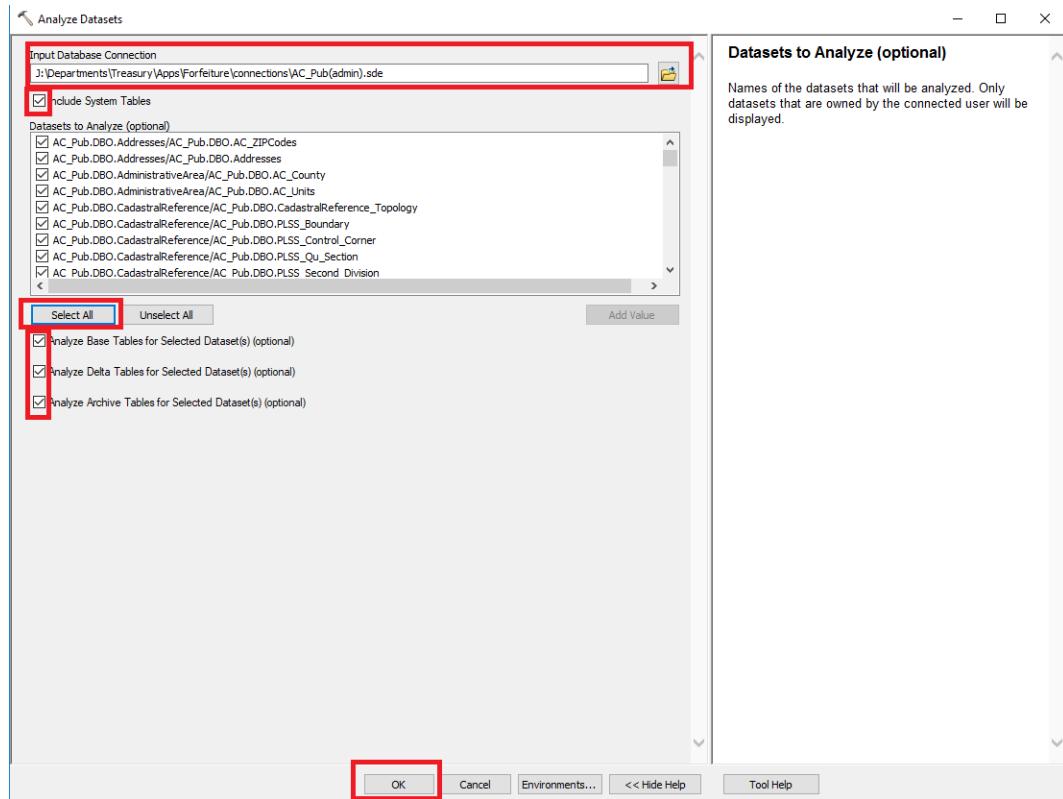


Figure 6.30: Recalculate Statistics

ENTERPRISE GEODATABASE  
PERFORMANCE TROUBLESHOOTING

## Editing Is Slow In a Specific Feature Dataset

This list of steps worked to improve performance in the ParcelEditing Feature Dataset. Note the highlighted steps are suspected to be important and discussed further here.

- Compress GDB
- Analyze Dataset
- Unregister Replicas
- Compress GDB
- **Unversion Dataset**
- **Restart the SQL Server**
- Delete Topology
- Recreate Topology
- **Register dataset as versioned**

## Unregister As Versioned

With all users disconnected

- In Catalog ⇒ ACPro ⇒ Problem Dataset ➔ Manage ⇒ Unregister As Versioned

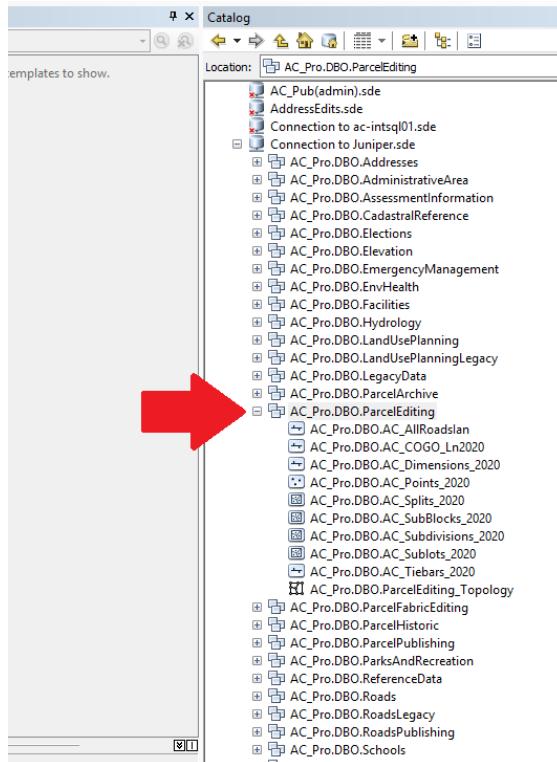


Figure 6.31: Unregister FDS as Versioned

## Restart the SQL Server

➢ In SQL Server Management Studio  Juniper ⇒ restart

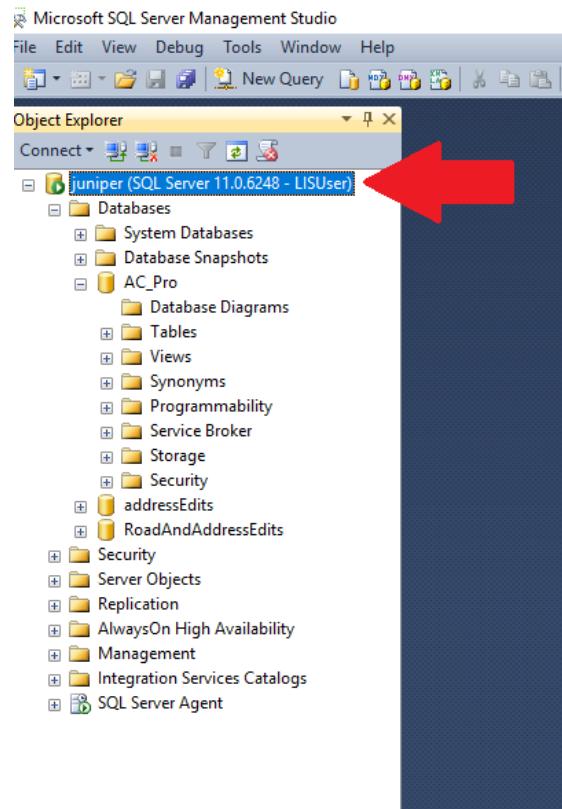


Figure 6.32: Restart SQL Server

## Register the FDS as Versioned

- In Catalog ⇒ ACPro ⇒ Problem Dataset  Manage ⇒ Register As Versioned

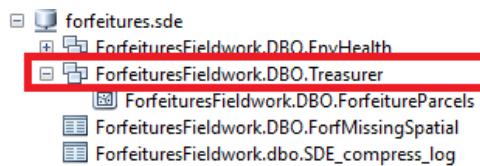


Figure 6.33: Register FDS as Versioned

### 6.5.5 MANAGING MAP SERVICES

#### TO STOP ARCGIS SERVER

## Launch ArcGIS Server Manager

Site ⇒ GIS Server ⇒ Machines ⇒ Stop the Server

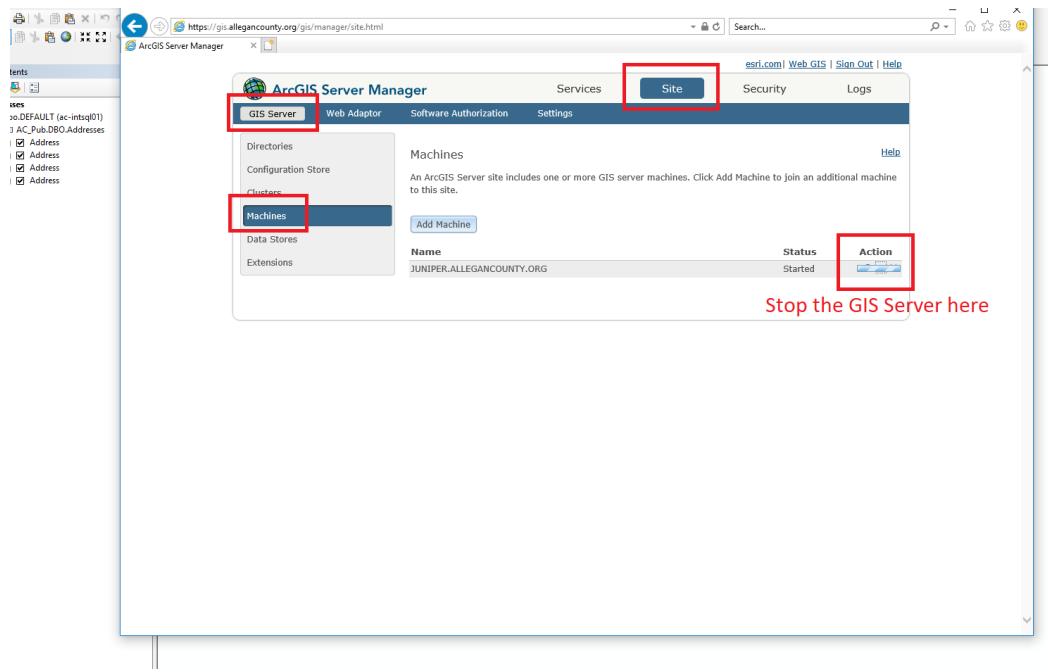


Figure 6.34: Stop the GIS Server

## F I X I N G D A M A G E D S E R V I C E S

### Error:

Service is currently being configured by another administrative operation

### Remedy:

This tech support article applies:

<https://support.esri.com/en/technical-article/000015549>

There are at least 2 ways to fix:

- Use the ArcGIS Server Account Utility
- Remove Lock Files

### Use the ArcGIS Server Account Utility

#### Access the GIS Server

To Log in to Juniper

windows R ⇒ mstsc

⇒ juniper

Use personal network credentials

---

## On the GIS Server (Juniper)

In Windows Search, find:

Configure ArcGIS Server Account  
Utility

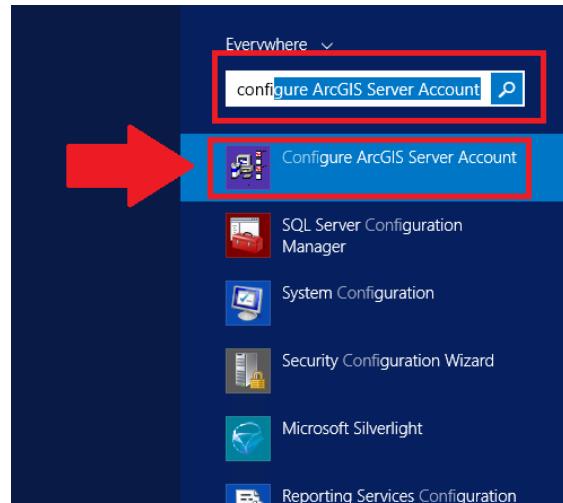


Figure 6.35: ArcGIS Server Account Utility

Use credentials:

PW: @lleganGxxxxxx

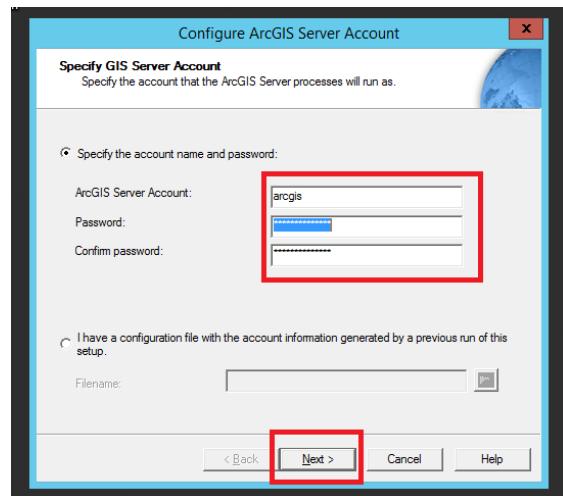


Figure 6.36: Account Utility Login

In the utility, paste these paths:

C:\arcgisserver\directories  
C:\arcgisserver\config-store  
C:\arcgisserver\logs

