

Finding the Needle in a Haystack: Query Filters and Thematic Rules in Autodesk AutoCAD Map 3D

Scott Mizzak

Application Engineer

scottm@cadtechnologycenter.com

Key learning objectives

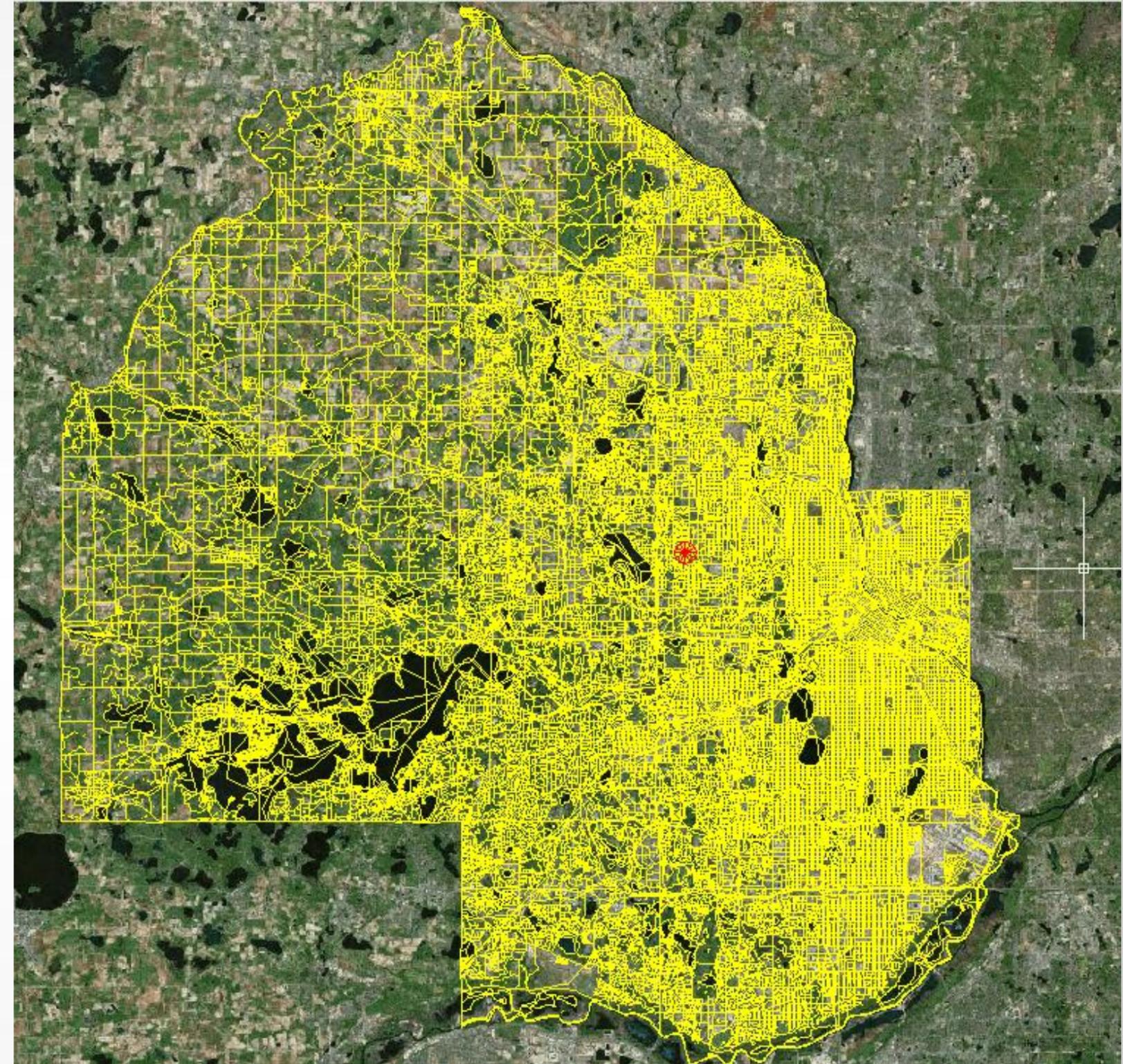
At the end of this discussion, you will be able to:

- Understand the process of using query filters
- Understand the hierarchy within the tool for complex filters
- Create maps that will tell the story without overwhelming the reader.
- Counters – When a feature has multiple values after a join.

Query Filter

| | | | | |
|---|----|----|-----|----------|
|  | 16 | 27 | 053 | 43619456 |
|  | 17 | 27 | 053 | 43619450 |
|  | 18 | 27 | 053 | 43679396 |
|  | 19 | 27 | 053 | 43831821 |
|  | 20 | 27 | 053 | 43855815 |
|  | 21 | 27 | 053 | 43831606 |
| | 22 | 27 | 053 | 43659824 |
|  | 23 | 27 | 053 | 43619268 |
|  | 24 | 27 | 053 | 43619296 |
|  | 25 | 27 | 053 | 43619516 |
|  | 26 | 27 | 053 | 43831598 |
|  | 27 | 27 | 053 | 43677157 |

Row of 81892 | 0 [Search to Select](#) | Options ▾



MTFCC Codes:

| MTFCC Code | Feature Class | Super Class | Description |
|------------|---------------------------|-----------------------|--|
| H1100 | Connector | Hydrographic Features | Hydrographic connection between two nonadjacent water features |
| H3010 | Stream/River | Hydrographic Features | A Natural flowing waterway |
| H3020 | Canal, Ditch, Aqueduct | Hydrographic Features | An artificial Waterway constructed to transport water |
| L4020 | Powerline | Misc. Linear Feature | One or more wires, often on elevated towers |
| L4110 | Fence Line | Misc. Linear Feature | A man-made barrier enclosing or bordering a field, yard, etc |
| L4140 | Property/Parcel Line | Misc. Linear Feature | A line defined as beginning at one location and ending at another |
| P0001 | Nonvisible Linear Bnd. | Bounding Edges | A boundary line that does not correspond to visible feature (Shoreline) |
| P0002 | Perennial Shoreline | Bounding Edges | Permanent boundary between land and water for a feature that exists year round |
| P0004 | Non-visible edge | Bounding Edges | A bounding Edge that does not represent a legal boundary. (Bay meets an Ocean) |
| R1011 | Railroad Feature | Rail Features | A line of fixed rails or tracks that carries mainstream railroad traffic. |
| S1100 | Primary Road | Road/Path Features | Generally Divided, Limited Access Highways |
| S1200 | Secondary Road | Road/Path Features | Main arteries, usually US Highway, State Highway or County Highway systems |
| S1400 | Rural Roads | Road/Path Features | Generally a paved non arterial streets that has a single lane of traffic in each direction |
| S1500 | Vehicular Trail | Road/Path Features | Unpaved dirt trail where a four-wheel drive vehicle is required |
| S1630 | Ramp | Road/Path Features | Allows controlled access from adjacent roads onto a limited access highway |
| S1640 | Service Drive | Road/Path Features | A road, usually paralleling a limited access highway |
| S1710 | Walkway/Trail | Road/Path Features | A path used for walking |
| S1720 | Stairway | Road/Path Features | A pedestrian passageway from one level to another by a series of steps |
| S1730 | Alley | Road/Path Features | A service road that does not generally have associated addressed structures |
| S1740 | Private Road | Road/Path Features | A road within private property that is privately maintained for service |
| S1750 | Internal US Census Bureau | Road/Path Features | Internal US Census Bureau use |
| S1780 | Parking Lot Road | Road/Path Features | the main travel route for vehicles through a paved parking area. |

Complete list of all codes: https://www.census.gov/rdo/pdf/AttD_MAF_TIGER_Feature_Classification_Codes.pdf

Scale Ranges for Layer tl_2009_27053_edges_CalcProp1

Add a Scale Range Duplicate Delete Up Down

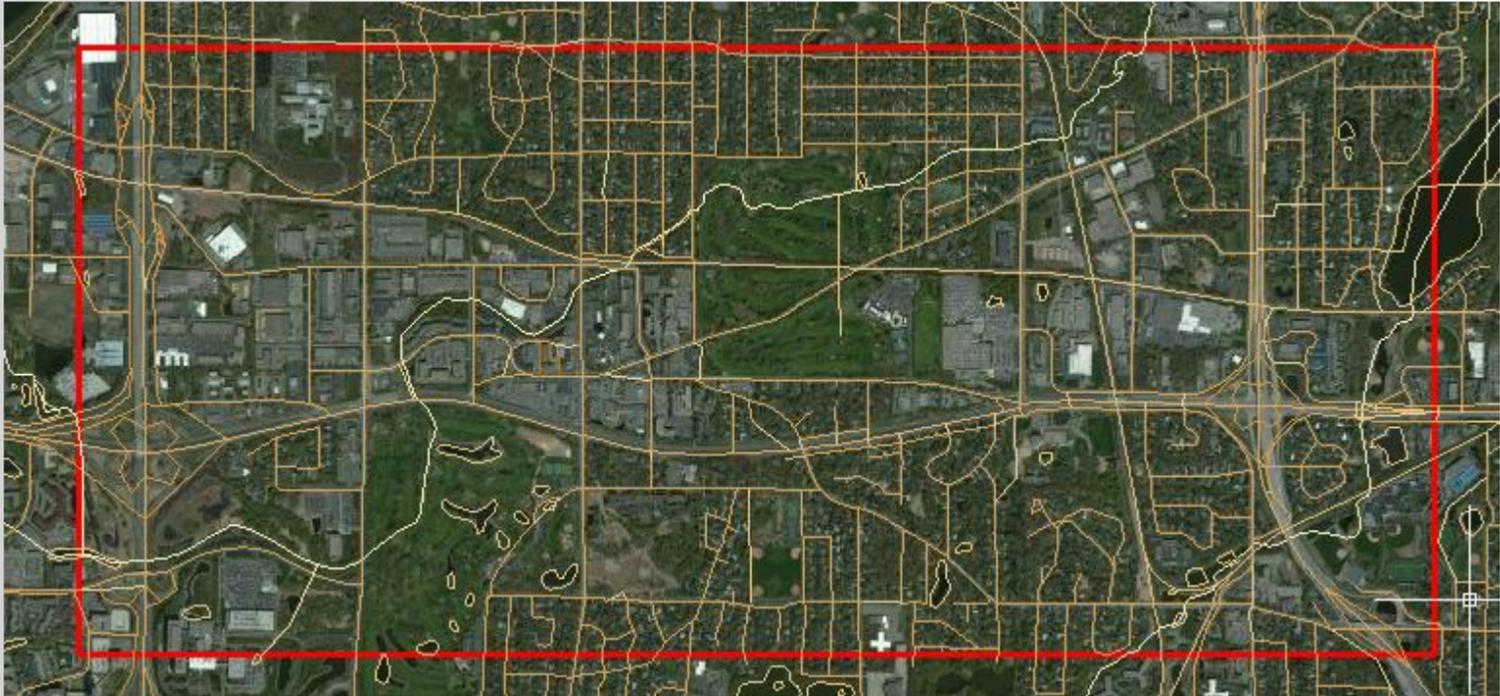
| From | To |
|------|----------|
| 0 | Infinity |

Line Style for 0 - Infinity Scale Range

New Theme... Add a Rule Duplicate Delete Delete All Up Down

| Thematic Rules | Style | Legend Label |
|-------------------|-------|--------------|
| "MTFCC" = 'H1100' | ... | H1100 |
| "MTFCC" = 'H3010' | ... | H3010 |
| "MTFCC" = 'H3020' | ... | H3020 |
| "MTFCC" = 'L4020' | ... | L4020 |
| "MTFCC" = 'L4110' | ... | L4110 |
| "MTFCC" = 'L4140' | ... | L4140 |
| "MTFCC" = 'P0001' | ... | P0001 |
| "MTFCC" = 'P0002' | ... | P0002 |
| "MTFCC" = 'P0004' | ... | P0004 |
| "MTFCC" = 'R1011' | ... | R1011 |
| "MTFCC" = 'S1100' | ... | S1100 |
| "MTFCC" = 'S1200' | ... | S1200 |
| "MTFCC" = 'S1400' | ... | S1400 |
| "MTFCC" = 'S1500' | ... | S1500 |
| "MTFCC" = 'S1630' | ... | S1630 |
| "MTFCC" = 'S1640' | ... | S1640 |
| "MTFCC" = 'S1710' | ... | S1710 |
| "MTFCC" = 'S1720' | ... | S1720 |
| "MTFCC" = 'S1730' | ... | S1730 |
| "MTFCC" = 'S1740' | ... | S1740 |
| "MTFCC" = 'S1750' | ... | S1750 |
| "MTFCC" = 'S1780' | ... | S1780 |