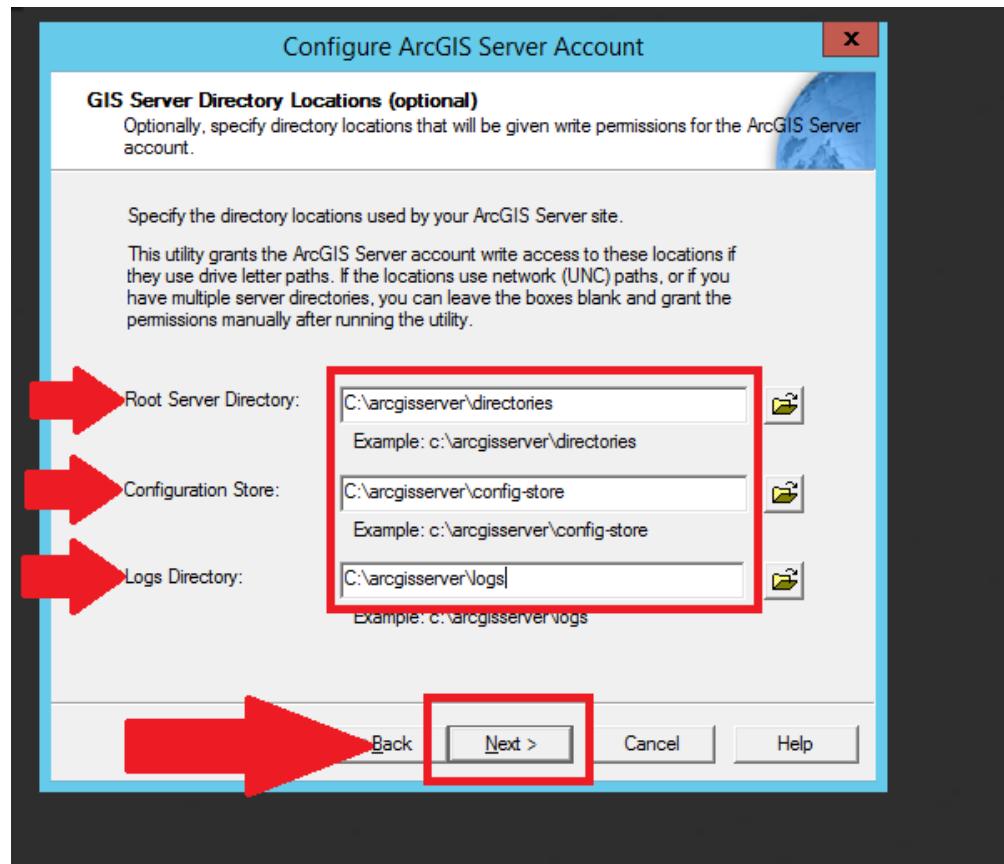


Figure 6.37: GIS Directory Locations Filled

Push **Next**

Select option **Do not export Configuration File**

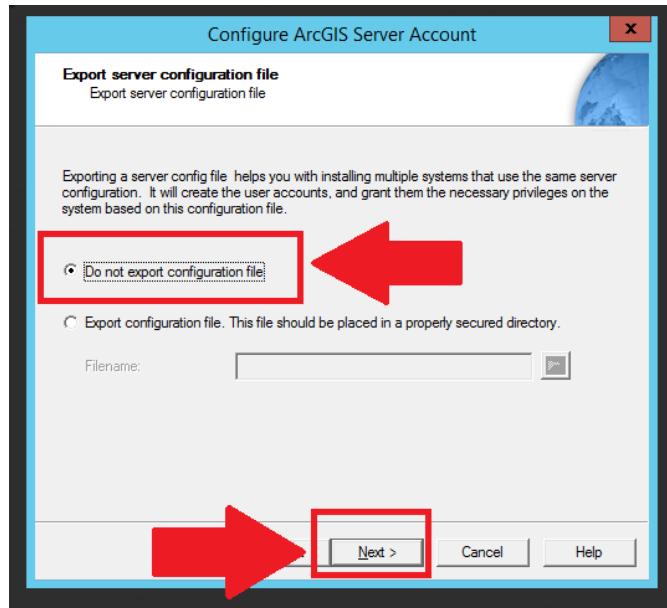


Figure 6.38: Do not Export Config File

Push **Next**

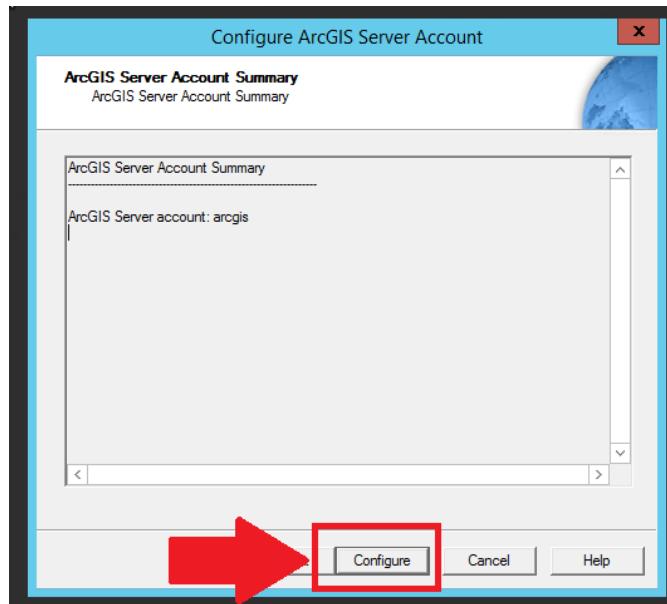


Figure 6.39: Configure Account

Push **Configure**

While the tool runs, open the service manager

In Windows Search, find: **Service Manger**

Launch **Service Manger** When the tool completes,

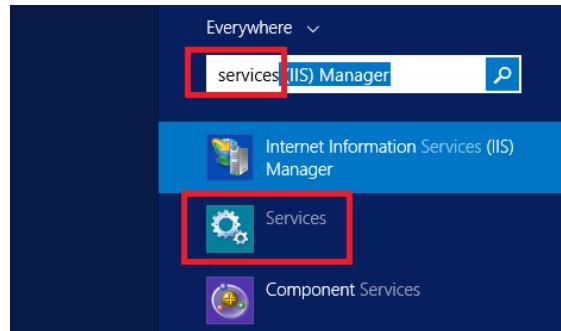


Figure 6.40: Search For Service Manager

Push **Finish**

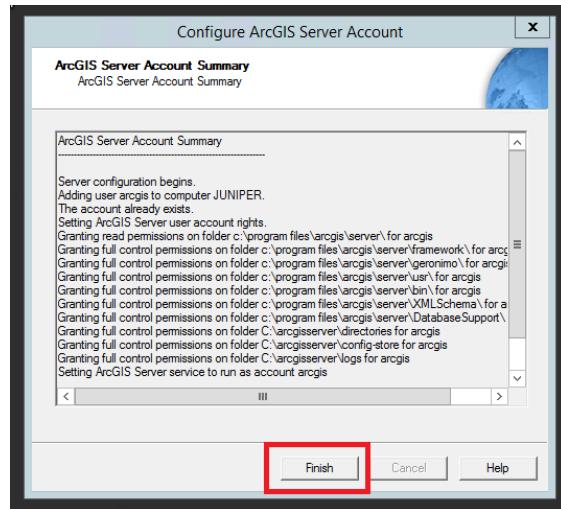


Figure 6.41: Finish On Configure

## Services Manager

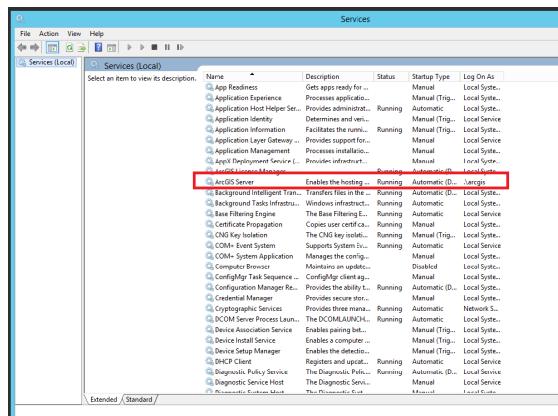


Figure 6.42: Open Services Manager

In services, select the ArcGIS Server service and restart the service. (Randy had to do this)

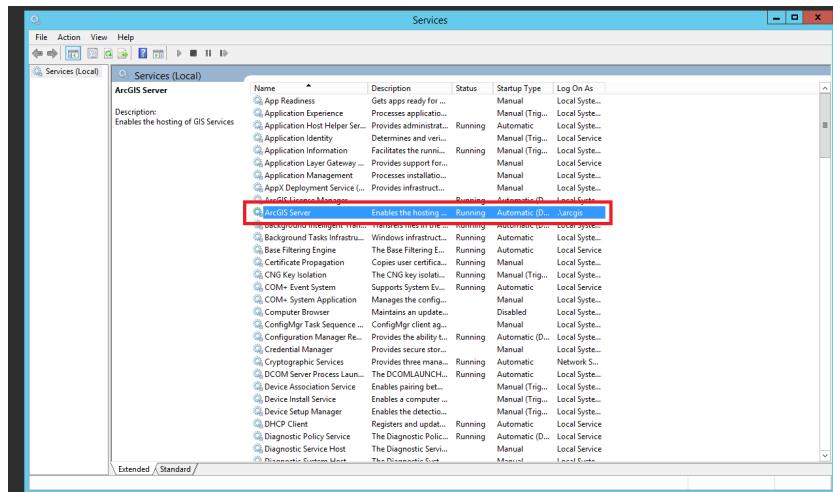


Figure 6.43: arcGis Service In Services Manager

## Quick and dirty fix

When a service get hung up in som admin process, you may get an error like:

### Error:

**Service is currently being configured by another administrative operation**

### Removing Lock Files

This may work, here is a blog about it

<https://community.esri.com/thread/103710> Network location for an example service

```
on juniper
C:\arcgisserver\config-store\services\ParcelViewer2\
PV2Adresses.MapServer\startup\JUNIPER.ALLEGANCOUNTY.ORG
```

Suggested Steps:

- 1)stop arcgis server services.
- 2)delete the lock files(\*.glock and \*.rlock )
 (in arcgisserver\config-store).
- 3) restart arcgis server service.
- 4)stop the pending stopping service and then start it.

mapservices would not stop so I try this:

<https://support.esri.com/en/technical-article/000012685>

Check permission levels for the arcGIS account ArcGisServerPermissions.PNG

---

If necessary, add the arcgis user to the permissions on the folders ArcGisServer-PermissionsAddUser.PNG

## 6.5.6 MANAGING GEODATABASE REPLICAS

### ADDING A NEW FEATURE CLASS TO A REPLICATOR

Source: <https://support.esri.com/en/technical-article/000010345>

#### Summary

Currently, there is no out-of-the-box tool to add a feature class to an existing replica. With ArcGIS Desktop, one must either recreate the replica or if the workflow allows, replicate the new feature class as a separate replica.

#### Steps:

The steps below outline how to recreate the replica using the Register Existing Data option in Desktop. These steps can be applied to both one-way and two-way replicas.

- Synchronize the changes between parent and child replica geodatabases using the existing replica so that the data is identical in each database, then Unregister the replica in both geodatabases. For two-way replicas, ensure that changes are synchronized in both directions and there are no outstanding edits before unregistering the replica.
- Create or import the new feature class into the parent geodatabase, and add the GlobalID.
- Register the newly added data as versioned.
- Copy and paste the new feature class to the child geodatabase using ArcCatalog.
- Note: that the GlobalIDs must have already been added to the feature class.
- For two-way replica or one-way full model, register the newly added data in child geodatabase as versioned.
- Using the parent geodatabase, add all the data that is to be replicated to a map in ArcMap.
- Click the 'Create Replica' tool on the Distributed Geodatabase toolbar.
- Select 'One way replica' or 'Two way replica' and click Next.
- Select 'Register existing data only'.
- Select the child geodatabase and specify a replica name.

- Click Next and click Finish.
- A new replica is created that includes the new data.

## 6.5.7 MANAGING GEODATABASE VERSIONS

### VERSION QUERIES

## SQL Queries

Four queries of SDEversions, SDEstates, sdestatelineages, and SDEcompresslog

```
use AC_Pub
select name, owner, version_id, state_id, parent_name
, parent_owner from
[AC_Pub].[dbo].[SDE_versions]
select * from [AC_Pub].[dbo].[SDE_states] order by state_id
select * from [AC_Pub].[dbo].[sde_state_lineages] order
by lineage_name,
lineage_id
select TOP(5) * from [AC_Pub].[dbo].[SDE_compress_log] order by
compress_end DESC
```

Query of SDEversions and SDEstates

```
use AC_Pub
SELECT v.version_id,v.creation_time,v.creation_time,
s.state_id, s.creation_time
FROM SDE_versions v
INNER JOIN SDE_states s ON v.state_id = s.state_id
```

---

## FINDING ORPHANED VERSIONS

### Remove orphaned versions

Follow the procedure: [Link to source](#)

Use SQL Server Management Studio to execute two queries and compare the results.

#### Step 1:

Execute the query:

```
use AC_Pub
SELECT ObjectID, name from dbo.GDB_ITEMS where
TYPE='4ED4A58E-621F-4043-95ED-850FBA45FCBC';
```

#### Step 2:

Execute the query:

```
use AC_Pub
SELECT name from [dbo].[SDE_versions]
order by name
```

---

Compare the tables

This graphic summarizes elements of the queries. Note the items from step two

```

SQLQuery29.sql - A..._Pub (LISUser (59))*
use AC_Pub
SELECT ObjectId, name from dbo.GDB_ITEMS where TYPE='4ED4A58E-621F-4043-95ED-850FBA45FCBC';
code for versions
in gdbItems

SQLQuery28.sql - A..._Pub (LISUser (57))*
use AC_Pub
SELECT name from [dbo].[SDE_versions]
order by name

```

ObjectID	name
1	16497 ProtoPubParcelPubReplica
2	16520 ProtoPubLandUsePlanningReplica
3	17074 SchoolsReplica
4	17542 EIReplica
5	17893 EmergencyMgmt
6	19929 AddressesReplica
7	40149 EnvHealthReplica

name
1 CAddress_TablesToReversionPar
2 DEFAULT
3 JMone_TablesToReversionParc
4 SYNC_SEND_17893_0
5 SYNC_SEND_40559_12
6 SYNC_SEND_40965_7

Figure 6.44: Find Orphan Versions

that have no match in step one.

Orphaned versions can be removed by name in ArcGIS

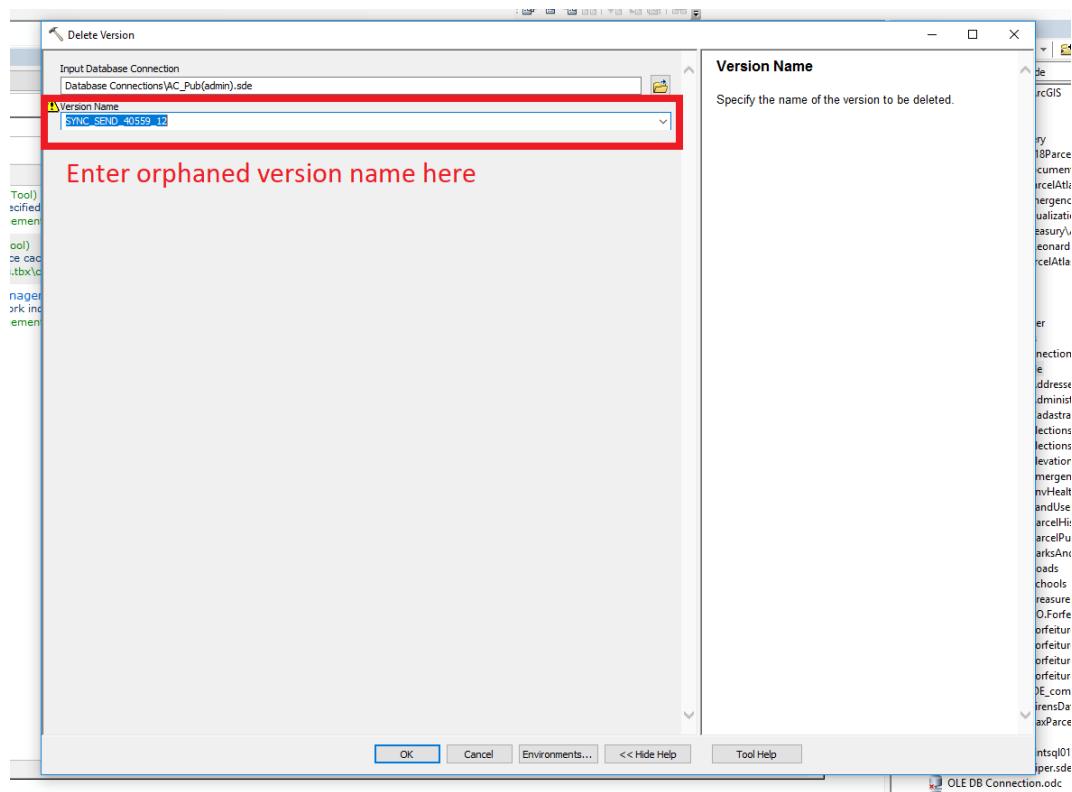


Figure 6.45: Delete Orphan Versions

## 6.5.8 MXD MANAGEMENT

### FIND / REPLACE TEXT OBJECT

#### Python Code

Python Code for finding and replacing a text object in a ArcGIS .mxd file. A snippet of this code may be found in the LayerUpdates/Zoning/processing folder. It is used to edit the .mxd files located there.

```
import arcpy
from arcpy import env

env.workspace = r"J:\Apps\Python\LayerUpdates\zoning\processing"
for mxdname in arcpy.ListFiles("*.mxd"):
    print mxdname
    mxd = arcpy.mapping.MapDocument(r"J:\Apps\Python\
        LayerUpdates\zoning\processing\" + mxdname)
    for elm in arcpy.mapping.ListLayoutElements
        (mxd, "TEXT_ELEMENT"):
        if elm.text.startswith('As ammended'):
            elm.text = elm.text.replace('As ammended',
                'As amended')
            print elm.text
    mxd.save()
del mxd
```

## 6.6 LATEX PACKAGES USED BY AGGIS

### 6.6.1 COMMON ERRORS

Source:

<https://www.ocf.berkeley.edu/~latex/files/commonerrors.tex>

If you have every compiled a  $\text{\LaTeX}$  document, chances are high you have received a few error messages. Sometimes they come from something as stupid and as easy to fix as forgetting a parenthesis or forgetting to end an environment. There are also a lot more cases where you have no idea what you have done wrong and it takes you a long time to find or even understand your error.

The purpose of this is to explain some of the common errors that may happen when compiling a  $\text{\LaTeX}$  document and suggestions for what is probably going on and how to debug your document.

### THE FORM OF AN ERROR

There are two forms of errors:  $\text{\LaTeX}$  errors and  $\text{\TeX}$  errors. In both types of errors, the part after the error message will tell you where the error occurred. An example:

1.15 <offending text>

The 1.15 tells you what line the error occurred on and the text will tell you the text that caused the error.

### LATEX ERRORS

The general form of an error in  $\text{\LaTeX}$  is shown below:

! LaTeX error: <error message>

See the  $\text{\LaTeX}$  manual or  $\text{\LaTeX}$  Companion for explanation.

Type H <return> for immediate help.

...

---

The ! lets you know that the error has occurred. The error message will tell you what type of error you have committed. After the ellipses, you will find the line at which the error occurred and the text that caused the error (or at least the text where  $\text{\LaTeX}$  found the error).

## TEX ERRORS

Errors may also have the following form:

```
! <error message>
```

These errors are formatted differently because they are error messages that came from  $\text{\TeX}$  instead of  $\text{\LaTeX}$ . After the error, you will still find the line that the error occurred in and the text of the error.

## WARNINGS

There are some error messages that are just warnings and will not stop or change the compilation of the document. Chances are you have seen them many times.

## UNDERFULL

The following error results when a line does not extend the width of the page, something  $\text{\LaTeX}$  always tries to accomplish:

```
Underfull \hbox (badness 10000) in paragraph at lines  
104--107
```

This error message is just a warning and is not something to worry about. For the most part, when a line does not span the width of the page, it is because you have written something that you want to only cover part of the page.

## OVERFULL

The following error results when a line extends beyond the width of the page:

```
Overfull \hbox (16.04988pt too wide) in paragraph at  
lines 30--31 [] [] \OT1/cmtt/m/n/12 I'm trying to put  
way too much text into a line in my document.
```

---

Usually this error comes from when you are using the `verbatim` package because it will not move to the next line if your text does not go to the next line. The easiest way to fix this is to find the place in your document where this is occurring and change the text so that it fits to the page.

This error will still show up if the text is still on the page but outside of the width of text that  $\text{\LaTeX}$  has set. In this case, you are welcome to fix things so that the error does not show up or you can leave the text as it is.

## R E F E R E N C E S

The following warnings occur when references are changed when  $\text{\LaTeX}$  was compiled:

`LaTeX Warning: Label(s) may have changed. Rerun to get cross-references right.`

`LaTeX Warning: There were undefined references.`

`LaTeX Warning: Reference ‘name’ on page 1 undefined on input line 15.`

The way to fix these errors is to recompile the document again to correct the page numbers. Sometimes it is necessary to recompile the document twice to fix this error. You also may have defined a reference wrong, so you should check to make sure your label is correct.

## B E G I N N I N G A N D E N D I N G

### B E G I N E N D E D B Y E N D

This type of error occurs when each environment is not correctly started and ended. When you are missing an `\end` command, the following error will show up:

```
! LaTeX Error: \begin{enumerate} on input line 23
ended by \end{document}.
```

---

To fix this, you need to end the environment mentioned in the error with the appropriate command.

When you are missing a \begin command, the following will appear:

```
! LaTeX Error: \begin{document} ended by  
\end{itemize}.
```

To fix this, you basically do the same thing as before, correctly beginning the environment mentioned in the error with the appropriate command.

## END OCCURRED INSIDE A GROUP

The following error message will show up at the end of compiling a file if an environment is begun that is not ended:

```
(\end occurred inside a group at level <n>)
```

To fix this error, make sure you end the environment that was begun. The previous error is more helpful in finding the \begin statement.

## ENDED BY END OF LINE

The following error will occur when you try to place a command inside a section heading:

```
! LaTeX Error: \verb ended by end of line.
```

See the LaTeX manual or LaTeX Companion for explanation.

Type H <return> for immediate help.

...

There will be many errors of the same type for this mistake. In order to find where you put the command, look in the output file and find the last heading that shows up.

---

## M I S S I N G   B E G I N   D O C U M E N T

This error is self-explanatory:

```
! LaTeX Error: Missing \begin{document}
```

## E R R O R S   U S U A L L Y   C A U S E D   B Y   B A D S P E L L I N G

### U N K N O W N   C O N T R O L   S E Q U E N C E

This error results when you use a command (something that starts with a \) that is not recognized by  $\text{\LaTeX}$ :

```
! Undefined control sequence.
```

Usually this error results from spelling a command incorrectly. Go to the line that is indicated by the error and fix the command.

## E N V I R O N M E N T   U N D E F I N E D

This error results when you begin an environment with a \begin command that is not recognized:

```
! LaTeX Error: Environment verbatim undefined.
```

Usually you have just spelled your environment incorrectly, so you just need to fix it.

## B A D   F I L E   N A M E

This error results when you have mistyped the command `latex` or do not have  $\text{\LaTeX}$  installed on your computer:

```
Bad command or file name
```

To fix this, correctly spell the command to compile your file or make sure that  $\text{\LaTeX}$  is correctly installed on your computer.

---

## C A N N O T F I N D F I L E N A M E

This error occurs when you try to compile a file that the computer cannot find:

```
! I can't find file 'sample'.
<*> sample
```

Please type another input file name:

To fix this error, make sure you have spelled the file name correctly. You also may be in the wrong directory to compile the file, so check to make sure you are in the same directory as your file.

## F A T A L E R R O R S

### R U N A W A Y A R G U M E N T

This error happens when a paragraph ends before a command's argument is done (i.e.,  $\text{\LaTeX}$  thinks that there is a missing  $\}$ ):

Runaway argument?

To fix this, you should use a different command to accomplish what you are trying to do. An example of this is to use  $\bfseries$  instead of  $\bfseries$  to make bold text in more than one paragraph.

This error can also be caused by a missing mandatory argument to a command.

## J U S T A N \*

This error normally occurs when you do not end your document with  $\end{document}$ :

\*

If you are prompted to enter something in, it is best to enter

$\end{document}$

and hope it works. Be sure to end your document with the appropriate command.

---

## E M E R G E N C Y   S T O P

This error happens when  $\text{\LaTeX}$  will stop trying to compile your document due to a serious error:

`! Emergency stop.`

To fix this error, you will need to figure out what caused it to stop compiling. Chances are you forgot to end your document with `\end{document}`, but there might also be another reason for the emergency stop.

## P L E A S E   T Y P E   A   C O M M A N D   O R   S A Y E N D

This error happens when your file has ended prematurely:

(Please type a command or say ‘`\end`’)

The best way to deal with this type of error is to type

`\end`

or

`\end{document}`

in the case that the absence of that command caused the error. Usually if you have ended your document correctly, the error will result from a missing } or forgetting to end a verbatim environment.

## G R A P H I C S   E R R O R S

### T O O   M A N Y   U N P R O C E S S E D   F L O A T S

This error occurs when figures or tables (i.e., floats) have not been typeset:

`! LaTeX Error: Too many unprocessed floats.`

$\text{\LaTeX}$  can only have so many floats waiting to be typeset. In order to fix this error, make sure that you are placing your floats where you want them (with a [h] option) and not wanting too many on one page in sequence. Using the command `\clearpage` can be very useful in distributing floats correctly.

## UNKNOWN GRAPHICS EXTENSION

The following error occurs when you try to use a type of graphic that is not supported by the type of file that you are producing:

```
! LaTeX Error: Unknown graphics extension: .gif
```

In order to fix this error, you should change your graphics to the types that are supported by the type of file you are outputting or you will need to include the correct package to deal with that type of graphic. Sometimes you may have named the graphic poorly so that  $\text{\LaTeX}$  will not recognize it as a graphic file.

## DIVISION BY ZERO

The following error occurs when the height of a graphic object is zero:

```
! Package graphics Error: Division by 0.
```

This is usually caused when you rotate an object with zero depth so that its height becomes zero. The best way to fix this is to use the keyword `totalheight` instead of `height`.

## MATH ERRORS

### DISPLAY MATH SHOULD END WITH \$\$

This error occurs when the `displaymath` or `equation` mode is ended incorrectly:

```
! Display math should end with $$
```

To fix this error, make sure that you end the `displaymath` or `equation` mode correctly (ending them with a `$` is not acceptable).

### BAD MATH ENVIRONMENT

#### DELIMITER

This error occurs when you do not have your delimiters correct in math mode:

```
! LaTeX Error: Bad math environment delimiter.
```

---

Usually this occurs when you forget to match a right delimiter with every left delimiter. This error may also happen when you forget to end an array.

## M I S S I N G R I G H T

This error occurs when you have a missing right parenthesis:

! Extra \right.

To fix this, you either need to add a \right command or you need to end an array.

## M I S S I N G D E L I M I T E R

This error message occurs when a delimiter is missing:

! Missing delimiter (. inserted).