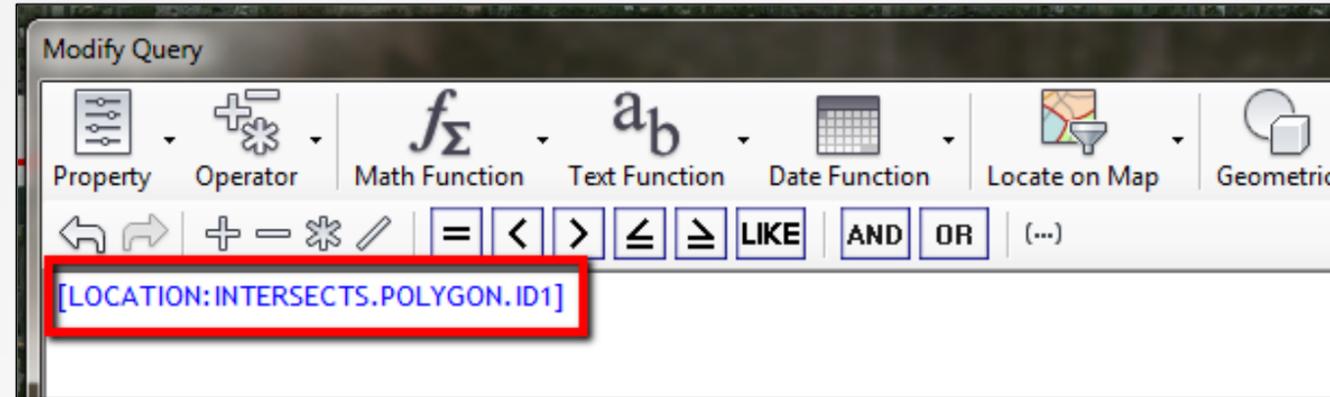
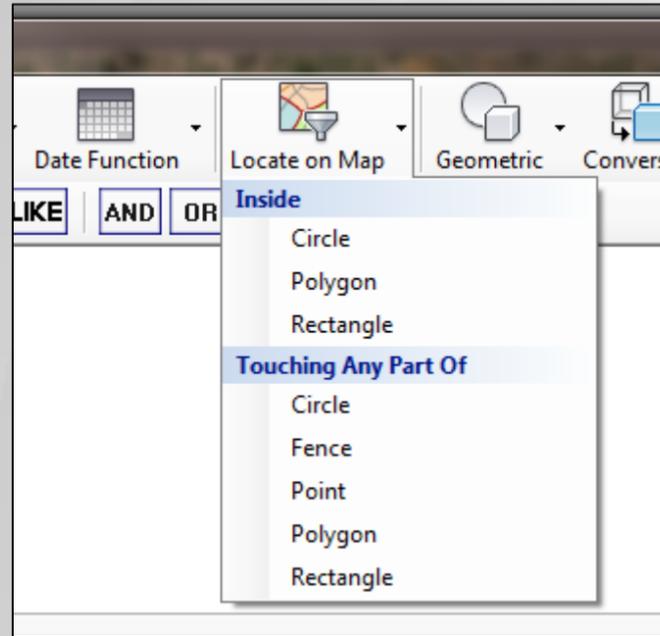
This is all I want:



- Only Road that falls within the box
- Only road classified as
 - 'S1100'
 - 'S1200'
 - 'S1400'
 - 'S1630'

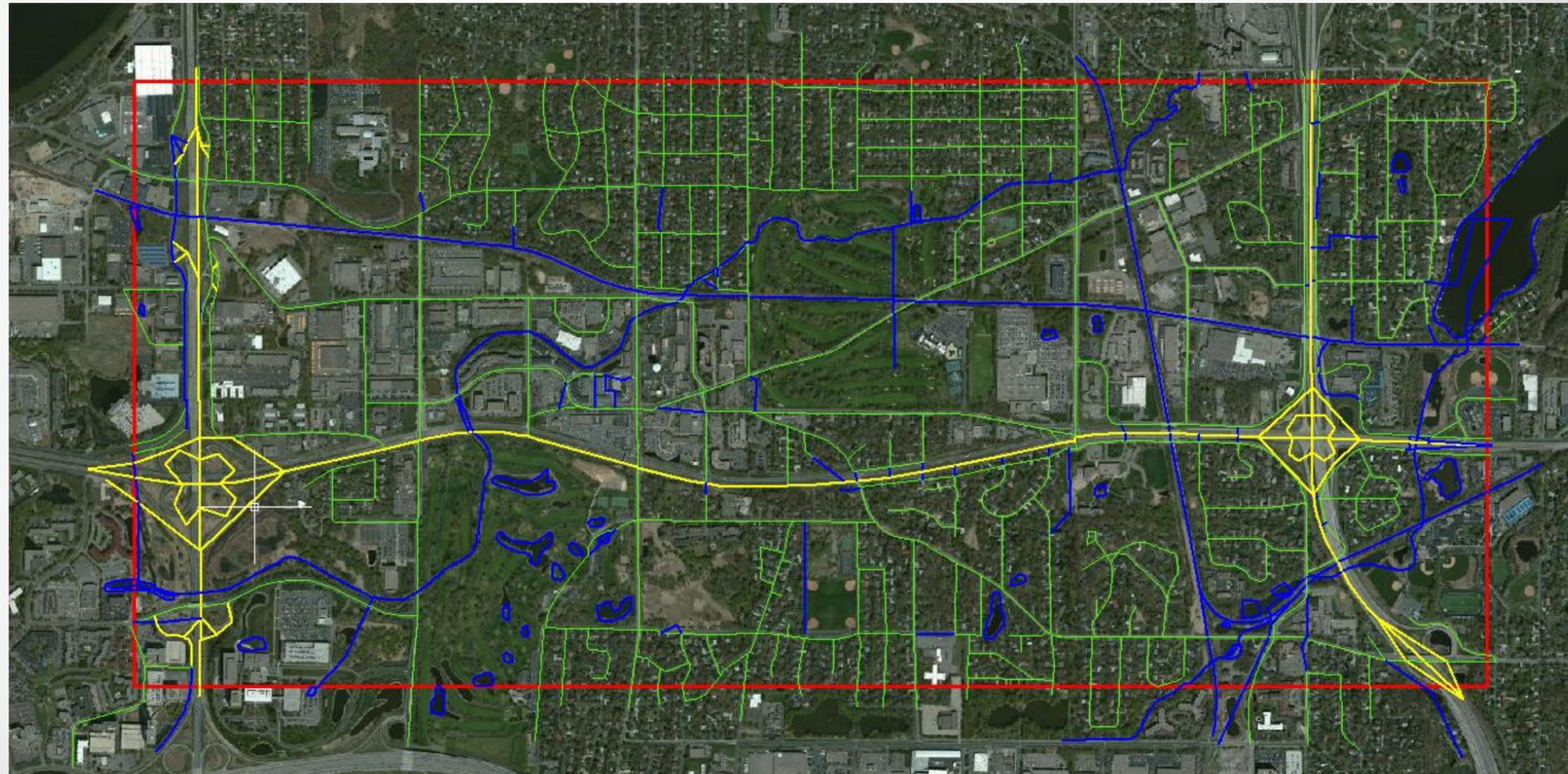
Now What?

Isolate all lines in the Polygon:

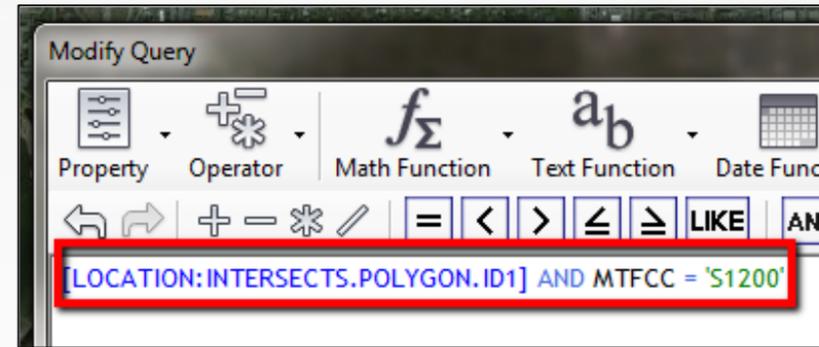
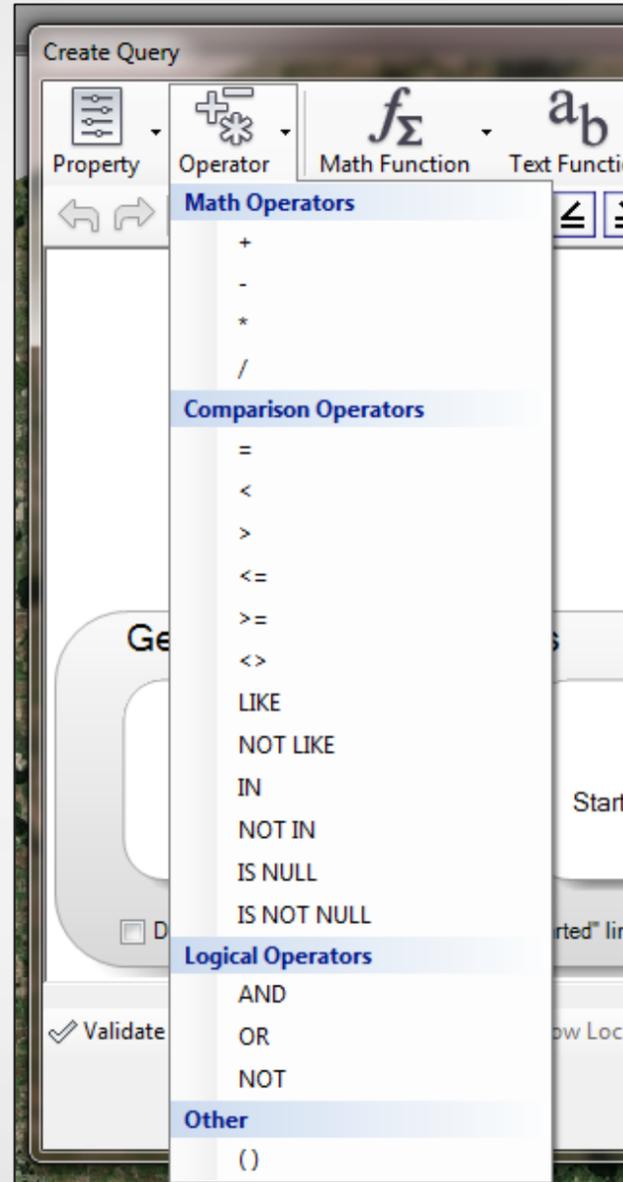
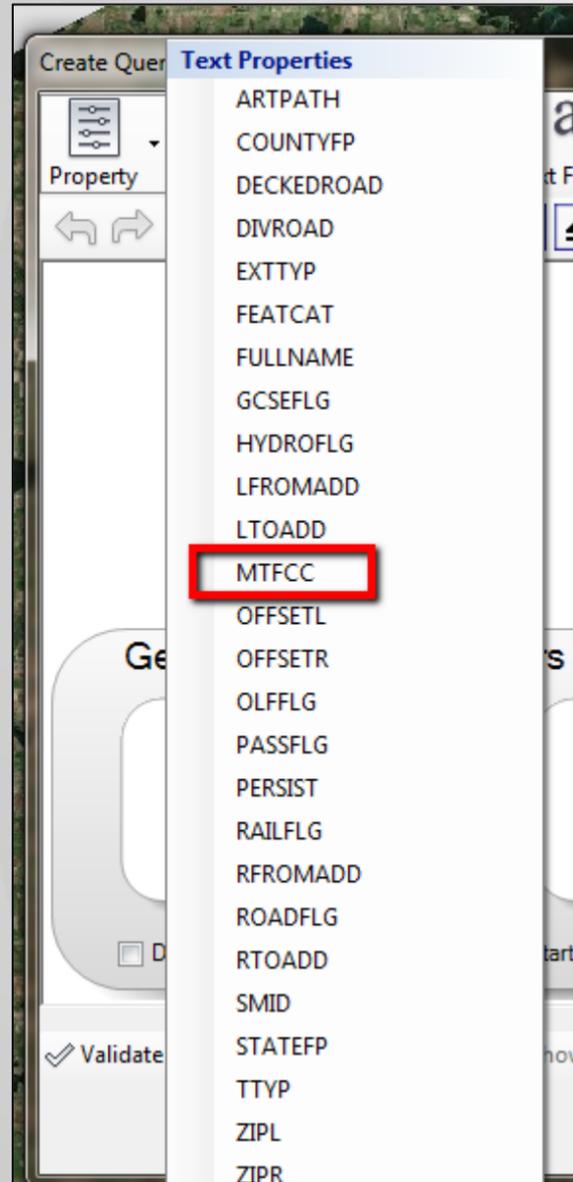


A screenshot of a Data Table. The table has three columns. The first column contains the values 216, 2531, 2536, 2538, 2539, and 2540. The second column contains the value 27 for all rows. The third column contains the value 053 for all rows. The table is titled 'Data Table' and shows 'Row of 933'.

| | | |
|------|----|-----|
| 216 | 27 | 053 |
| 2531 | 27 | 053 |
| 2536 | 27 | 053 |
| 2538 | 27 | 053 |
| 2539 | 27 | 053 |
| 2540 | 27 | 053 |