To fix this error, you need to make sure that you have a right delimiter for every left delimiter. If you do not want a right delimiter matching a left delimiter, you need to use “.” to not have an error message show up.

## M I S S I N G \$ I N S E R T E D

The following error occurs when you try to use a character that can only be used in math mode, like \_ or ^:

! Missing \$ inserted

To fix this error, make sure you change the character to what it should be in text mode.

## T A B U L A R E N V I R O N M E N T E R R O R S

### M I S P L A C E D A L I G N M E N T T A B

#### C H A R A C T E R &

This error occurs when you use & and when you are not in a tabular environment:

---

Misplaced alignment tab character &

To fix this error, you need to use \& to make a &.

## E X T R A   A L I G N M E N T   T A B

This error occurs when you use too many tabs for the number of columns in a table:

```
! Extra alignment tab has been changed to \cr
```

The result of this error is that a new row is formed where the extra tab was. You should go back and fix your table so that the correct number of items in each row would show up.

## A R G U M E N T   H A S   A N   E X T R A   }

These errors happen when an incorrect number of arguments to a tabular environment have been specified:

```
! Argument of \cline has an extra }.
```

```
! Argument of \multicolumn has an extra }.
```

To fix this error, make sure your arguments to the tabular environment are correct.

## E R R O R S   W I T H   L I S T S

### M I S S I N G   I T E M

This error occurs when there is plain text in an environment that takes items:

```
! LaTeX Error: Something's wrong--perhaps a missing
\item.
```

To fix this error, make sure the plain text is changed into an item.

---

## T O O D E E P L Y N E S T E D

This error occurs when there are too many lists for  $\text{\LaTeX}$  to handle:

! LaTeX Error: Too deeply nested

$\text{\LaTeX}$  can only handle four levels of one type of list and six levels of different types of lists. To fix this, you need to use less levels of lists or define your own list environment.

## M I S C E L L A N E O U S E R R O R S

### O N L Y U S E D I N T H E P R E A M B L E

This error occurs when you place a command in the body of a  $\text{\LaTeX}$  document that should be placed in the preamble:

! LaTeX Error: Can be used only in the preamble.

To fix this error, just move the command to the preamble.

### T H E R E I S N O L I N E / P A G E H E R E T O E N D

This error occurs when you incorrectly use the commands that make a new line or a new page:

! LaTeX Error: There's a no line here to end.

You may just leave the command that is making a new line in place or you can take it out. Here,  $\text{\LaTeX}$  is just trying to make sure that everything looks nice.

### C O M M A N D A L R E A D Y D E F I N E D

This error occurs when you try to define a command that already exists:

! LaTeX Error: Command ... already defined.

To fix this, you need to define your command differently.

---

## M I S S I N G   N U M B E R

This error is made when a number is expected as an argument and one is not provided:

```
! Missing number, treated as zero.
```

To fix this error, you need to find where a number is expected so that you can provide the correct one.

## 6 . 6 . 2   F L O A T   P A C K A G E

### U S E P A C K A G E

text

### S I M P L E   U S E

text

### O P T I O N S

text

Add optional arguments to the usepackage line:

Useful options:

➤ **OPTION NAME**

OPTION NOTE

➤ **OPTION NAME**

OPTION NOTE

### U S E   W I T H   O P T I O N S

text

---

## C O M M A N D S

### 6.6.3 G R A P H I C S E X A M P L E S A N D N O T E S

#### C U R L Y F R A M E E X A M P L E

```
\documentclass[landscape]{article}
\usepackage{wallpaper}
\usepackage{niceframe}
\usepackage{xcolor}
\usepackage{ulem}
\usepackage{graphicx}
\usepackage{geometry}
\geometry{tmargin=.75cm,bmargin=.25cm,lmargin=.8cm,rmargin=.2cm}
\usepackage{multicol}

\begin{document}

\curlyframe[.9\columnwidth]{

TEXTTTTTTTTTTTTTTTTTT

}

\end{document}
```

#### R E C T F R A M E E X A M P L E

```
\documentclass[landscape]{article}
\usepackage{wallpaper}
\usepackage{niceframe}
\usepackage{xcolor}
\usepackage{ulem}
\usepackage{graphicx}
\usepackage{geometry}
\geometry{tmargin=.75cm,bmargin=.25cm,lmargin=.8cm,rmargin=.2cm}
```

---

```
\usepackage{multicol}

\begin{document}
\begin{minipage}{.33\textwidth}
\centering
\scalebox{3}{\color{green!30!black!60}
\font\border=umrandb
\generalframe
{\border \char113} % up left
{\border \char109} % up
{\border \char112} % up right
{\border \char108} % left
{\border \char110} % right
{\border \char114} % lower left
{\border \char111} % bottom
{\border \char115} % lower right
\centering
\includegraphics[height=1.25cm]{GIS_Logo_better.jpg}}
\end{minipage}
%\vspace{-8mm}

\end{document}
```

## 6.6.4 GRAPHICX PACKAGE

### U S E P A C K A G E

text

### S I M P L E U S E

text

## O P T I O N S

text

Add optional arguments to the usepackage line:

Useful options:

- **OPTION NAME**

OPTION NOTE

- **OPTION NAME**

OPTION NOTE

## U S E   W I T H   O P T I O N S

text

## C O M M A N D S

### 6 . 6 . 5   H Y P E R R E F   P A C K A G E

#### I N T R O D U C T I O N

Official hyperref package documentation

**Notes:**

- Add the *hyperref package* to the preamble **last** [2]

- To use Tex in a pdf bookmark: use

```
\texorpdfstring{\\"}{}
```

i.e. \paragraph{Sample Text\texorpdfstring{\\"}{}}

Creates a new line without an error.

---

```
\usepackage[options]{hyperref}
```

## S I M P L E   U S E

Use `\href{URL}{DESCRIPTION}` to add a link with description

`\href{https://www.latex-tutorial.com}{Website with tutorials}`  
produces:

[Website with tutorials](https://www.latex-tutorial.com)

## O P T I O N S

Add optional arguments to the `usepackage` line:

Useful options:

- **pdftex**  
enables other options like breaklines
- **breaklinks**  
allow links to be broken across several lines  
eg. <https://lists.gnu.org/archive/html/emacs-orgmode/2013-06/msg00776.html>
- **colorlinks**  
Colors the text of links and anchors.(default is false)
- **linkcolor**  
Color for normal internal links(default is red).
- **anchorcolor**  
Color for anchor text.
- **citecolor**  
Color for bibliographic citations in text.
- **urlcolor**  
Color for linked URLs

## U S E   W I T H   O P T I O N S

---

```
\usepackage[breaklinks,colorlinks,citecolor=blue,
urlcolor=green]{hyperref}
```

---

## C O M M A N D S

\href{URL}{text} Makes text a link to URL.

To put a file path in text:

eg:

[Official hyperref package documentation](#)

(documentation Pt.4 pg.15)

\href[options]{URL}{text}

Options:

➤ absolute

```
\href{C:/AC/jalapeno/documentation/packageDocs/hyperref2017.pdf}
    {Official hyperref doc}
```

➤ relative **Note: relative path must be from final pdf location**

```
\href{../../../../documentation/packageDocs/hyperref2017.pdf}
    {Official hyperref package doc}
```

This path works from main document

```
\href{../../../documentation/packageDocs/hyperref2017.pdf}
    {Official hyperref package documentation}
```

This path works from subsection document

\hyperref[label]{text}

Makes text a link to where \ref{label} would point.

\hypertarget{name}{text}

Sets an anchor on text with the label name.

\hyperlink{name}{text}

Makes text a link that takes you to the anchor labeled name.

Pair with \hypertarget.

\phantomsection

Used in conjunction with

\addcontentsline  
to make the correct link in the Table of Contents.

## 6.6.6 IMPORT PACKAGE

### U S E P A C K A G E

text

### S I M P L E U S E

text

### O P T I O N S

text

Add optional arguments to the usepackage line:

Useful options:

➢ **OPTION NAME**

OPTION NOTE

➢ **OPTION NAME**

OPTION NOTE

### U S E W I T H O P T I O N S

text

### C O M M A N D S

## 6.6.7 WRAPPING PACKAGE

---

## U S E P A C K A G E

text

## S I M P L E U S E

text

## O P T I O N S

text

Add optional arguments to the usepackage line:

Useful options:

➢ **OPTION NAME**

OPTION NOTE

➢ **OPTION NAME**

OPTION NOTE

## U S E W I T H O P T I O N S

text

## C O M M A N D S

## 6.7 LATEX TEMPLATES

### 6.7.1 LATEX SECTION TEMPLATE

```
\begin{document}
%
\section{SECTION NAME}
%
\subimport{THIS SECTION/}{SOMESubsection.tex}
\subimport{THIS SECTION/}{SOMESubsection.tex}
% etc...
%
\end{document}
```

### 6.7.2 LATEX SUBSECTION TEMPLATE

```
%  
%  
%  
%-----  
%      To Do:  
%  
%  
%  
%-----  
%  
% OPTIONAL PREAMBLE FOR LOCAL COMPILE %  
%  
\def\titlename{SubsectionTemplate}  
\def\authorName{Allegan County GIS Services}  
\def\pdfTitle{SubsectionTemplate}  
\def\pdfSubject{GIS Tools} %  
\def\pdfKeywords{latex,documentation}  
%
```

---



```
\noindent Text  
Text Text Text Text Text Text Text Text Text Text Text Text Text  
Text Text Text Text Text Text Text Text Text Text Text Text Text  
Text Text Text Text Text Text Text Text Text Text Text Text Text  
Text Text Text Text Text Text Text Text Text Text Text Text Text  
Text Text Text Text Text Text Text Text Text Text Text Text Text  
Text Text Text Text Text Text Text Text Text Text Text Text Text  
Text Text Text Text Text Text Text Text Text Text Text Text Text  
Text Text Text Text Text Text Text Text Text Text Text Text Text  
Text Text Text Text Text Text Text Text Text Text Text Text Text  
%  
\subparagraph*{SUBPAR HEADING}  
%  
\begin{itemize} %  
%  
\item ITEM 1  
%  
\item ITEM 2  
%  
\end{itemize} %  
%  
\subparagraph*{SUBPAR HEADING}  
%  
\noindent Text  
Text Text Text Text Text Text Text Text Text Text Text Text Text  
%  
\end{adjmulticols}  
%  
\clearpage  
%  
%  
\subsubsection{SUBSUBSECTION HEADING}  
%  
% Single Figure  
%  
%\begin{figure}[h!]  
%\centering  
% \includegraphics[width=1\textwidth]{ProjectDesign}  
%\vspace{-0.2in}
```

---

```
%\caption{Design}
%\end{figure}
%
\clearpage
%
%
\paragraph{Summary}
%
\noindent Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text Text
```

```
\paragraph{PAR HEADING}
\noindent Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text
%
\subparagraph{SUBPAR HEADING}
\noindent Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text
%
\subparagraph{SUBPAR HEADING}
\noindent Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text
%
\subparagraph{SUBPAR HEADING}
\noindent Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text
Text Text Text Text Text Text Text Text Text Text Text Text
%
\end{adjmulticols}
%
% Single Figure
%
%\begin{figure}[H]
%\centering
%    \includegraphics[width=1\textwidth]{IMAGE}
%\vspace{-.2in}
%
%\caption{IMAGE NAME}
%\end{figure}
\clearpage
```

## 6.8 PYTHON SCRIPTS USED BY AG GIS

### 6.8.1 FILE RENAME WITH PYTHON

#### PURPOSE AND SUMMARY

## Purpose

Changing the file names within a directory

## Summary

This script creates a list of all files in a source folder and then iterates through the list editing the file names, in this case, replacing spaces with no spaces.

#### REQUIREMENTS

## Software

- python 2.7 and a Python IDE
- A text editor

## Python(2.7)

This script was developed in python 2.7

## The Python Script

```
#-----
# Name:      RenameFiles.py
#
# Purpose:   Renames any number of files within a directory
#
# Notes:     This script creates a list of all files in a source folder and
#            then iterates through the list editing the file names,
#            in this case, replacing spaces with no spaces.
#
# Author:    BMay
#
# Created:   20190620
```

---

```
# Updated: 20190621
#-----
#####
# Imports and Relative path folder setup
#####
import os, sys
project = os.path.dirname(os.path.dirname(__file__))
processing = os.path.join(project, 'processing')
build = os.path.join(project, 'build')

#####
# vars
#####
renameSrc = os.path.join(processing, 'RenameSource')

#####
# Main
#####
if __name__ == "__main__":
    os.chdir(renameSrc)
    for i in os.listdir(renameSrc):
        print i
        newName = i.replace(' ', '')
        print newName
        os.rename(i, newName)
```

## 6.8.2 PDF OPTIMIZER

### PURPOSE AND SUMMARY

#### Purpose

Optimization of any number of pdf documents

---

## Summary

A Python script creates a list of .pdf docs in a folder. The list is used to write a .txt document in which every line is a DOS command to optimize each of the .pdf documents and save them to another location. The .txt must be saved as a .bat. When executed the batch process calls ghost script for the optimization.

## R E Q U I R E M E N T S

## Software

- ghostscript
- python 2.7 and a Python IDE
- A text editor

## About ghostscript

ghostscript is used for the optimization. ghostscript is an interpreter for the PostScript language and for PDF [1].