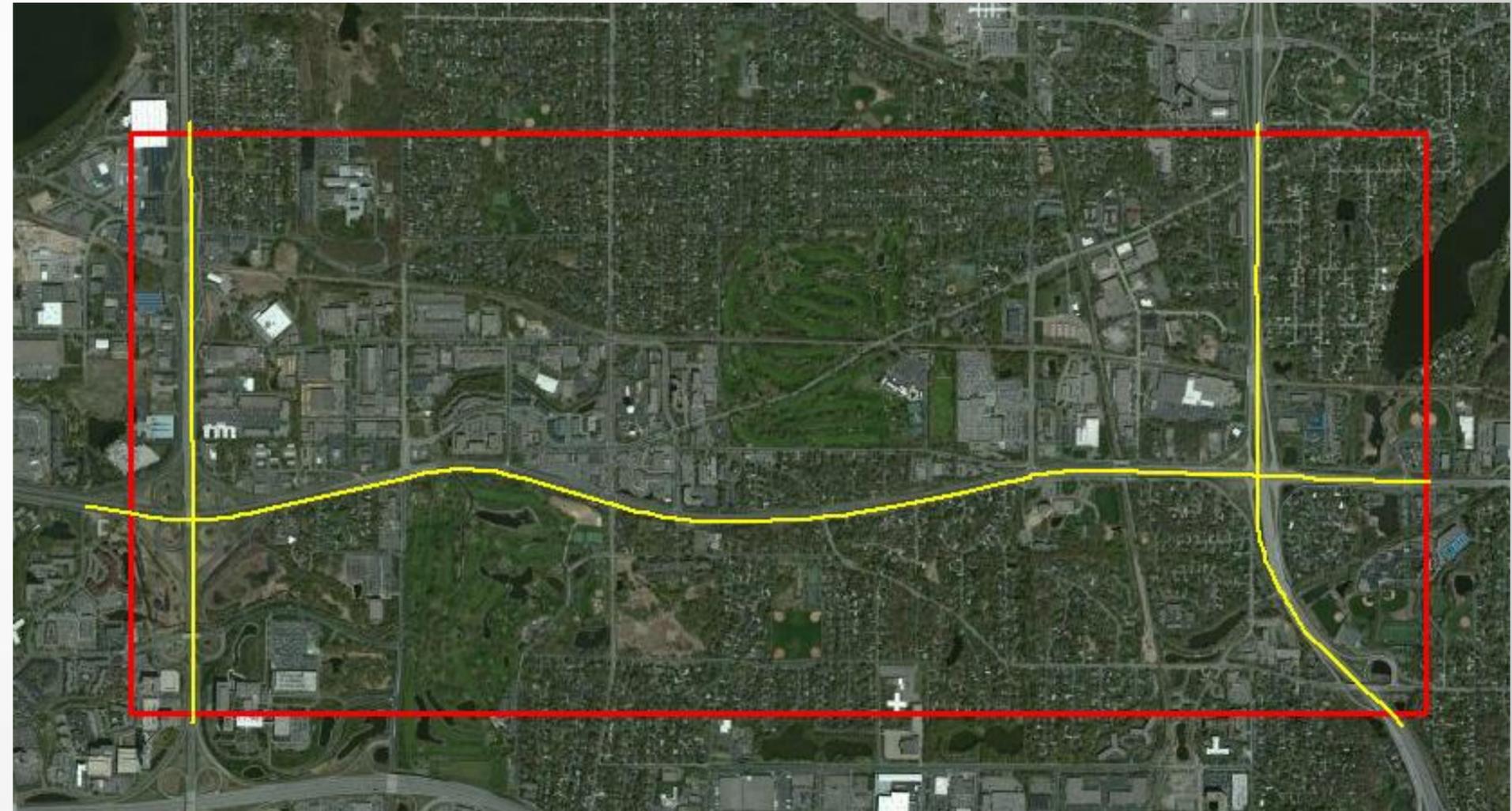


Isolate only the Roads: Compound Query

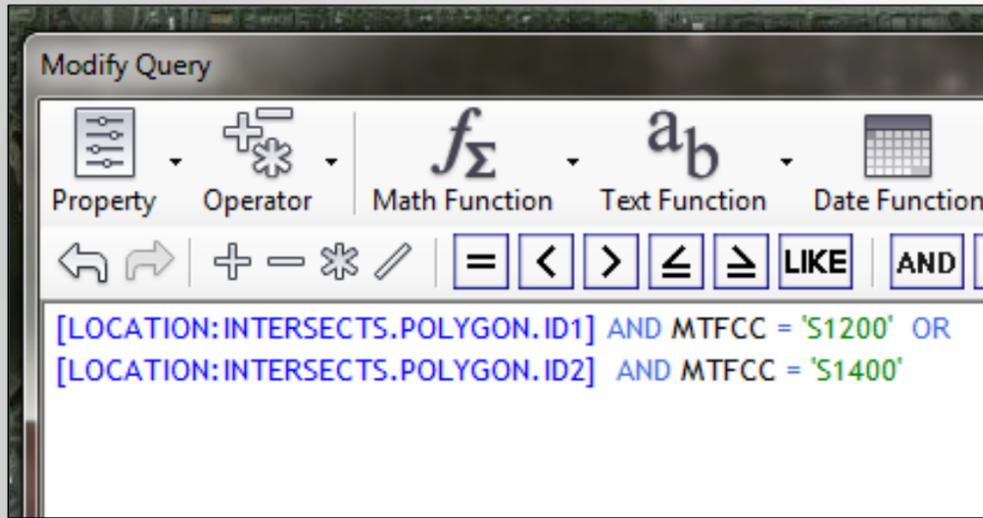


A data table is displayed, showing a list of rows with columns containing numerical values. The table is titled 'Data Table' and has a 'Row' column. The values in the columns are 20617, 23024, 23033, 23036, and 24824. The table is filtered to show 0 of 77 rows. The 'of 77 | 0' text is highlighted with a red rectangular box.

| Row | 20617 | 23024 | 23033 | 23036 | 24824 |
|-----|-------|-------|-------|-------|-------|
| | 27 | 27 | 27 | 27 | 27 |
| | 053 | 053 | 053 | 053 | 053 |

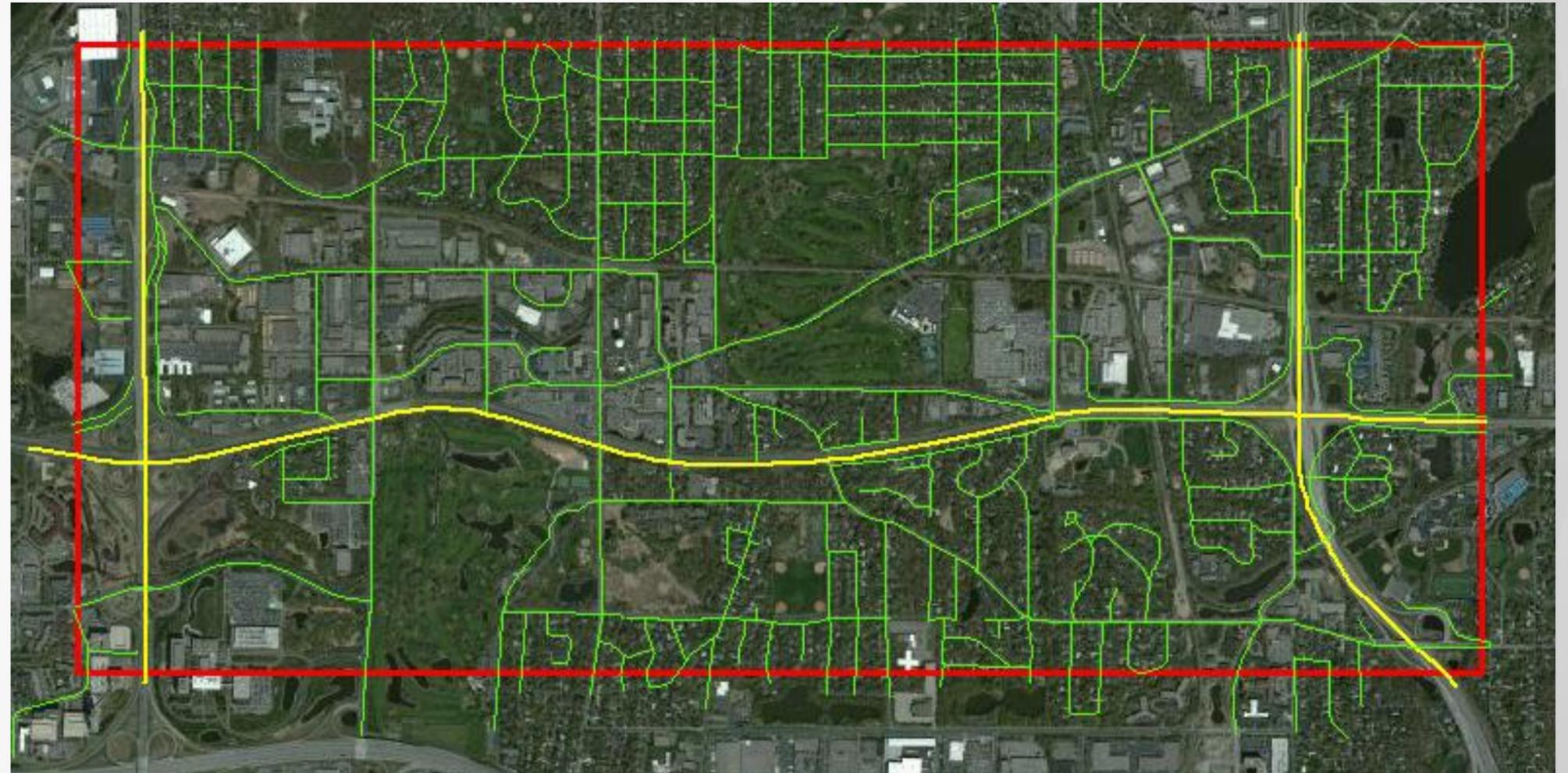


Isolating Roads: Compound - Complex Query



| | | |
|------|----|-----|
| 2559 | 27 | 053 |
| 2561 | 27 | 053 |
| 2563 | 27 | 053 |
| 2564 | 27 | 053 |

Row of 665 | 0 Search to Select Options



Isolating Roads: Completed Query

Modify Query

Property Operator Math Function Text Function Date Function

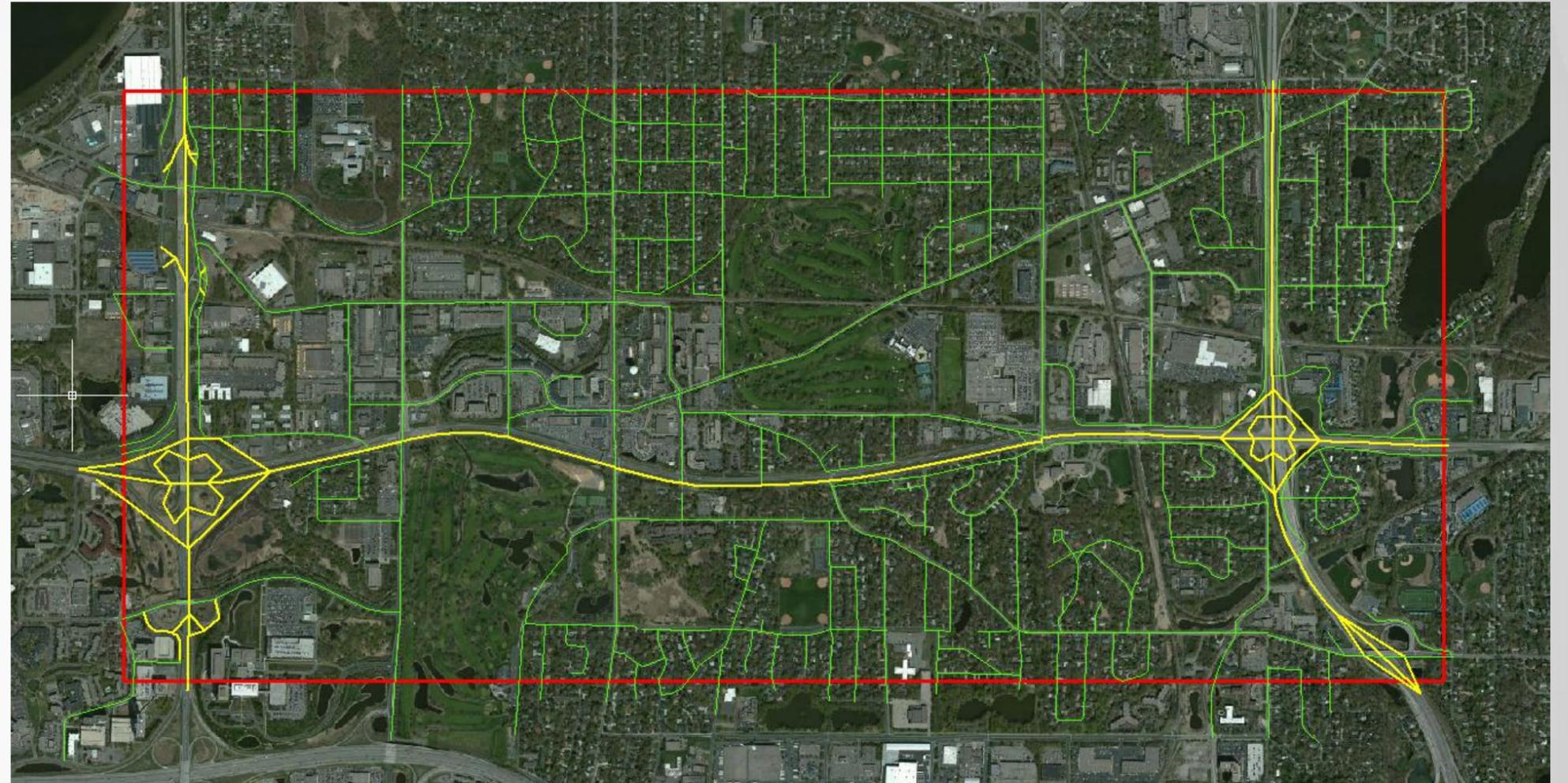
← → + - * / = < > ≤ ≥ LIKE AND OR

[LOCATION:INTERSECTS.POLYGON.ID1] AND MTFCC = 'S1200' OR
[LOCATION:INTERSECTS.POLYGON.ID2] AND MTFCC = 'S1400' OR
[LOCATION:INTERSECTS.POLYGON.ID3] AND MTFCC = 'S1100' OR
[LOCATION:INTERSECTS.POLYGON.ID4] AND MTFCC = 'S1630'

Data Table

| | | | |
|--|------|----|-----|
| | 2559 | 27 | 053 |
| | 2561 | 27 | 053 |
| | 2563 | 27 | 053 |

Row of 708 Search to Select Options



Modify Query

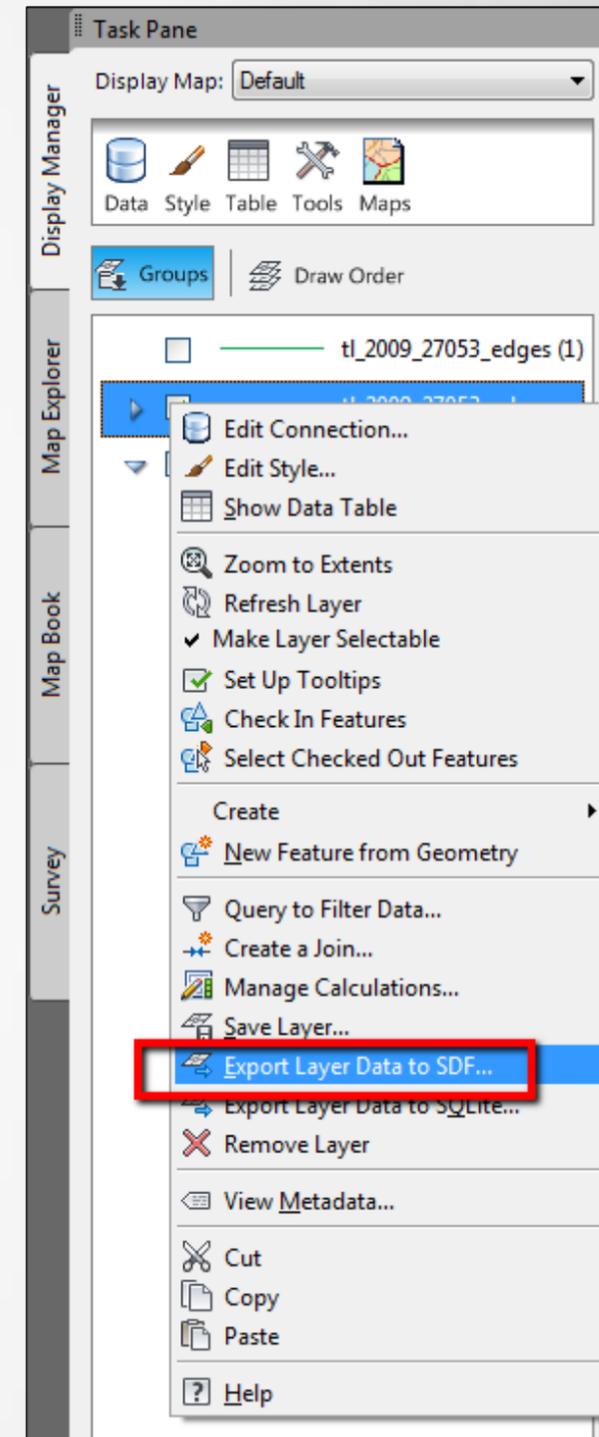
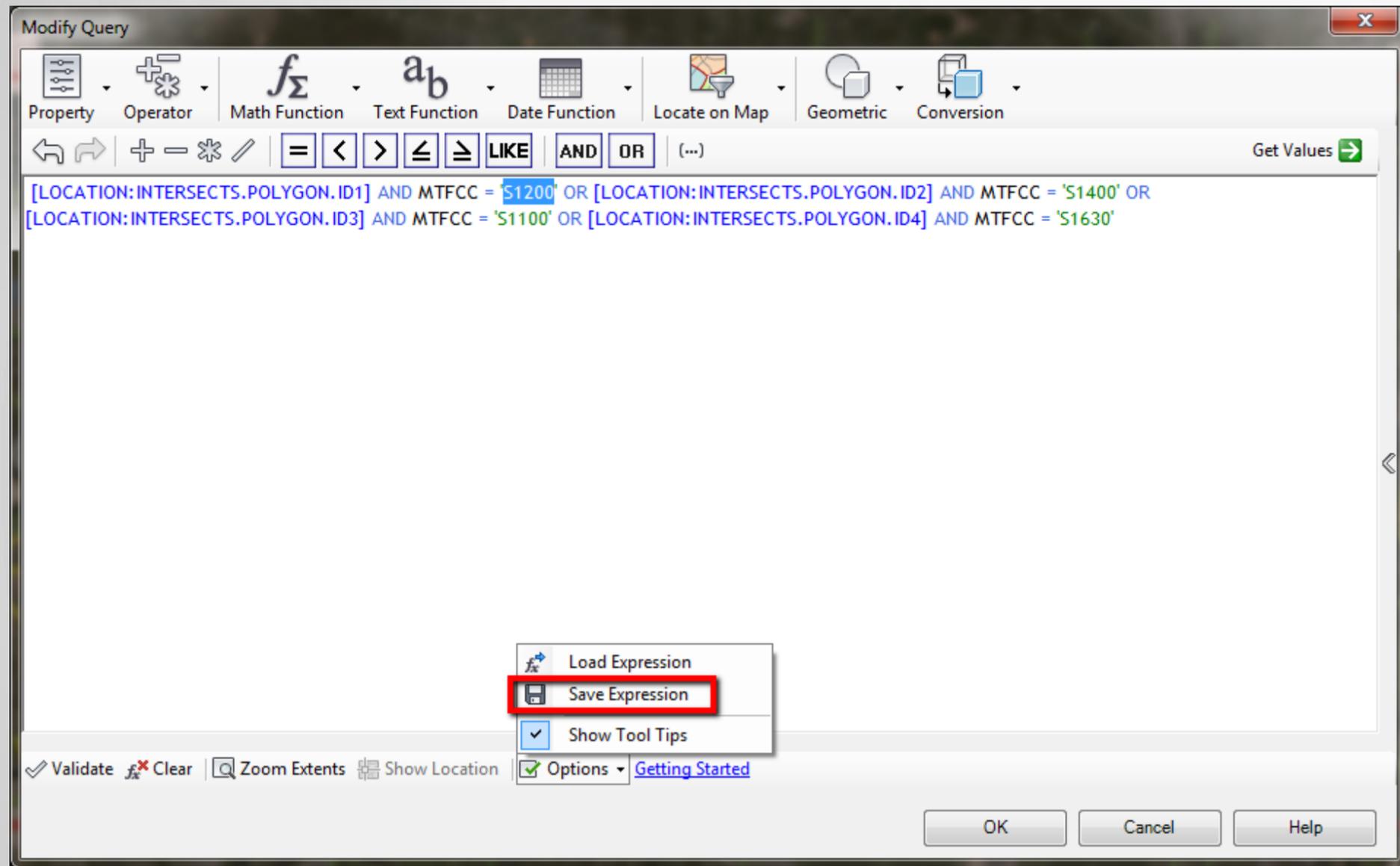
Property Operator Math Function Text Function Date Function Locate on Map Geometric Conversion

← → + - * / = < > ≤ ≥ LIKE AND OR (...)

[LOCATION:INTERSECTS.POLYGON.ID1] AND (MTFCC = 'S1200' OR MTFCC = 'S1400' OR MTFCC = 'S1100' OR MTFCC = 'S1630')

Now What?

Save the Expression and Save the Results:



Other Complex Expressions:

| 1 | Company | Name | House Number | Street Name | City | State | Zip code |
|----|-------------------------------|--------------------|--------------|---------------------|--------------|-------|----------|
| 2 | Jesse Hagemeyer | Jesse Hagemeyer | 27041 | Cty. Rd. 23 | Albany | MN | 56307 |
| 3 | Autodesk, Inc. | Rick Larson | 1190 | Schaller Rd. W | Albany | WI | 53502 |
| 4 | Design Tree Engineering | Jon Schuette | 2510 | S. Broadway St. | Alexandria | MN | 56308 |
| 5 | Advanced Engineering Concepts | Sean Bohan | 635 | Fairfax St. | Altoona | WI | 54720 |
| 6 | Hakanson Anderson | Brian Person | 3601 | Thurston Ave. | Anoka | MN | 55303 |
| 7 | Hakanson Anderson | Jeff Busse | 3601 | Thurston Ave. | Anoka | MN | 55303 |
| 8 | Dakota County | Bob Eibner | 14955 | Galaxie Ave. | Apple Valley | MN | 55124 |
| 9 | Dakota County | Jake Siebenaler | 14955 | Galaxie Ave. | Apple Valley | MN | 55124 |
| 10 | Widseth Smith Nolting | Juergen Brunkhorts | 7804 | Industrial Park Rd. | Baxter | MN | 56425 |
| 11 | City of Benson, MN | Elliot Nelson | 1410 | Kansas Ave. | Benson | MN | 56215 |
| 12 | Wright SWCD | Al Morris | 306 | Brighton Ave. | Buffalo | MN | 55313 |
| 13 | Wright SWCD | Ben Morris | 306 | Brighton Ave. | Buffalo | MN | 55313 |
| 14 | Wright SWCD | Bob Morris | 306 | Brighton Ave. | Buffalo | MN | 55313 |
| 15 | Wright SWCD | Jason Morris | 306 | Brighton Ave. | Buffalo | MN | 55313 |
| 16 | Wright SWCD | Luke Johnson | 306 | Brighton Ave. | Buffalo | MN | 55313 |

Modify Query

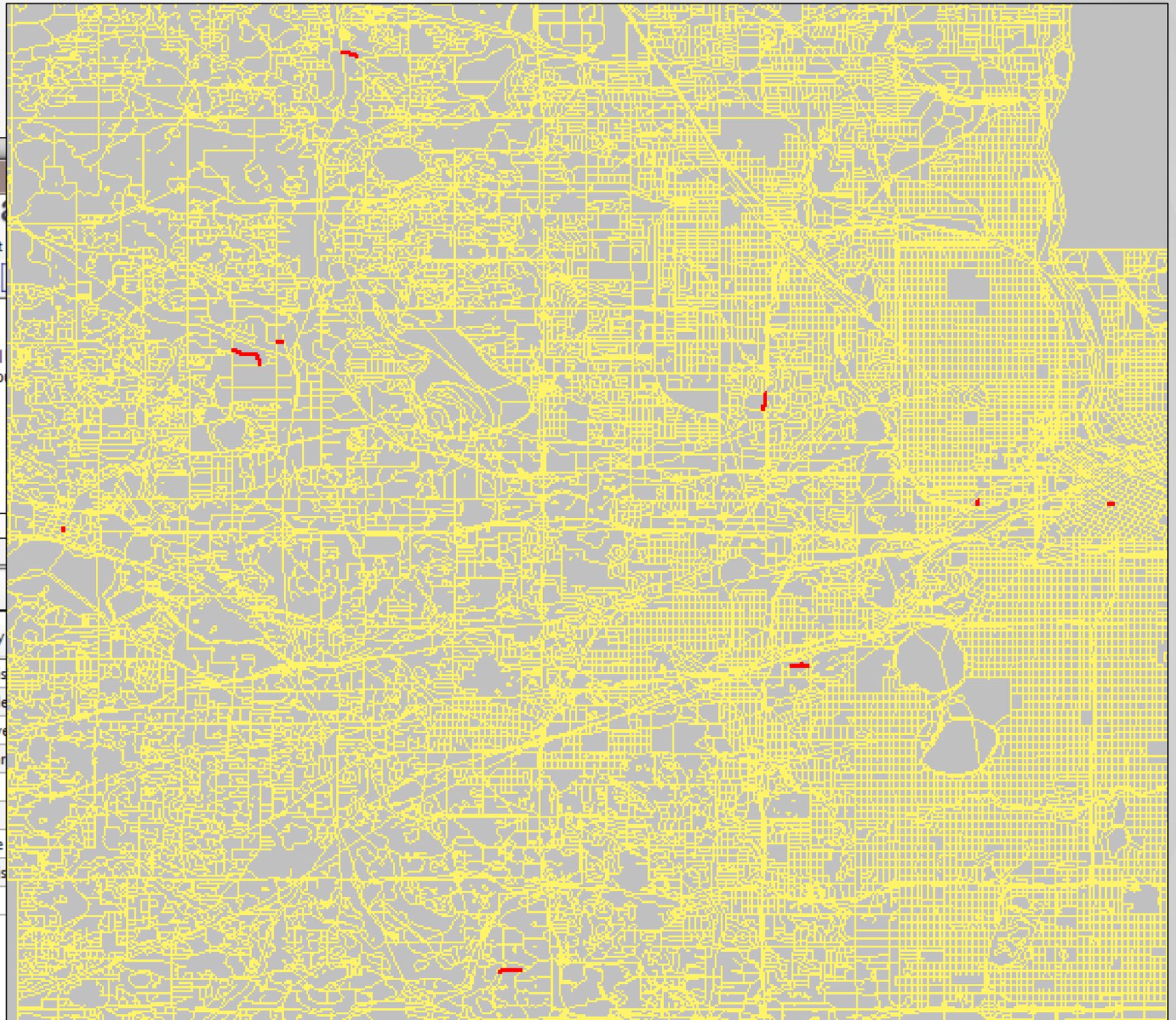
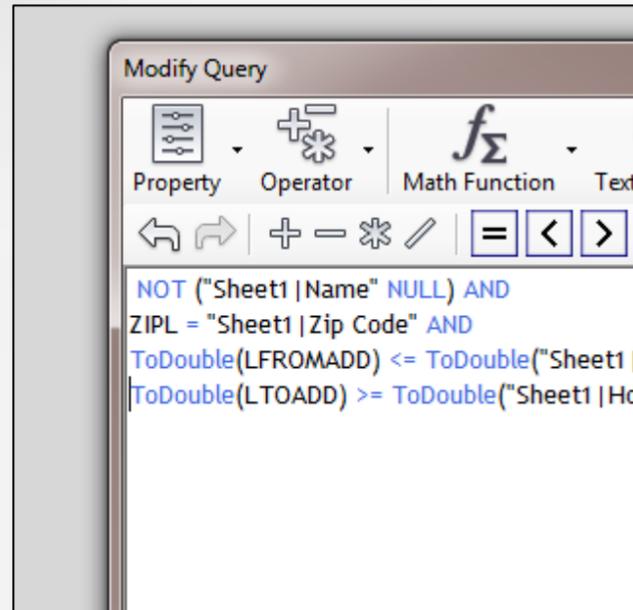
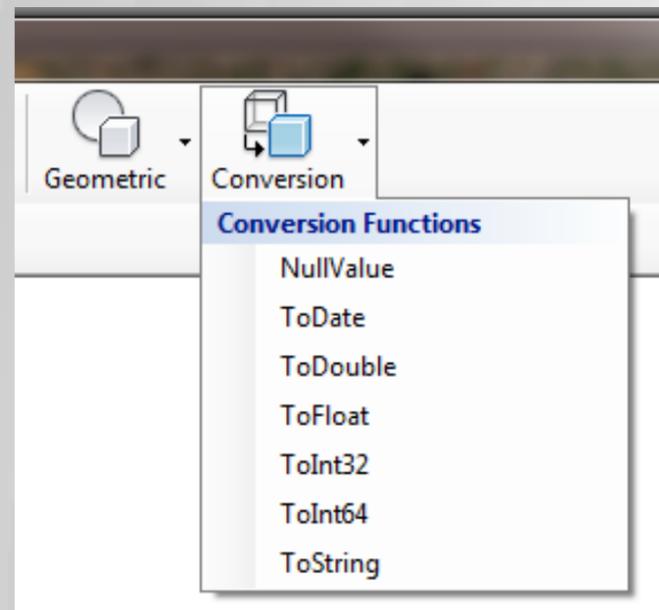
Property Operator Math Function Text Function Date