## Licensing

ghostscript is available opensource under AGPL conditions. more information can be found [here](#).

## Download

ghostscript can be downloladed [here](#).

### *note:*

The output of this script is bdoc.txt, Save as a .bat to execute the optimize.

## Python(2.7)

This script was developed in python 2.7

## The Python Script

The output is a batch file

---

```
#-----
# Name:      OptimizePDF.py
#
# Purpose:    Batch optimize pdfs
#
# Notes:      This script creates a list of pdf files in a source folder and
#              then creates a .txt that can be used as a .bat file to optimize
#              all of the pdfs in the source folder to a new location.
# Author:     BMay
#
# Created:    06/20/2019
#-----
#####
# Imports and Relative path folder setup
#####
import os, sys
project = os.path.dirname(os.path.dirname(__file__))
processing = os.path.join(project, 'processing')
build = os.path.join(project,'build')

#####
# String vars for each line of the .bat file
#####
inString1 = "gswin32 -sDEVICE=pdfwrite -dCompatibilityLevel=1.4 -dPDFSETTINGS=/ebook#"
    -dNOPAUSE -dQUIET -dBATCH -sOutputFile=H:\\2019ParcelAtlas\\optimized\\"
inString2 = " H:\\2019ParcelAtlas\\20190619\\"
usString = '_' # Underscore string to add to file names

#####
# Source pdfs path
#####
sourcepdf = os.path.join(project, '20190619x') # folder with pdfs to be optimized

#####
# new .txt
#####
batchdoc = os.path.join(processing,"bDoc.txt") # new .txt that can be used as a .bat

#####
# Main
#####
if __name__ == "__main__":
```

---

```
list1 = os.listdir(sourcepdf) # assemble list of all files in sourcepdf
l = open(batchdoc,'w') # open .txt doc to write lines
for i in list1: # iterate list of files
    #newi = i[0:] # allows slicing on file name if chars need to be removed
    #print newi
    #t = inString1 + usString + newi + inString2 + i + "\n"
    t = inString1 + usString + i + inString2 + i + "\n" # assemble each string
    print t
    l.write(t) # write each string
l.close()
```

## W I N D O W S B A T C H F I L E

A line from the batch file looks like:

```
gswin32 -sDEVICE=pdfwrite -dCompatibilityLevel=1.4 -dPDFSETTINGS=/ebook -dNOPAUSE
-dQUIET -dBATCH -sOutputFile=J:\Project\2018ParcelAtlas\build\optimized 02-
001-001-00.pdf J:\Projects\2018ParcelAtlas\build\2018071 \_02-001-00-00.pdf
```

To execute the batch file: change the extension of the scripts output from .txt to .bat. Double click the .bat to execute.

## 6.9 QGIS TOOLS

### 6.9.1 QGIS AZIMUTH AND DISTANCE PLUGIN

#### TOOL SUMMARY

The Azimuth and Distance Plugin can be added to QGIS to provide COGO functionality.

#### Background

QGIS is an opensource GIS that provides additional tools through Plugin architecture.

#### Why the Tool is Needed

QGIS does not have a COGO toolset built in.

#### Who the Tool is For

A user with QGIS installed locally and the ability to make a basic map.

#### Takeaways

The Azimuth and Distance Plugin provides the COGO functionality in QGIS.

The Plugin can be installed following these steps.

## AZIMUTH AND DISTANCE PLUGIN INSTALLATION

### Install the Plugin

Plugins (1) ⇒ Topography Group

Select the Azimuth and Distance Plugin (2)

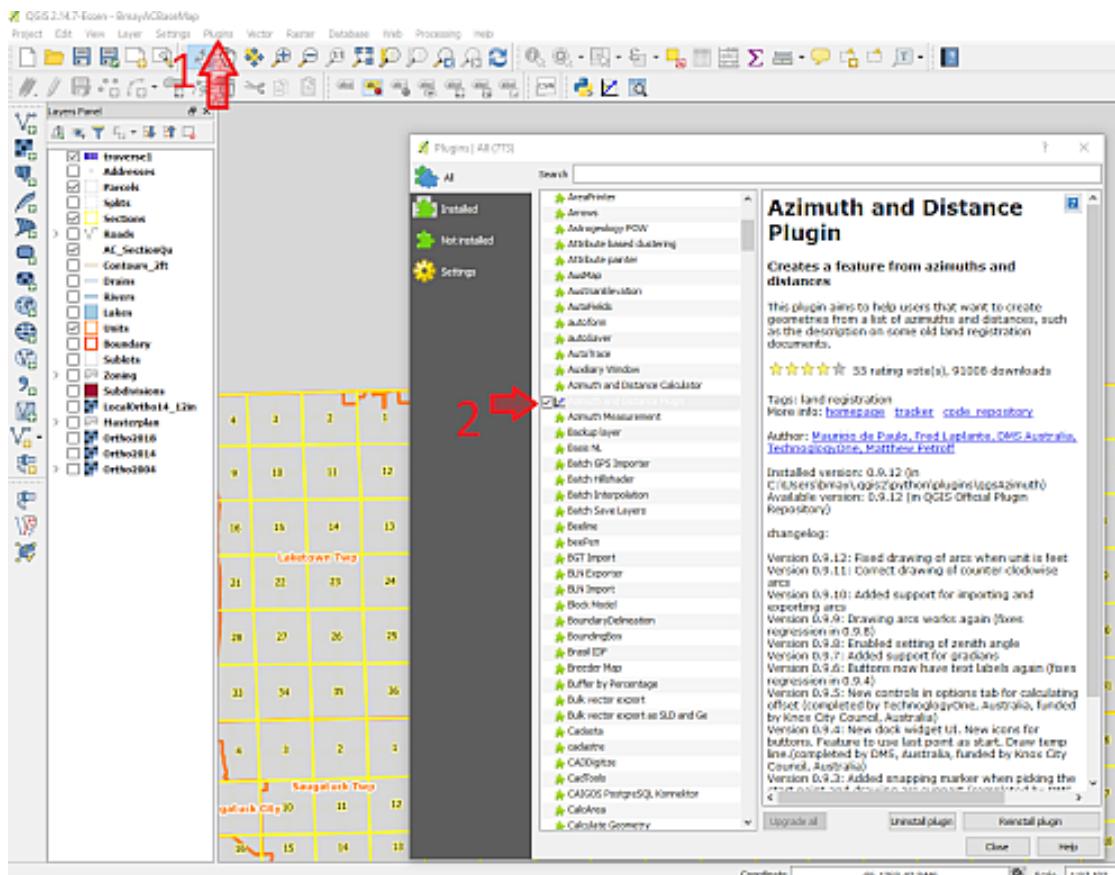


Figure 6.46: Launch Plugin

### Azimuth and Distance Plugin Tool is Added to Toolbar



Figure 6.47: COGO Icon

## 6.9.2 COGO TOOLS IN QGIS

### TOOL SUMMARY

Transfers of real property typically involve a Metes and Bounds description:

Commencing at Southeast corner of Section 1, Town 2 North, Range 11 West, Martin Township, Allegan County, Michigan; thence North 88 degrees 32 minutes 05 seconds West 1338.44 feet along the south line of said section to the point of beginning; thence North 01 degrees 27 minutes 55 seconds East 388 feet; thence South 88 degrees 32 minutes 05 seconds East 584 feet, more or less, to the centerline of the Gun River; thence southerly along said centerline to the south section line; thence West along said section line to the point of beginning.

Figure 6.48: Description From Deed

## Background

In GIS, *Coordinate Geometry* or **COGO** tools convert written descriptions of real property into digital map features.

Users in several county departments use COGO tools in their regular workflow.

The COGO tools in ArcGIS require an advanced license.

## Who the Tool is For

A user with QGIS installed locally and the ability to make a basic map.

## Why the Tool is Needed

A tool is needed to convert between written descriptions of real property and digital map data.

## Takeaways

QGIS is an open source GIS without a built in COGO toolset.

The Azimuth and Distance Plugin provides the COGO functionality in QGIS.

Following are instructions for using QGIS for COGO

---

To use COGO tools in QGIS, follow these steps

## Step 1:

Launch and Configure the Azimuth and Distance Plugin

\*Plugin installation is covered in a separate document.



Figure 6.49: COGO Icon

\*This tool draws in a temporary layer or in an active map layer.

Select **traverse1** as active layer in the tool.

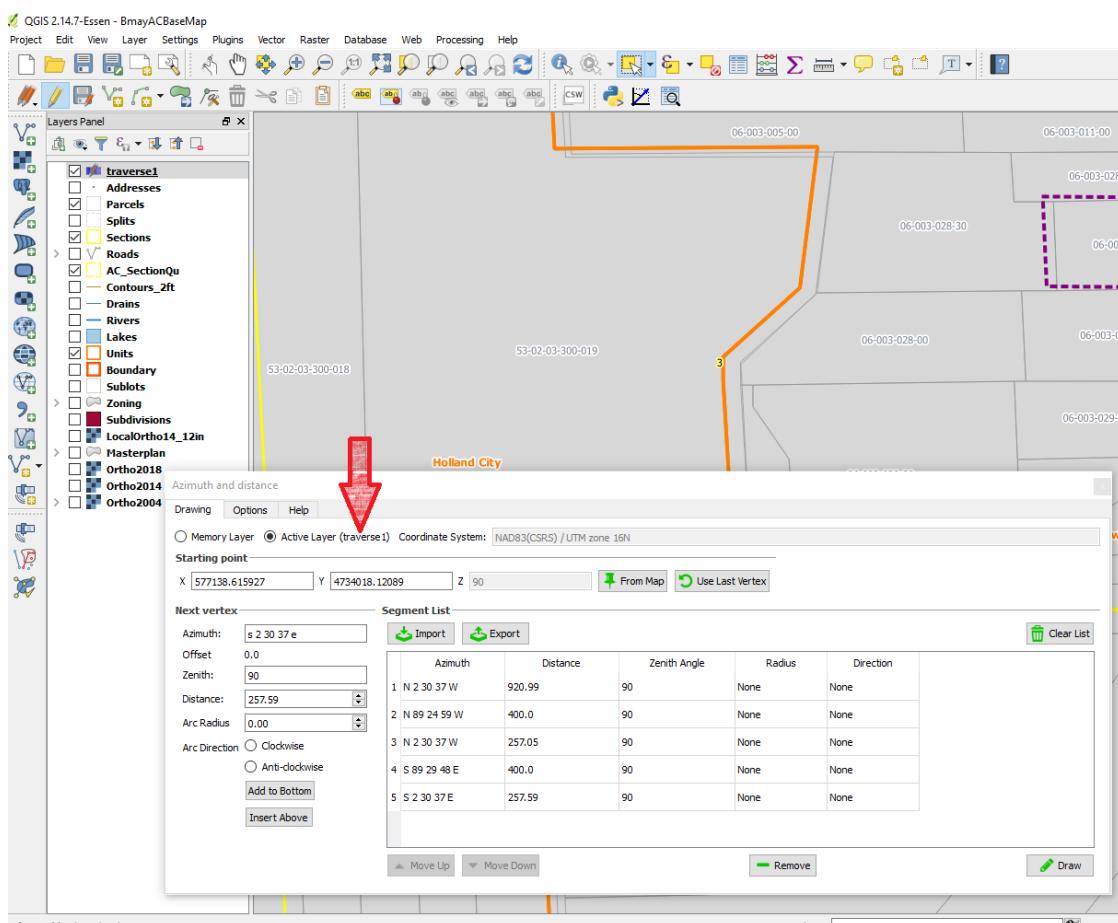


Figure 6.50: Check Active Layer

## Configure Options in Plugin

On the **Options** Tab: Select these radio buttons;