← → + - * / = < > ≤ ≥ LIKE

```
NOT ("Sheet1 | Name" NULL) AND
ZIPL = "Sheet1 | Zip Code" AND
LFROMADD <= "Sheet1 | House Number" AND
LTOADD >= "Sheet1 | House Number"
```

| FeatId | MTFCC | LFROMADD | LTOADD | ZIPL | ZIPR | FULLNAME | Sheet1 Name | Sheet1 House Number | Sheet1 Extra | Sheet1 Address | Sheet1 Company | Sheet1 City | Sheet1 State | Sheet1 Zip Code | ROA |
|--------|-------|----------|--------|-------|--------|----------------|-------------------|---------------------|--------------|----------------|-------------------|----------------|--------------|-----------------|-----|
| 2501 | S1400 | 1975 | 2089 | 55422 | <Null> | Lilac Dr N | John Rahkola | 2055 | <Null> | Lilac Dr N | MNDOT | Golden Valley | MN | 55422 | Y |
| 18252 | S1400 | 201 | 337 | 55422 | 55422 | Lilac Dr N | John Rahkola | 2055 | <Null> | Lilac Dr N | MNDOT | Golden Valley | MN | 55422 | Y |
| 52280 | S1400 | 101 | 203 | 55405 | 55405 | James Ave N | Catherine John... | 175 | <Null> | James Ave N | Water in Motio... | Minneapolis | MN | 55405 | Y |
| 80867 | S1400 | 1098 | 800 | 55422 | <Null> | Lilac Dr N | John Rahkola | 2055 | <Null> | Lilac Dr N | MNDOT | Golden Valley | MN | 55422 | Y |
| 1414 | S1400 | 22 | 98 | 55402 | 55415 | 6th St S | Dan Kvall | 50 | Suite 1100 | 6th St S | Dunham Associ... | Minneapolis | MN | 55402 | Y |
| 46996 | S1400 | 3001 | 3099 | 55447 | 55447 | Harbor Ln N | Russell Depuydt | 3025 | Suite 121 | Harbor Ln N | H Z United LLC | Plymouth | MN | 55447 | Y |
| 77823 | S1400 | 301 | 699 | 55447 | 55447 | Harbor Ln N | Russell Depuydt | 3025 | Suite 121 | Harbor Ln N | H Z United LLC | Plymouth | MN | 55447 | Y |
| 50350 | S1400 | 10027 | 10549 | 55344 | 55344 | Valley View Rd | Virginia Winberg | 10250 | Suite 123 | Valley View Rd | EVS, Inc. | Eden Prairie | MN | 55344 | Y |
| 46984 | S1400 | 14501 | 15099 | 55447 | 55447 | 28th Ave N | Kirk Mohs | 14800 | Suite 140 | 28th Ave N | MFRA | Plymouth | MN | 55447 | Y |
| 20239 | S1400 | 6889 | 6999 | 55369 | 55369 | E Fish Lake Rd | Steve Seibert | 6901 | Suite 184 | E Fish Lake Rd | AE2S | Maple Grove | MN | 55369 | Y |
| 22670 | S1400 | 4801 | 5099 | 55416 | 55416 | W 35th St | Matt Pavak | 4931 | Suite 200 | W 35th St | Civil Site Group | St. Loius Park | MN | 55416 | Y |

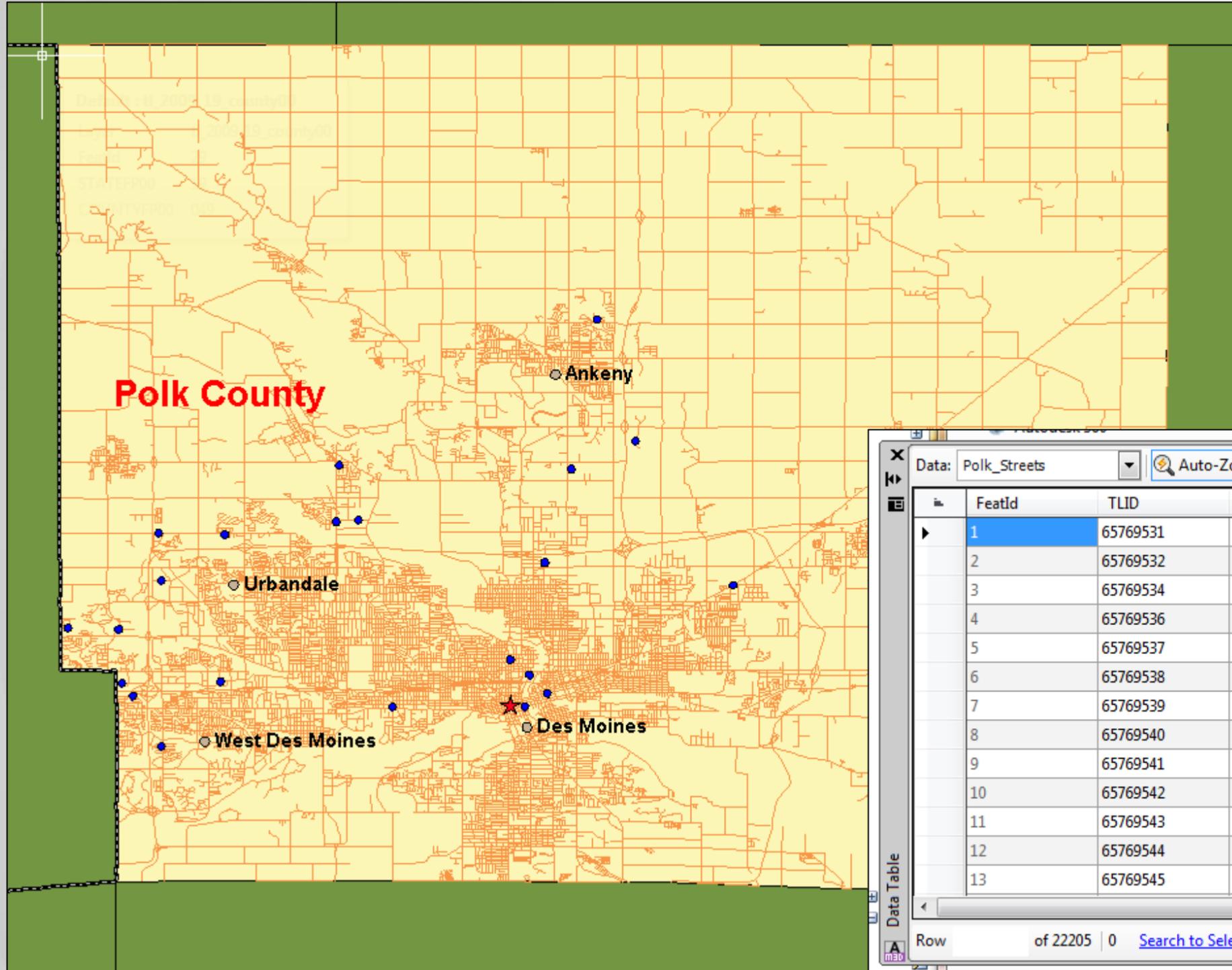
Solution:



ve TICKETS (22)

| Sheet1 Company | Sheet1 Name | Sheet1 House Number | Sheet1 Extra | Sheet1 Address | Sheet1 City |
|-------------------|-------------------|---------------------|--------------|----------------|---------------|
| Dunham Associ... | Dan Kvall | 50 | Suite 1100 | 6th St S | Minneapolis |
| MNDOT | John Rahkola | 2055 | <Null> | Lilac Dr N | Golden Valle |
| AE2S | Steve Seibert | 6901 | Suite 184 | E Fish Lake Rd | Maple Grove |
| Civil Site Group | Matt Pavek | 4931 | Suite 200 | W 35th St | St. Loius Par |
| MFRA | Kirk Mohs | 14800 | Suite 140 | 28th Ave N | Plymouth |
| H Z United LLC | Russell Depuydt | 3025 | Suite 121 | Harbor Ln N | Plymouth |
| EVS, Inc. | Virginia Winberg | 10250 | Suite 123 | Valley View Rd | Eden Prairie |
| Water in Motio... | Catherine John... | 175 | <Null> | James Ave N | Minneapolis |
| Sathre-Bergqui... | Dave Pemberton | 150 | <Null> | Broadway Ave S | Wayzata |

Manually:



Create/Modify Expressions

Property Operator Math Function Text Function Date Function Locate on Map

← → + - * / = < > ≤ ≥ LIKE AND OR (...)

TLID = 65810908 OR
TLID = 65795626 OR
TLID = 65800078 OR
TLID = 65804586 OR
TLID = 65790070 OR
TLID = 65779054 OR
TLID = 65783847 OR
TLID = 65795588 OR
TLID = 65776505 OR
TLID = 65801839 OR
TLID = 65775746 OR
TLID = 65783884 OR
TLID = 65808242

Data: Polk_Streets Auto-Zoom Auto-Scroll

| FeatId | TLID | FEDIRP | FENAME | FETYPE | ZIPL | FRADDL | TOADDL |
|--------|----------|--------|------------------|--------|--------|--------|--------|
| 1 | 65769531 | NW | 166th | Ave | 50156 | 12800 | 13094 |
| 2 | 65769532 | NW | 166th | Ave | 50156 | 11400 | 11942 |
| 3 | 65769534 | NW | 166th | Ave | <Null> | <Null> | <Null> |
| 4 | 65769536 | <Null> | State Highway 17 | <Null> | <Null> | <Null> | <Null> |
| 5 | 65769537 | <Null> | State Highway 17 | <Null> | <Null> | <Null> | <Null> |
| 6 | 65769538 | <Null> | <Null> | <Null> | <Null> | <Null> | <Null> |
| 7 | 65769539 | NW | 158th | Ave | 50156 | 14098 | 14198 |
| 8 | 65769540 | NW | 128th | St | 50156 | 15800 | 15916 |
| 9 | 65769541 | NW | 100th | St | 50156 | 15800 | 16096 |
| 10 | 65769542 | NW | 158th | Ave | 50156 | 12999 | 12801 |
| 11 | 65769543 | NW | 158th | Ave | 50156 | 13000 | 13790 |
| 12 | 65769544 | NW | 114th | St | 50156 | 15800 | 16598 |
| 13 | 65769545 | NW | 158th | Ave | 50156 | 11399 | 10789 |