- **Boundary**
- **Bearing**
- **Feet**
- **Degree**

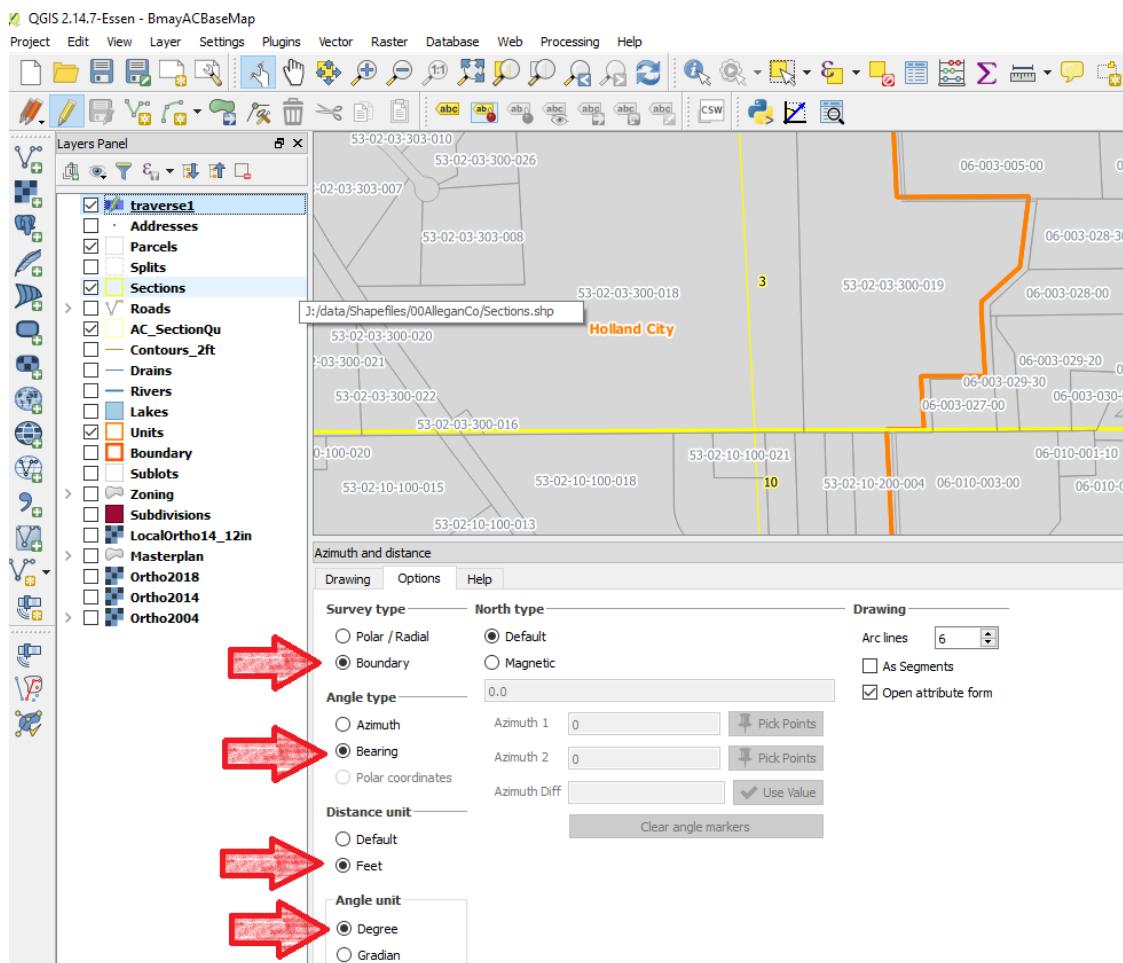


Figure 6.51: Plugin Options

## Step 2: Activate traverse layer in map

\*For a map layer to be editable, it must be activated in the Layers Panel.

(If necessary) left click the layer **traverse1** in Layer Panel to activate it.

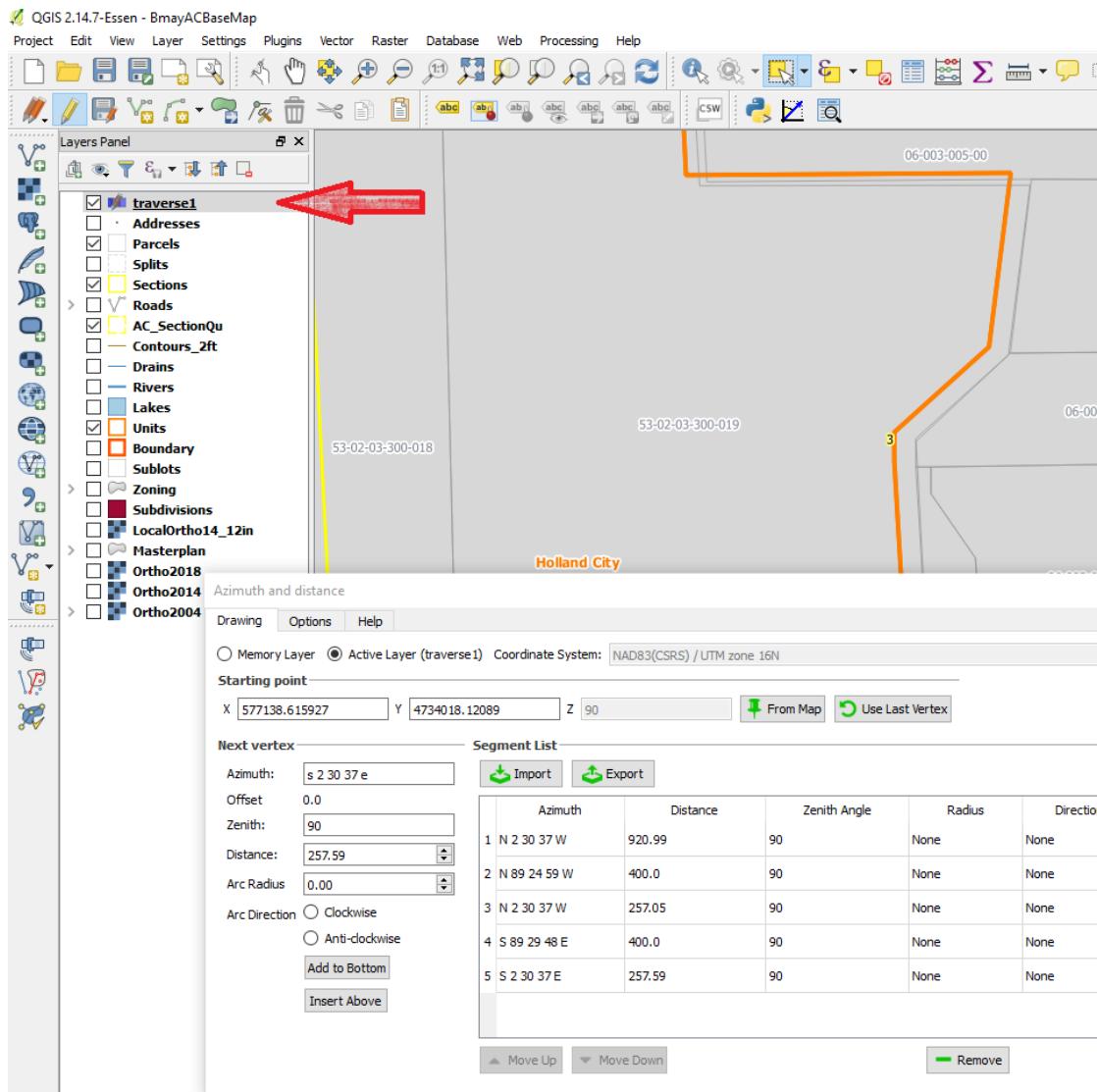


Figure 6.52: activate layer

## Step 3: Locate the Point of Commencement

To get to the Point of Commencement,

Use **any combination** of the following methods:

- Use Reference Layers such as Units, Sections, Quarter Sections, and Parcels.

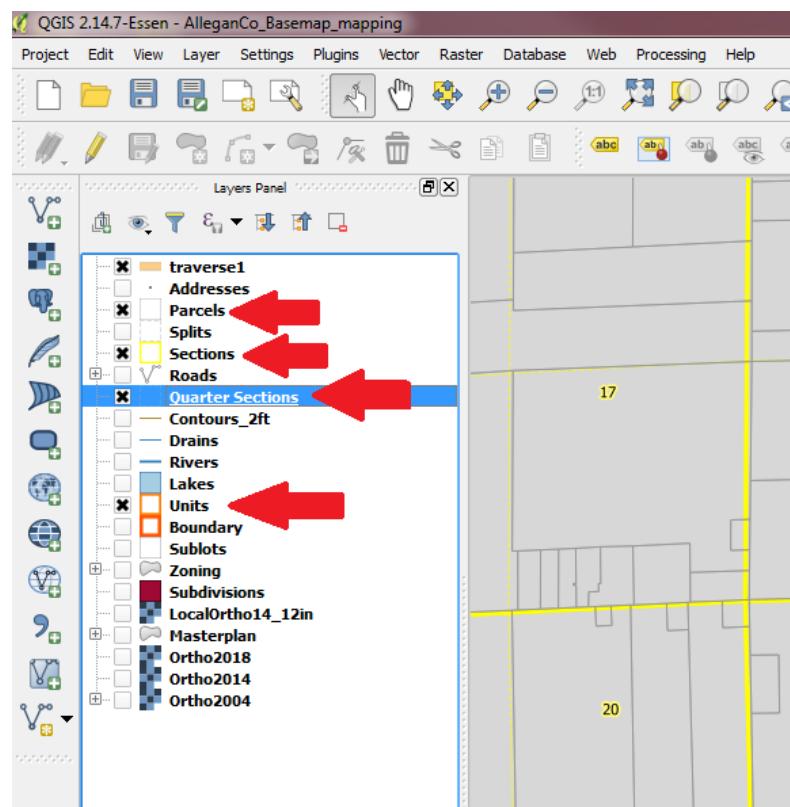


Figure 6.53: Select Reference Layers

➤ Use the Measuring Tool

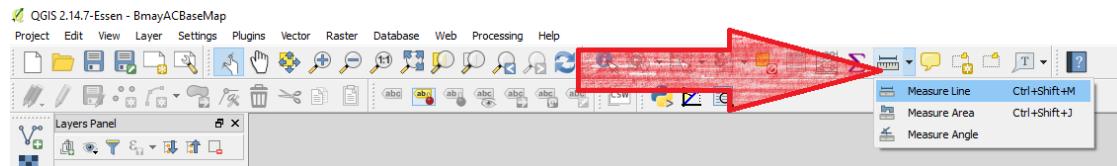


Figure 6.54: Measuring Tool

➤ Search by Parcel Number (Search Layers Plugin)



Figure 6.55: Search Layer Icon

➤ Draw COGO lines (Step 4)

## Step 4: Draw a Line With Azimuth and Distance

Commencing at Southeast corner of Section 1, Town 2 North, Range 11 West, Martin Township, Allegan County, Michigan; thence North 88 degrees 32 minutes 05 seconds West 1338.44 feet along the south line of said section to the point of beginning; thence North 01 degrees 27 minutes 55 seconds East 388 feet; thence South 88 degrees 32 minutes 05 seconds East 584 feet, more or less, to the centerline of the Gun River; thence southerly along said centerline to the south section line; thence West along said section line to the point of beginning.

Figure 6.56: Description From Deed

### On the Drawing Tab:

- Azimuth (bearing): Enter Bearing in format: *N 88 32 05 W*
- Offset: Set to *0*
- Zenith: Set to *90*
- Distance: Enter Feet Distance in numbers only *1338.44*

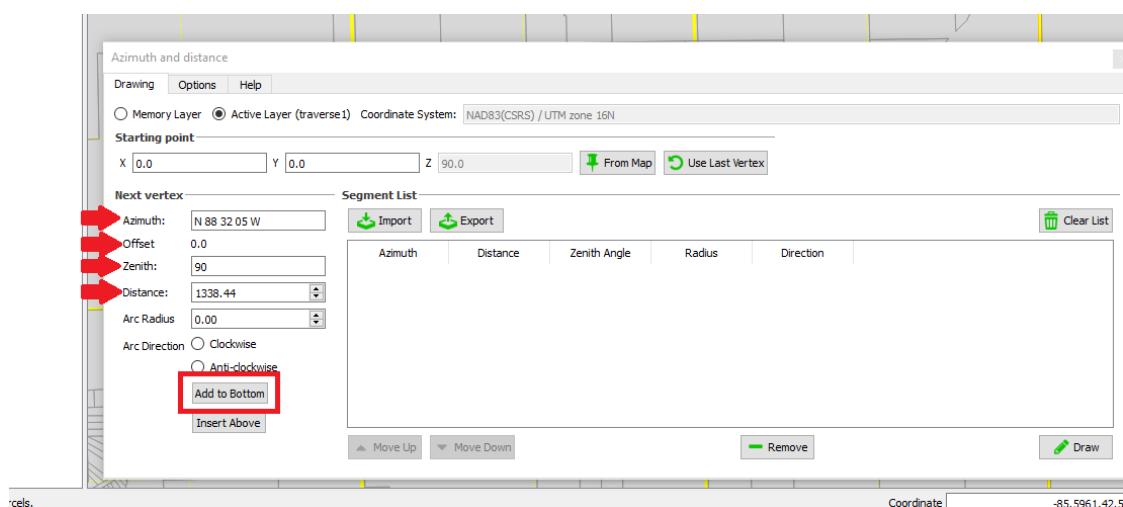


Figure 6.57: Entering Bounds

Push **Add to Bottom**

## Line is added to the list

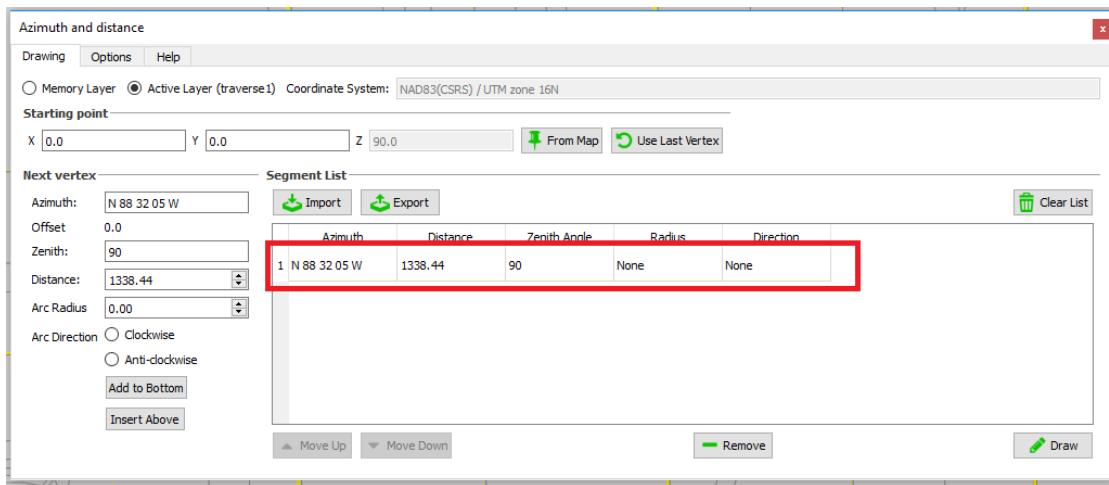


Figure 6.58: Line Added

Add as many bounds as you can from the description

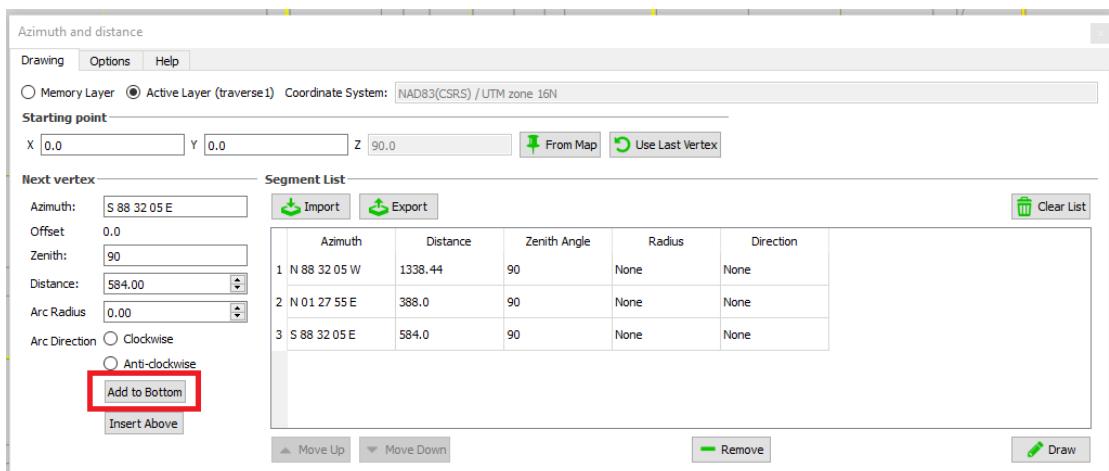


Figure 6.59: Three Lines Added

## Choose A Point to Start Drawing From

Push the **From Map** button.

\*Decide which layer to reference for a starting point.

Align cursor with desired starting point and click.

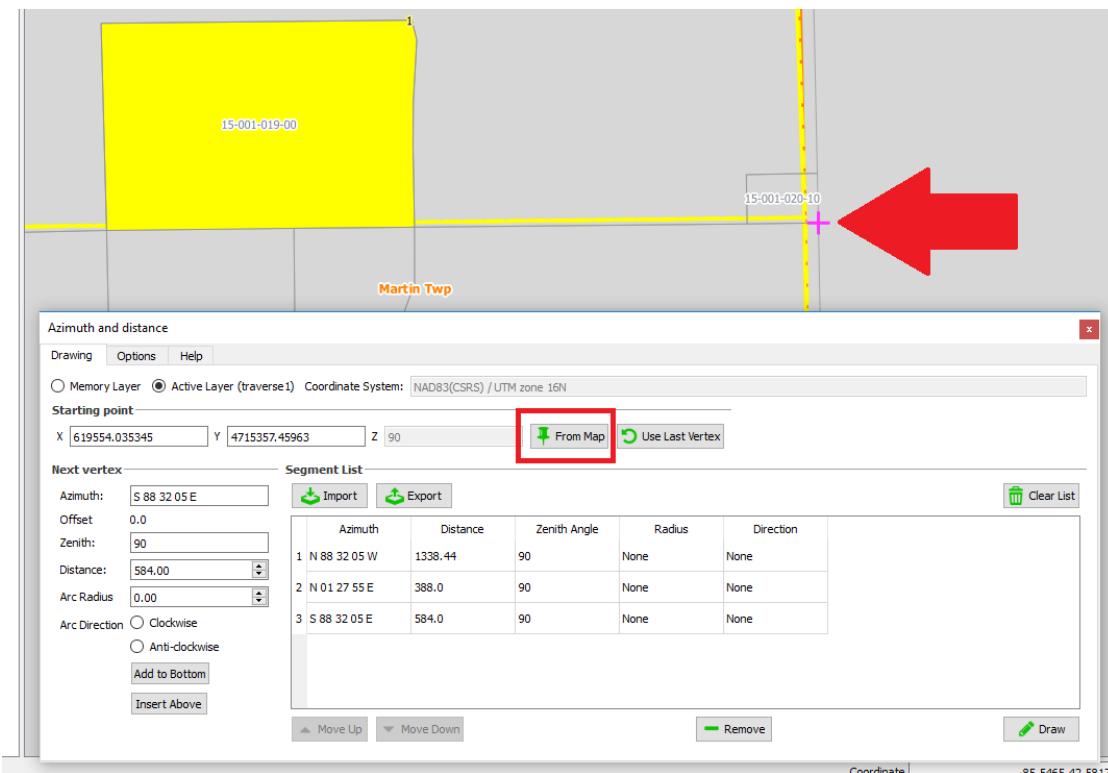


Figure 6.60: From Map

## Draw the Segments So Far

- Push **Draw**
- Enter Attributes for the polyline to be created
- Press **OK**

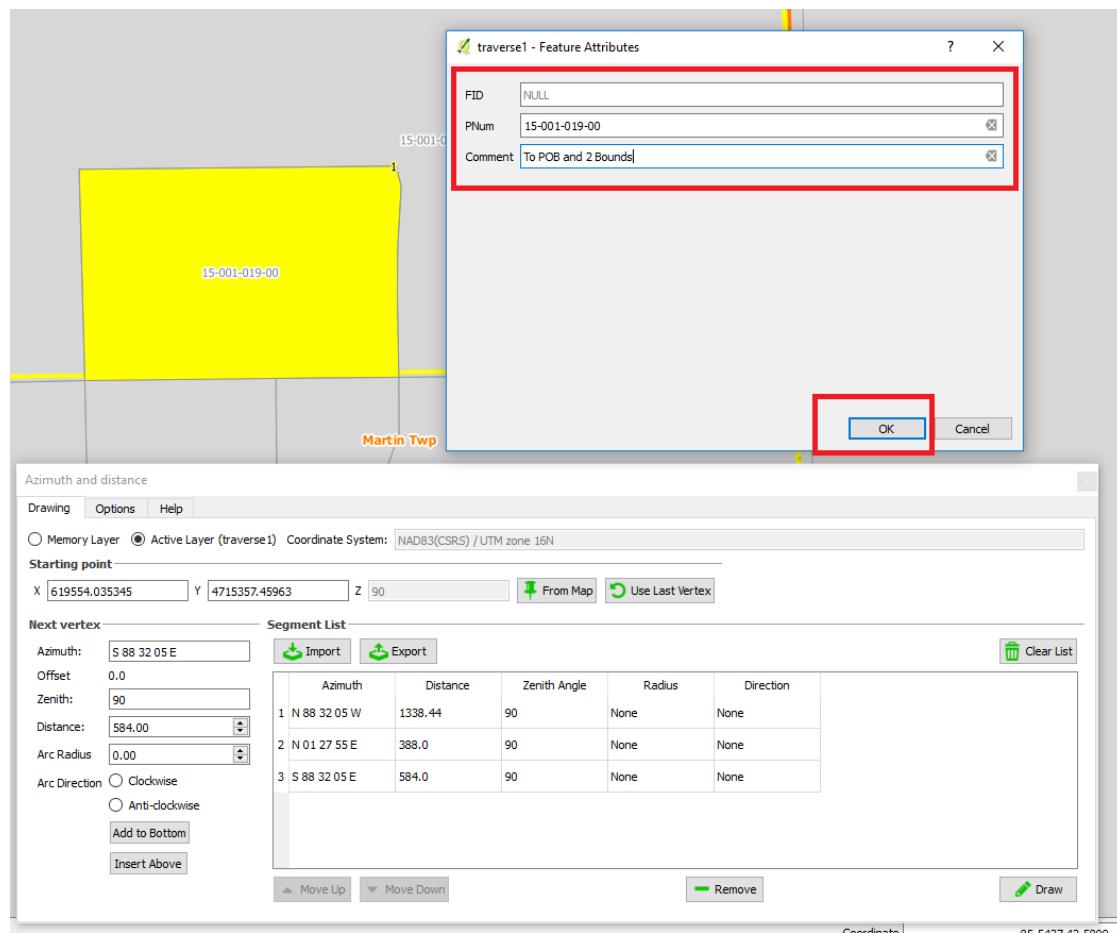


Figure 6.61: Enter Attributes

## Use the sketch to identify the parcel

In this case, turn on ortho photo to verify the remaining bounds.

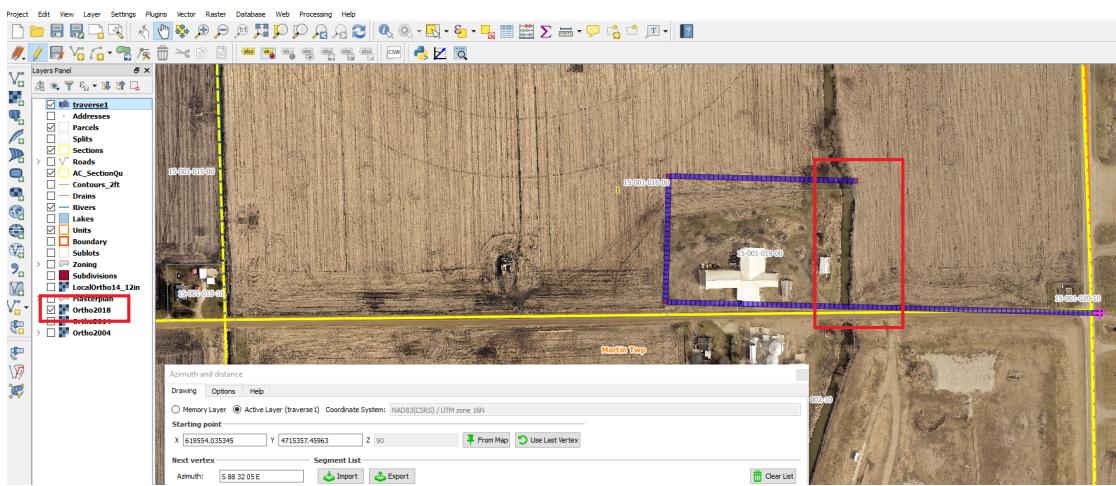


Figure 6.62: Verify Remaining Bounds

## (optionally) Save Input for Later Use

If you want to save the segments for later use, press **Export**.

Name it and select a **save** location.

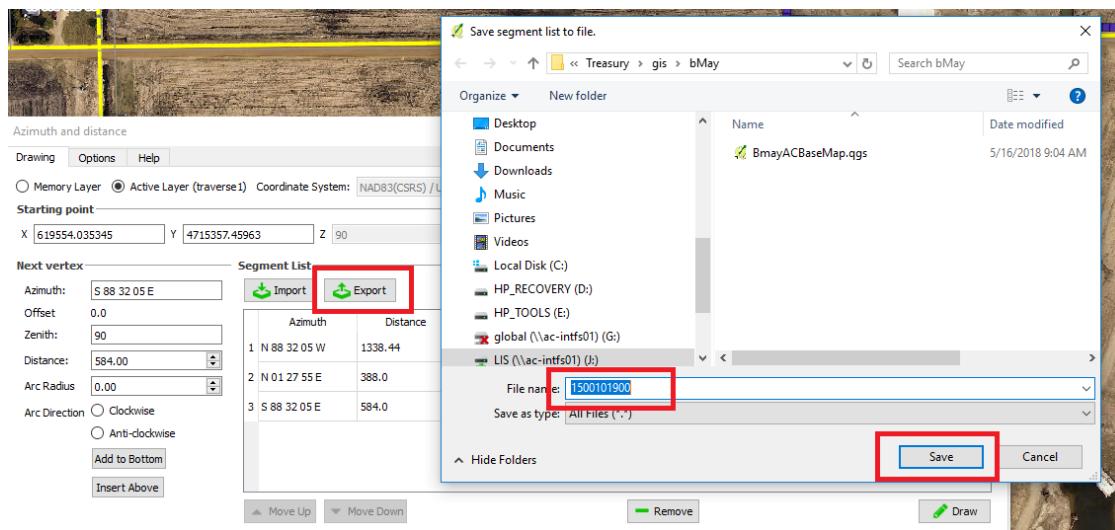


Figure 6.63: Save Segment List

## Verify Attributes

Right click on **Traverse1** in the Layers Panel

and select **open attribute table**.

The attributes you entered should be in the table.