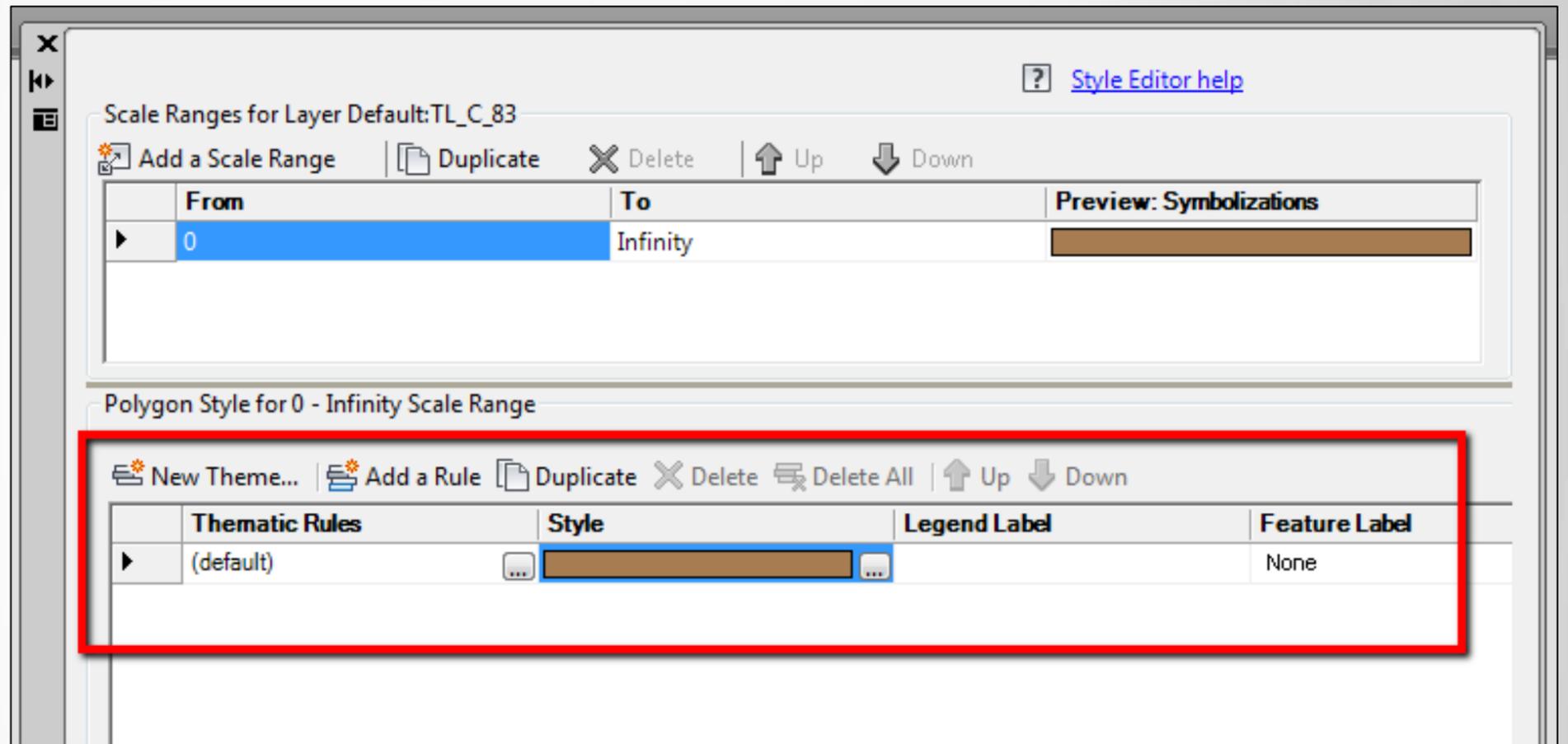
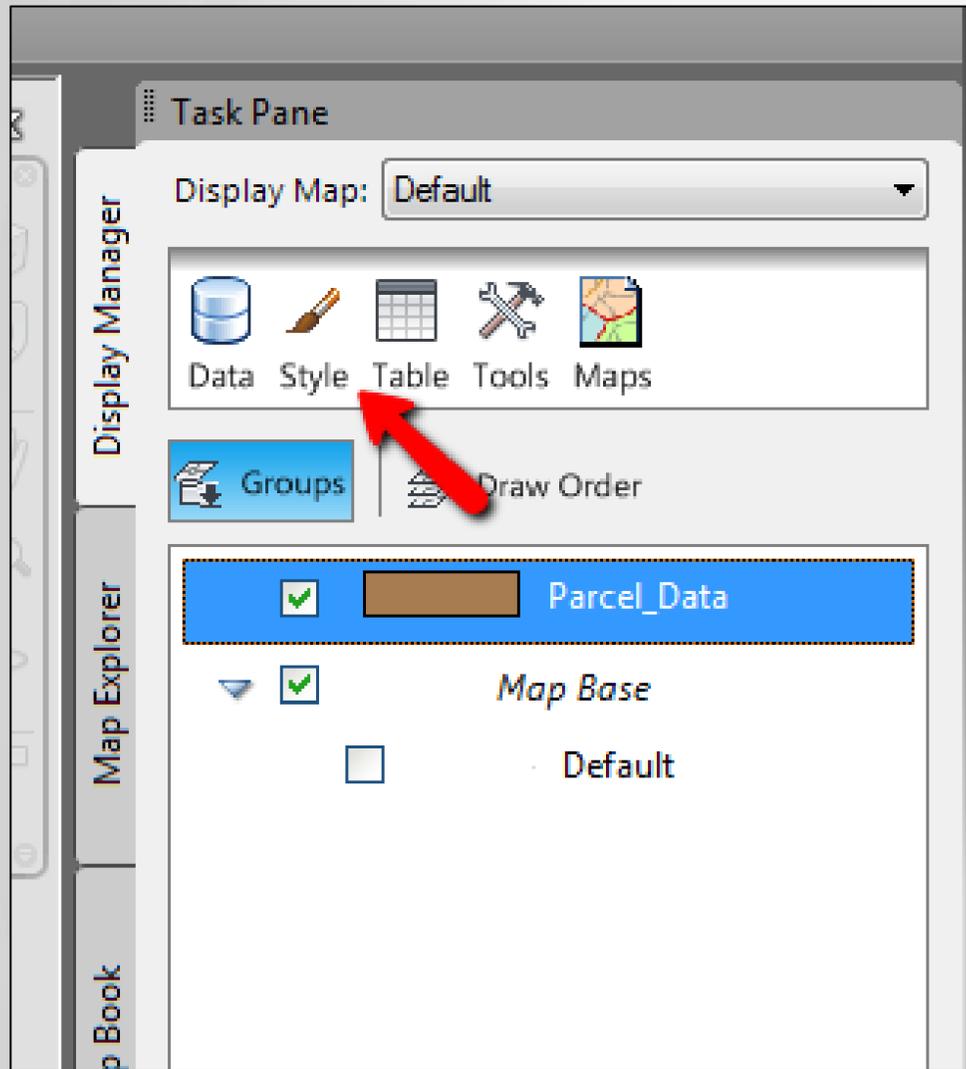
Row of 22205 | 0 Search to Select Options

Started
OK

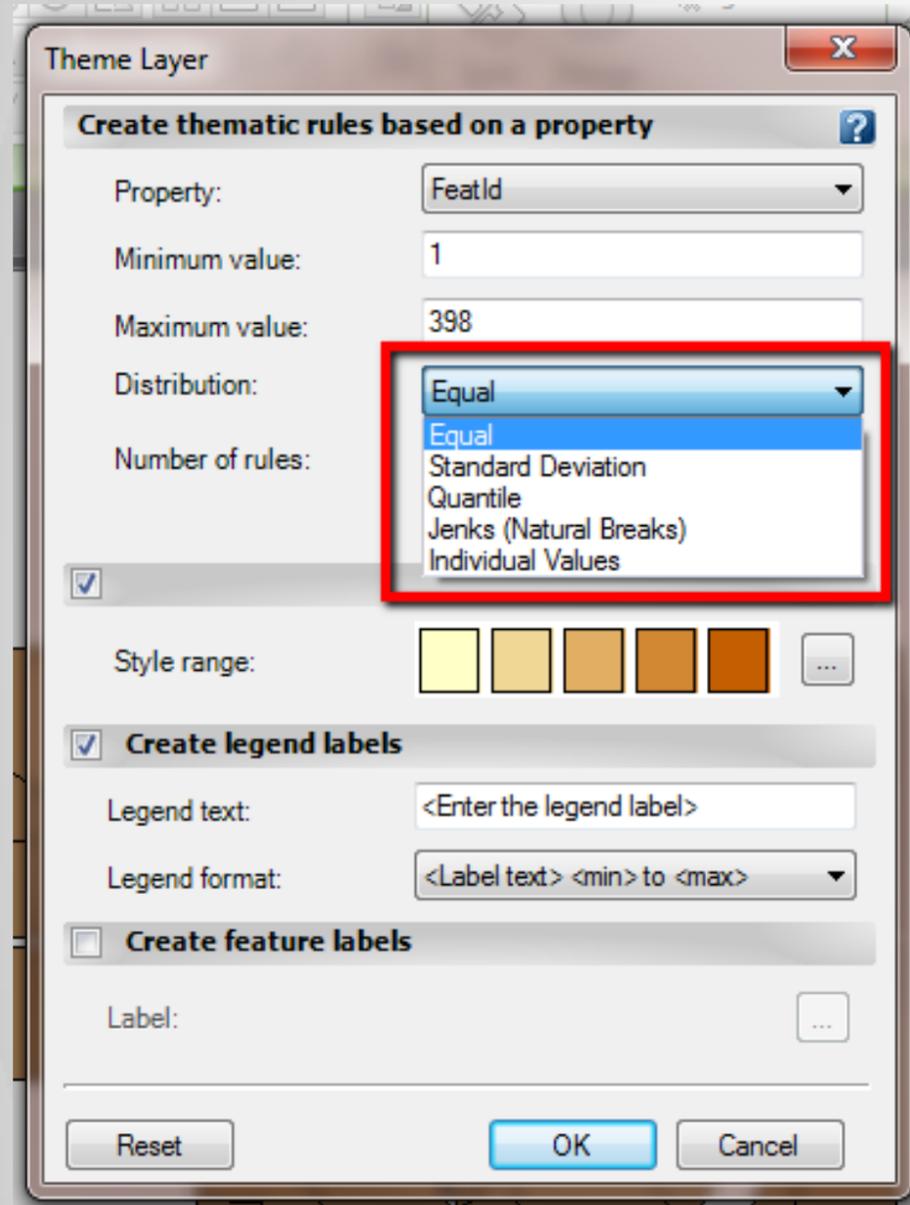
Your Techniques?

Thematic Themes

Thematic Themes



New Thematic Theme Setup:



Equal: The Difference between the max and the min values then divided by the number of rules. All ranges will be equal in size

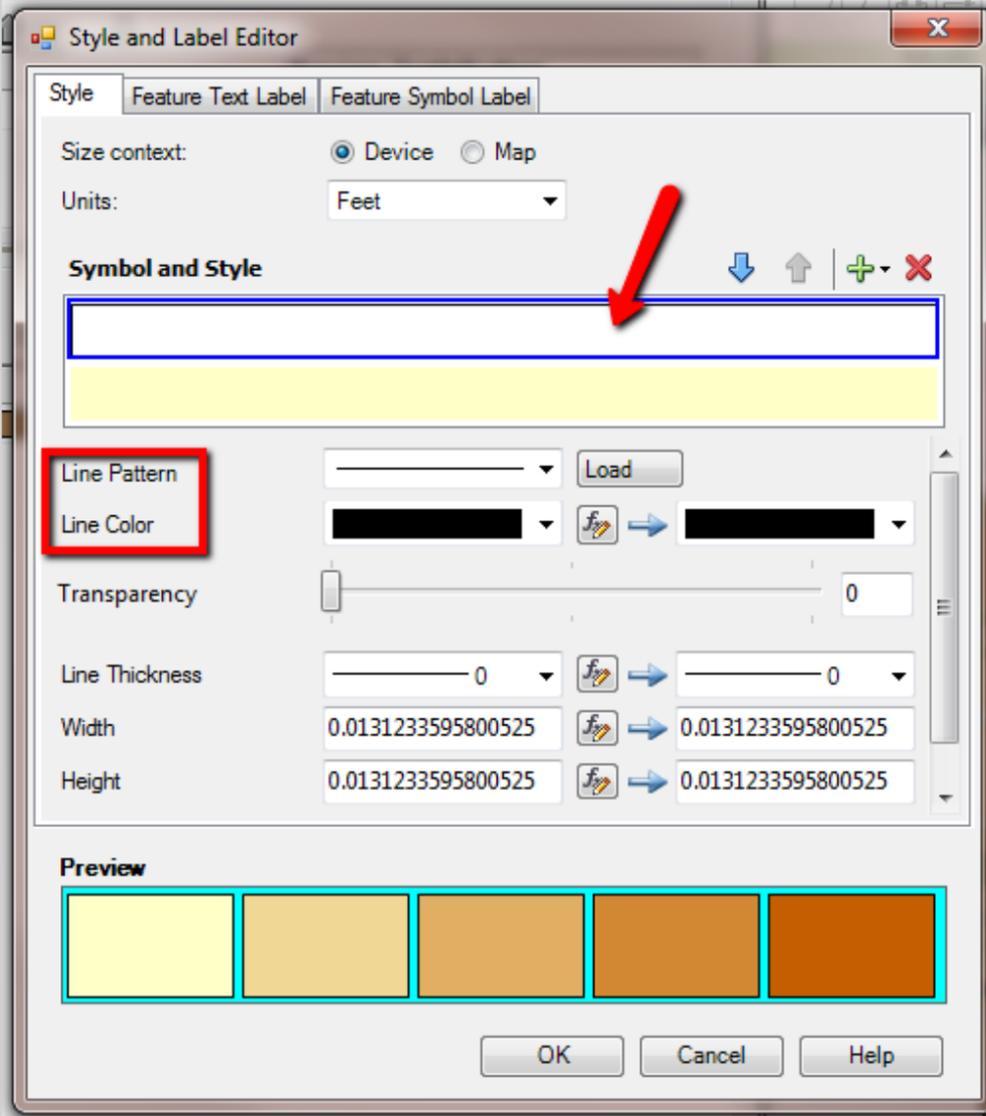
Standard Deviation: Based on how the values vary from the mean. The mean is calculated and then the standard deviation is added and subtracted from it.

Quantile: Each range will contain the same number of entities

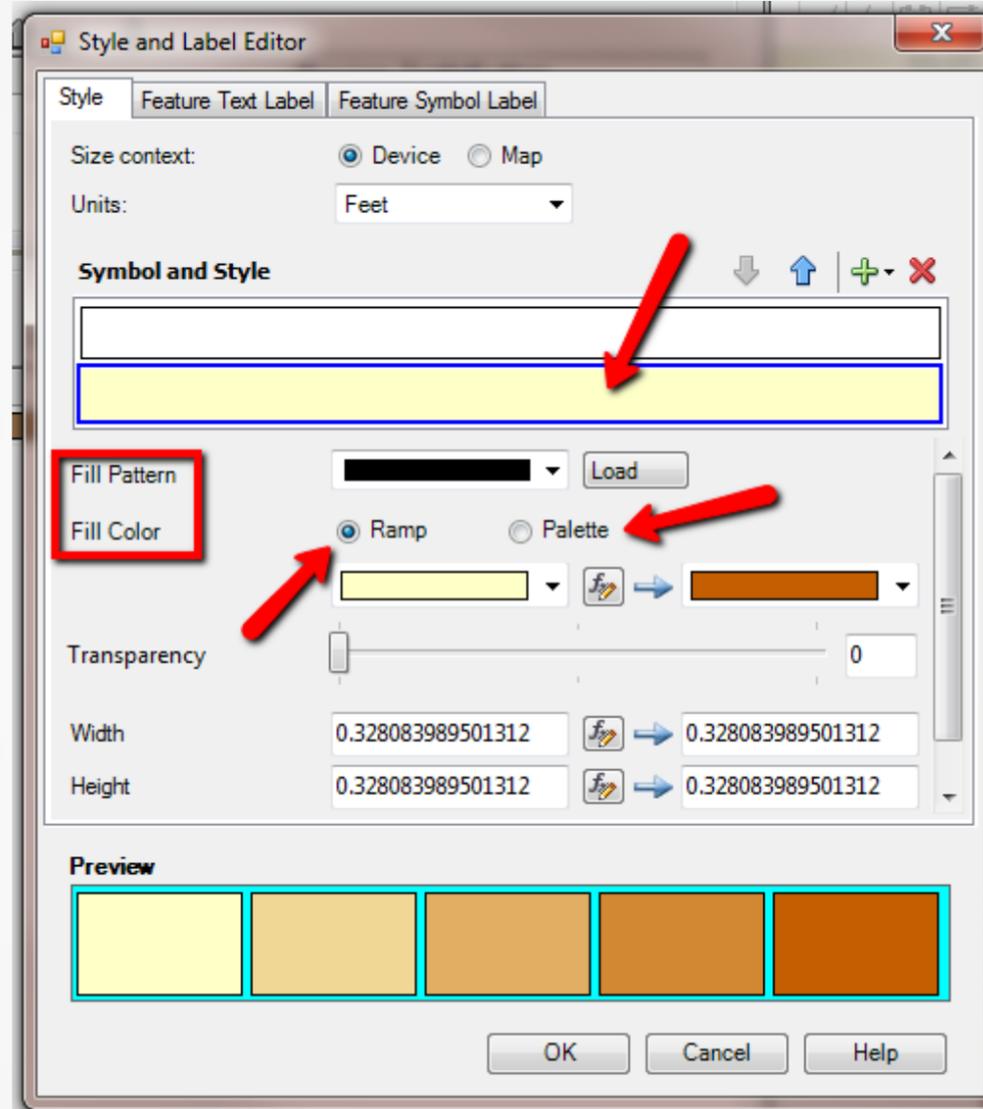
Jenks (Natural Breaks): Ranges are based on natural groupings

Individual Values: Features are not grouped.