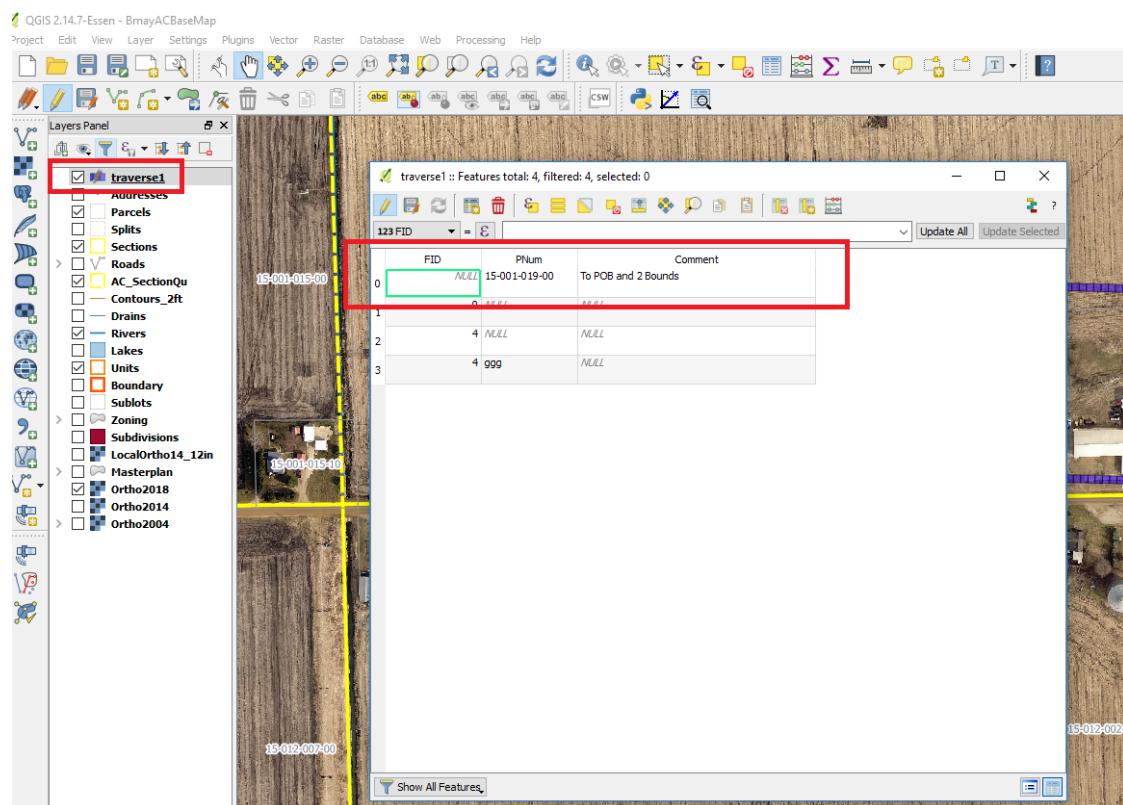


Figure 6.64: Segments In Table

### 6.9.3 SEARCH LAYERS PLUGIN

#### TOOL SUMMARY

QGIS has some tools built in and others can be added via the Plugin architecture.

#### Background

QGIS is an open source GIS and search by feature attributes is needed.

#### Who the Tool is For

QGIS users that require a search by attributes tool.

#### Why the Tool is Needed

QGIS users need a tool to search for features by attribute.

#### Takeaway

The Search Layers Plugin can be added to any installation of QGIS.

## P L U G I N S E T U P

### Install Search Layers Plugin

- To install: Plugins ⇒ **Search Layers** Plugin ⇒ Install

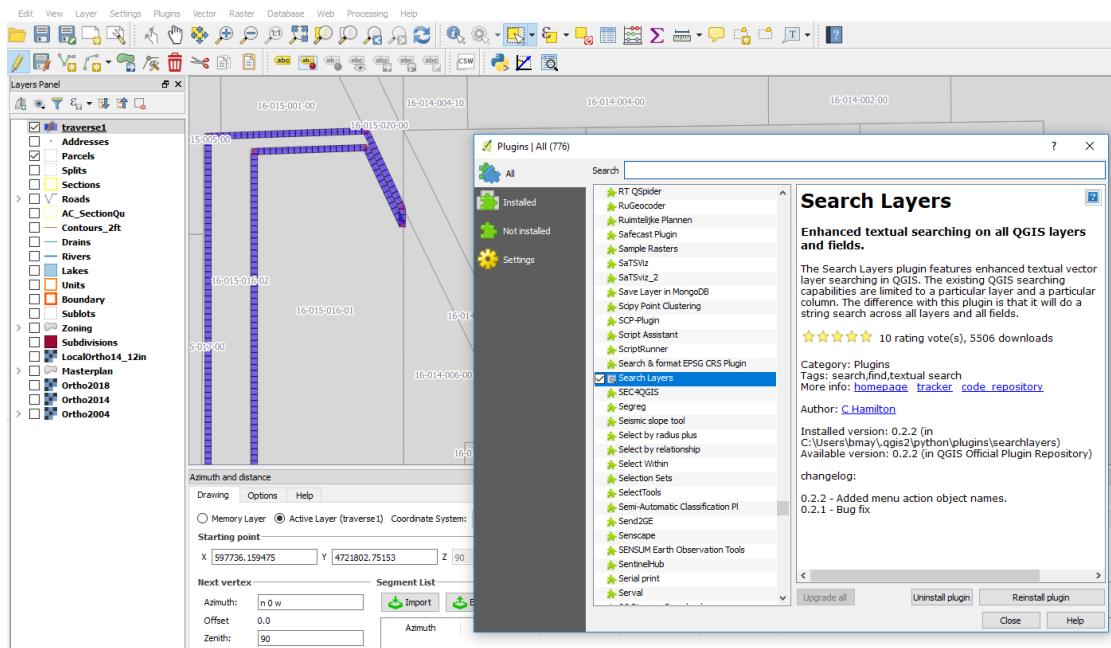


Figure 6.65: Search Layers Plugin

### Search Layers Plugin Tool is Added to the Toolbar



Figure 6.66: Search Layer Icon

## USING THE PLUGIN

## Enter Parcel Search Data

## In The Search Layers Plugin:

- Enter **parcel number** (with dashes) into *Search String*
- Select **Parcels** in *Search Layers*
- Select **PARCELID** in *Search Fields*
- Select **=** in *Comparison*

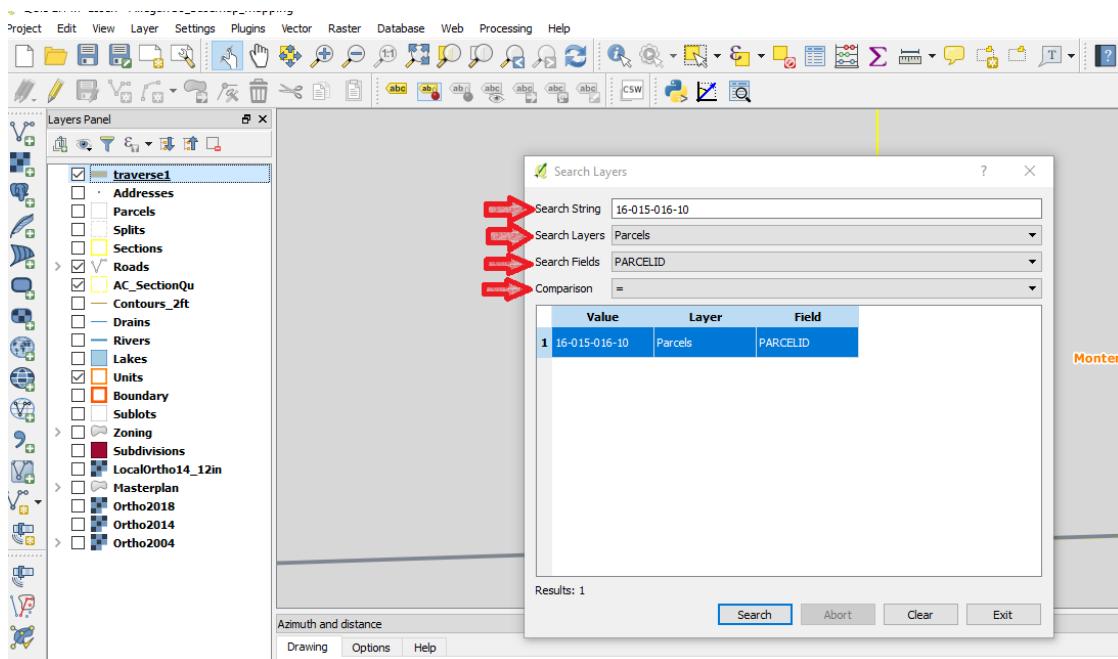


Figure 6.67: Search Layers Setup

- click on result in table

Screen zooms into the selection

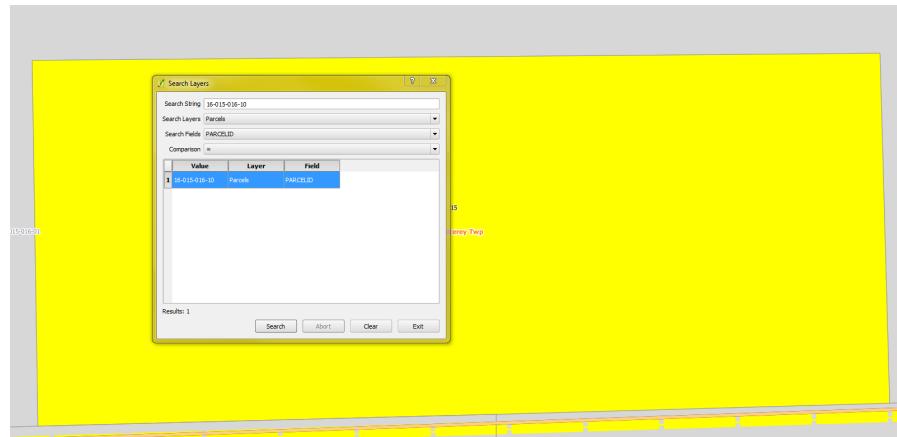


Figure 6.68: Search Results

Zoom out far enough to find a reference point



Figure 6.69: Search Results Zoomed Out

# Part IV

# Resources



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## Reading Room

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ESRI PRODUCT DOCUMENTATION  
ARCGIS ENTERPRISE

### arcgis 10.5 Enterprise Functionality Matrix

Document Link

## G E O G R A P H Y 1 0 1

### T E R M S A N D A B B R E V I A T I O N S

#### BLM Glossary of Terms

[Document Link](#)

### C O O R D I N A T E S Y S T E M S

#### A Primer on Coordinate Systems Commonly Used in Michigan

[Document Link](#)

### P L S S R E S O U R C E S

#### PLSS Development Notes

[Document Link](#)

#### Theoretical Township Map

[Document Link](#)

#### US Public Land Survey System

[Document Link](#)

## PRINTING RESOURCES

### PAGE SIZES

#### ANSI Size Illustration

[Document Link](#)

#### Standard Paper Size Guide

[Document Link](#)

STATE RESOURCES

STATE TAX COMMISSION

## State Tax Commission Course on Legal Description

[Document Link](#)

V E R S I O N   C O N T R O L   R E S O U R C E S

G I T   R E S O U R C E S

## git Branching Model

Document Link



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## Task Summaries

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### S U R V E Y P L A N S

### U S I N G C O O R D I N A T E S F R O M S U R V E Y P L A N S

### H O W T O U S E N O R T H I N G A N D E A S T I N G C O O R D I N A T E S T A B L E

**Using a spreadsheet to convert the dimensions** To use Northing and Easting from survey plans: In a spreadsheet, adjust the data to be relative to the 1st point

So if a survey gives you:

Pt	Northing	Easting
1	995.9952	9766.6
2	994.3049	9112
3	989.234	7150
4	1194.3099	9114
5	1193.266	8710.2059
6	1193.0954	8644.2016
...	...	...
32	1617.7856	8827.4296

Table 1: Survey Plan Northing and Easting

Calculate Relative North and Relative Easting of the points to Point 1 by subtracting the point 1 values from each of the other points.

Use formulas:

	A	B	C	D	E
1	Pt	Northing	Easting	Relative NS	Relative EW
2	1	995.9952	9766.6	0	0
3	2	994.3049	9112	=B3-B\$2	=C3-C\$2
4	3	989.234	7150	=B4-B\$2	=C4-C\$2
...	...	...	...	...	...
6	32	1617.7856	8827.4296	=B9-B\$2	=C9-C\$2

Table 2: Survey Plan Northing and Easting

Giving you:

	A	B	C	D	E
1	Pt	Northing	Easting	Relative NS	Relative EW
2	1	995.9952	9766.6	0	0
3	2	994.3049	9112	-1.6903	-654.6
4	3	989.234	7150	-6.7612	-2616.6
...	...	...	...	...	...
6	32	1617.7856	8827.4296	621.7904	-939.1704

Table 3: Relative Northing and Easting

So to place pt 32:

From pt 1:

Use distances 621.7904' N and 939.1704'W

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## References

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- [1] Artiflex, *ghostscript.com*, 2018. 191
- [2] na, *The hyperref package*, CTAN, na ed., na na. 179



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## Glossary

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**git** An open source version control system. 15



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# Index

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ANSI Paper, 171  
ArcGIS Enterprise 10.5 functionality  
    matrix, 169  
  
BLM, 170  
  
coordinate systems, 170  
  
File Rename, 142  
  
georef, 170  
git Branching Model, 173  
  
map projections, 170  
Michigan, 170  
  
paper sizes, 171  
PDF Optimization, 143  
PLSS, 170  
  
State Plane, 170  
State Tax Commission, 172  
  
Town and Range, 170  
Township(Theoretiocal Diagram), 170