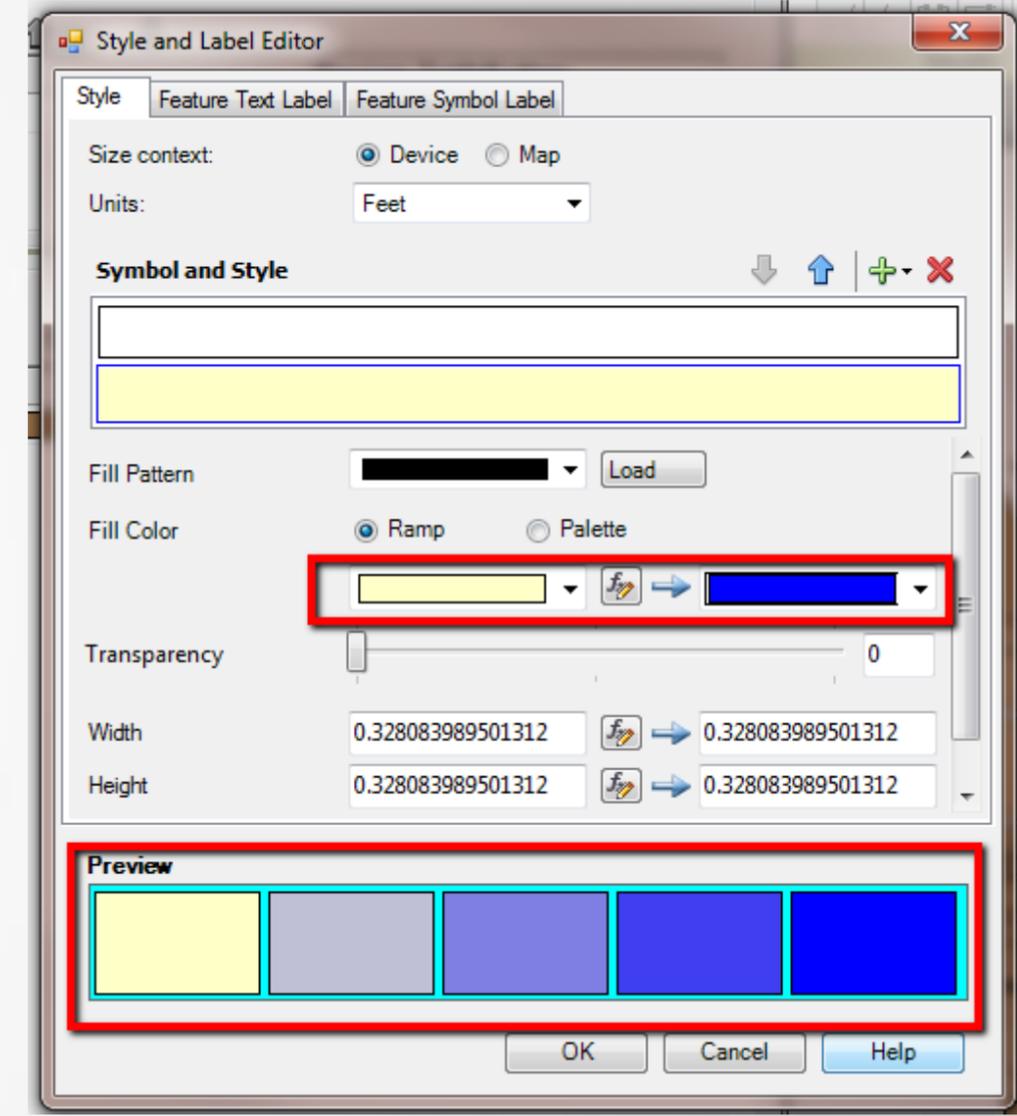
Style Range:



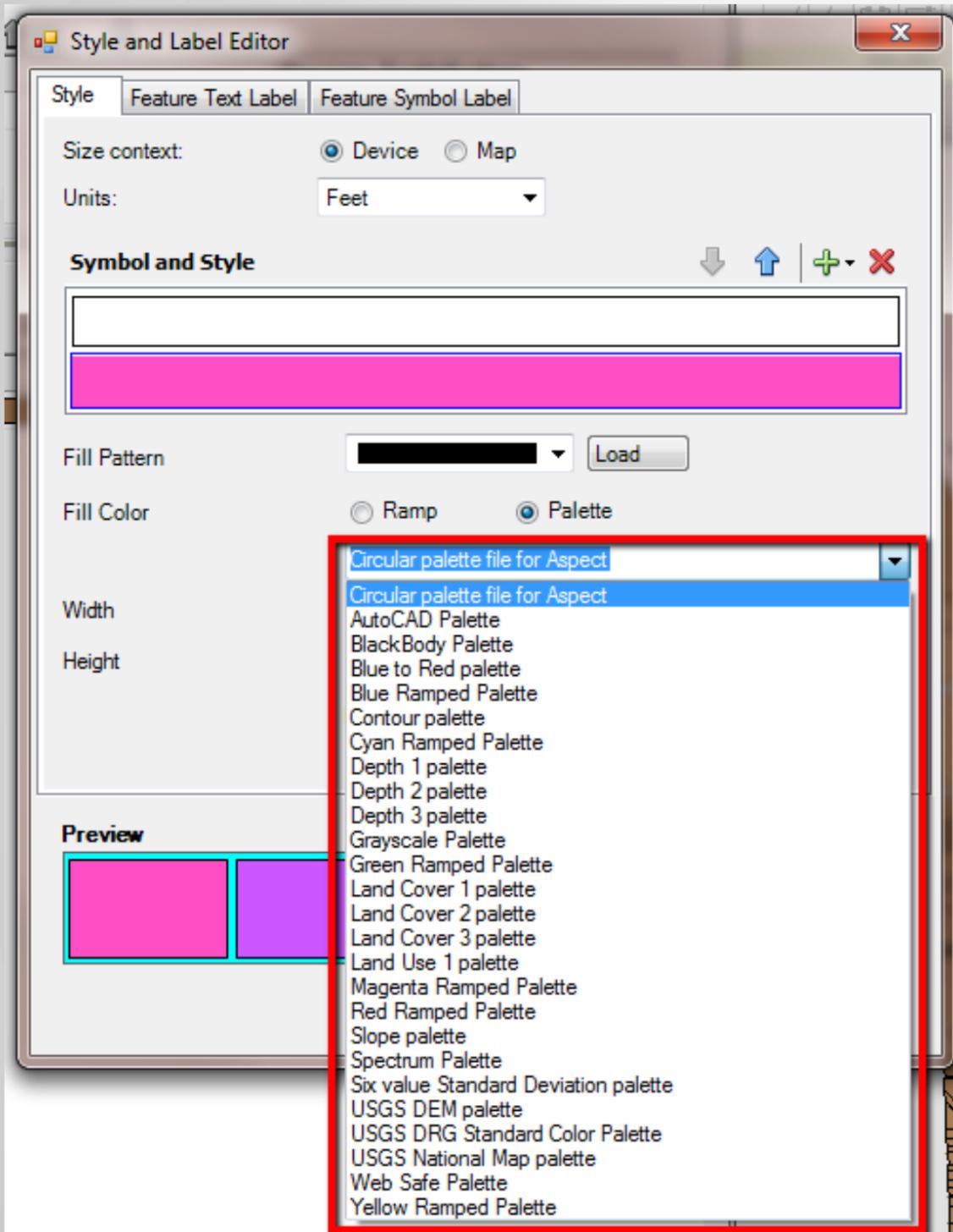
Line Pattern



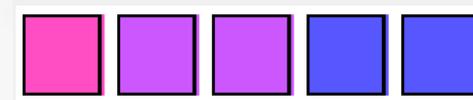
Fill Pattern



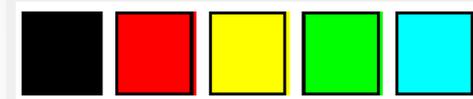
Style Range: Fill Pattern Palettes



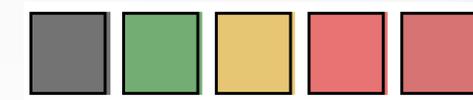
Circular Palette



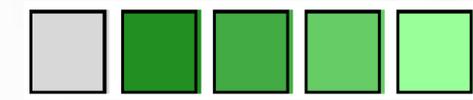
AutoCAD Palette



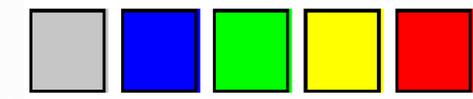
Depth 2 Palette



Depth 3 Palette



Slope Palette



Six Value Std Dev



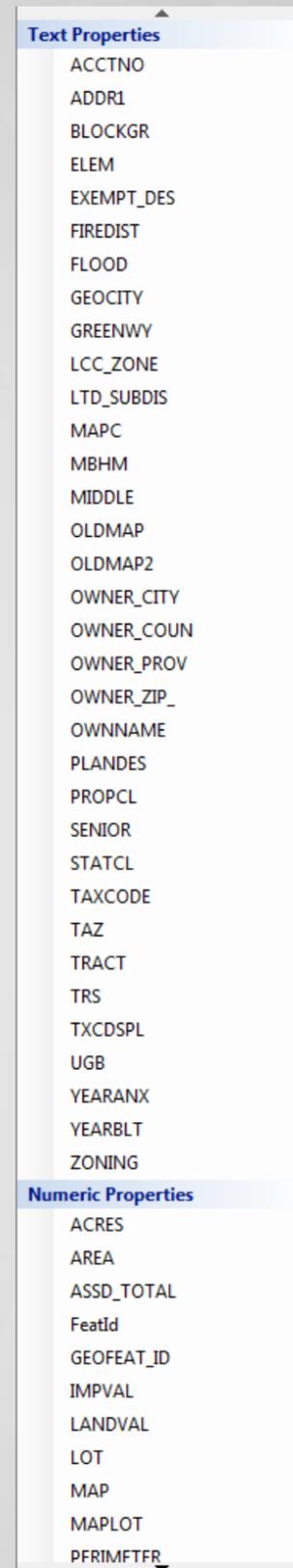
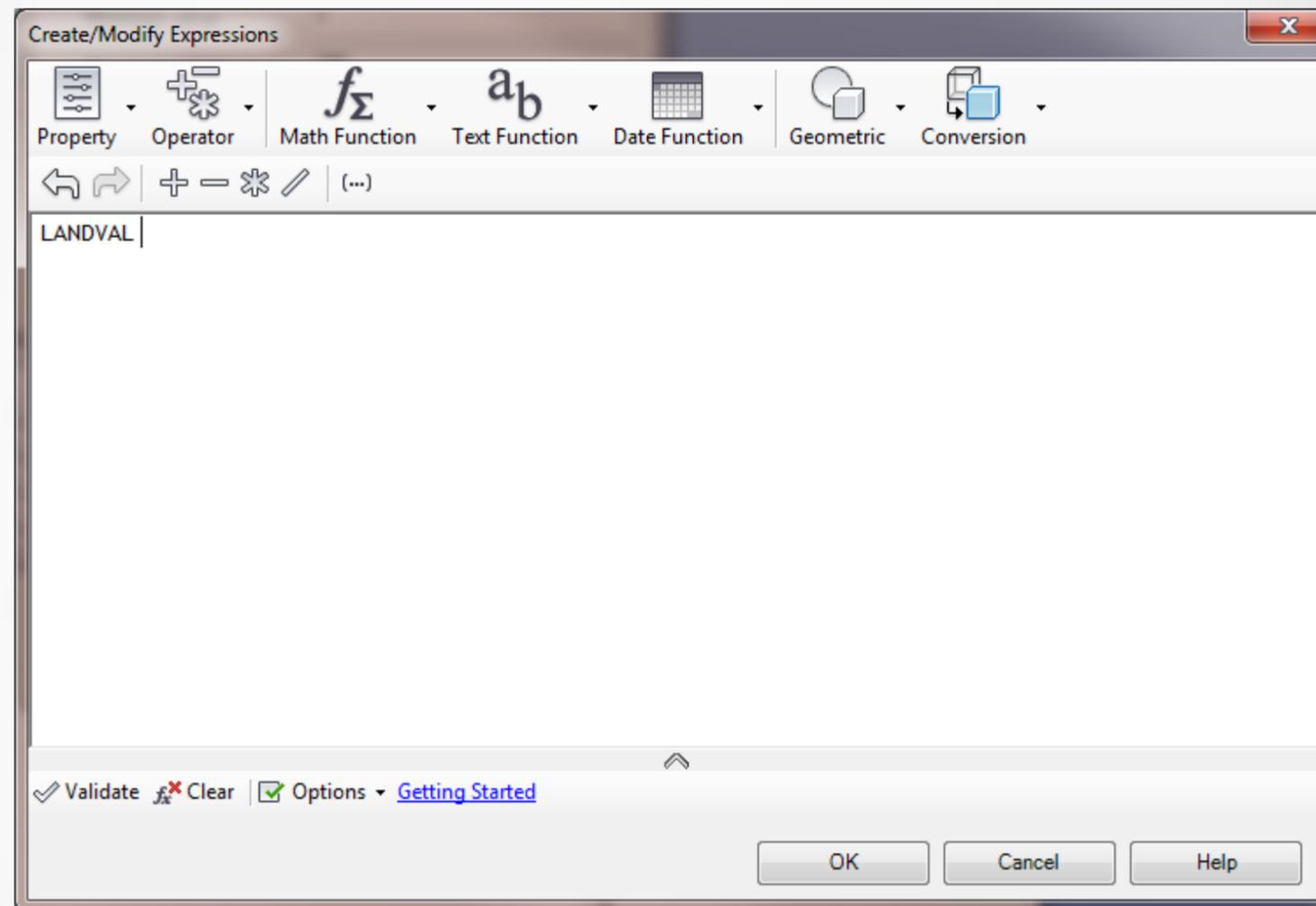
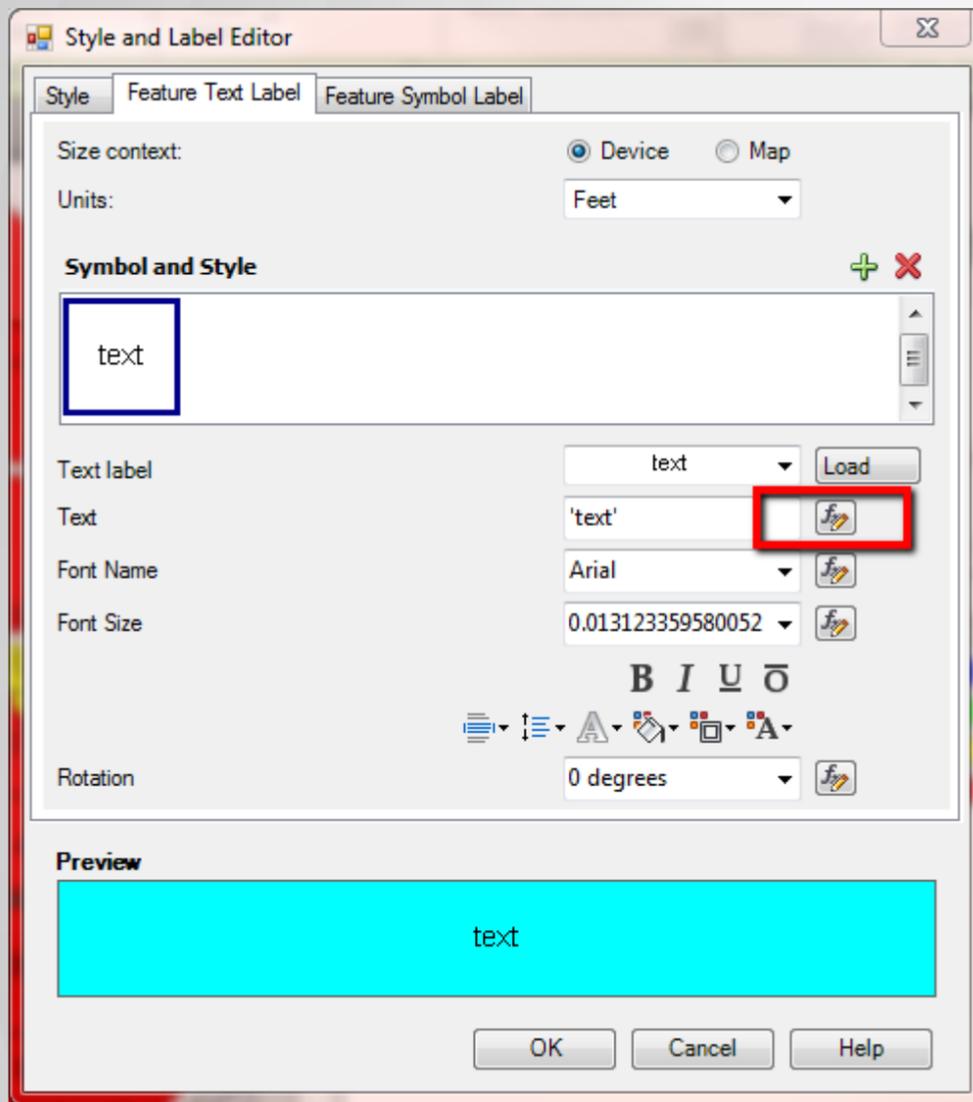
USGS DEM



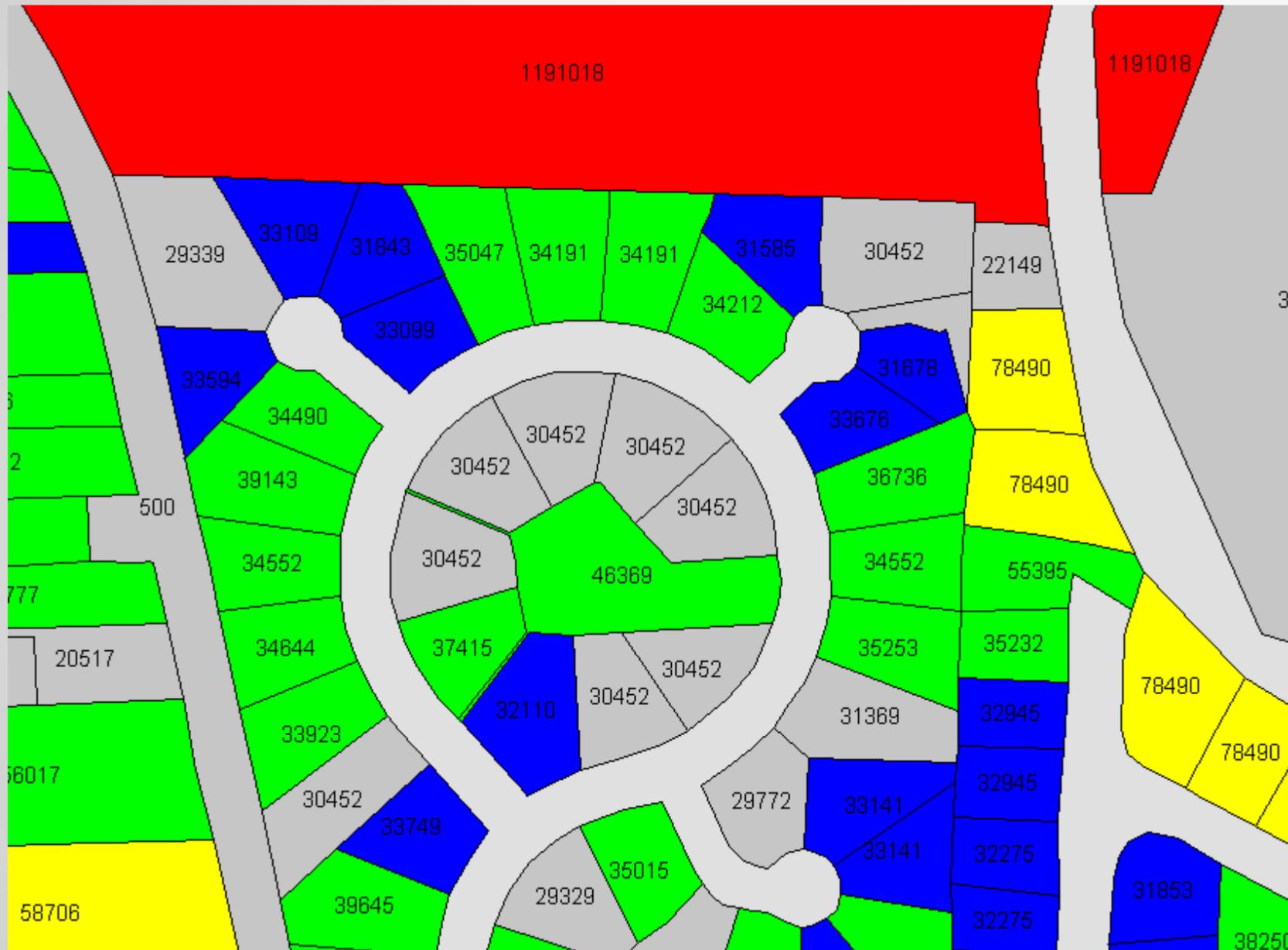
USGS DRG



Displayed Text: Land Value



Results: “Quantile” with “Slope Palette”



Task Pane

Display Map: Default

Display Manager

Data Style Table Tools Maps

Groups Draw Order

Map Explorer

Parcel_Data

| | |
|--|---------------------|
| | 500 to 31451 |
| | 31451 to 33768 |
| | 33768 to 58000 |
| | 58000 to 109933.5 |
| | 109933.5 to 5535213 |

Map Book

Map Base

Default

Manipulation: Manually Changing the Range

Create/Modify Expressions

Property Operator Math Function Text Function Date Function Local

← → + - * / = < > ≤ ≥ LIKE AND OR

"LANDVAL" >= 500 AND "LANDVAL" < 25000

Scale Ranges for Layer Default:TL_C_83

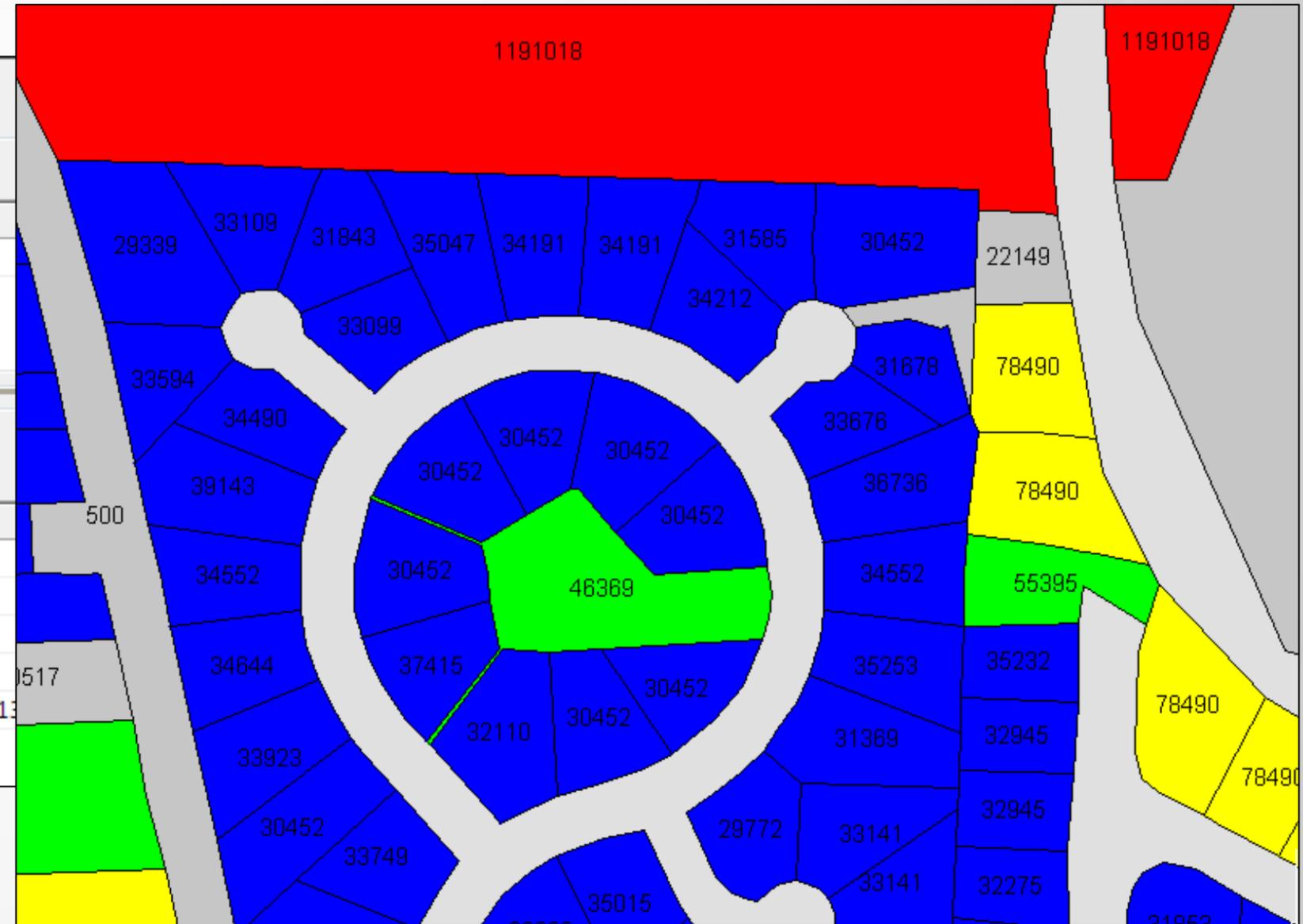
Add a Scale Range Duplicate Delete Up Down

| From | To |
|------|----------|
| 0 | Infinity |

Polygon Style for 0 - Infinity Scale Range

New Theme... Add a Rule Duplicate Delete Delete All Up Down

| Thematic Rules | Style | Legend Label |
|--|--------|------------------|
| "LANDVAL" >= 500 AND "LANDVAL" < 25000 | Blue | 500 to 25000 |
| "LANDVAL" >= 31451 AND "LANDVAL" < 45000 | Green | 25000 to 45000 |
| "LANDVAL" >= 33768 AND "LANDVAL" < 58000 | Yellow | 45000 to 58000 |
| "LANDVAL" >= 58000 AND "LANDVAL" < 150000 | Red | 58000 to 150000 |
| "LANDVAL" >= 109933.5 AND "LANDVAL" < 553521 | Grey | 150000 to 553521 |



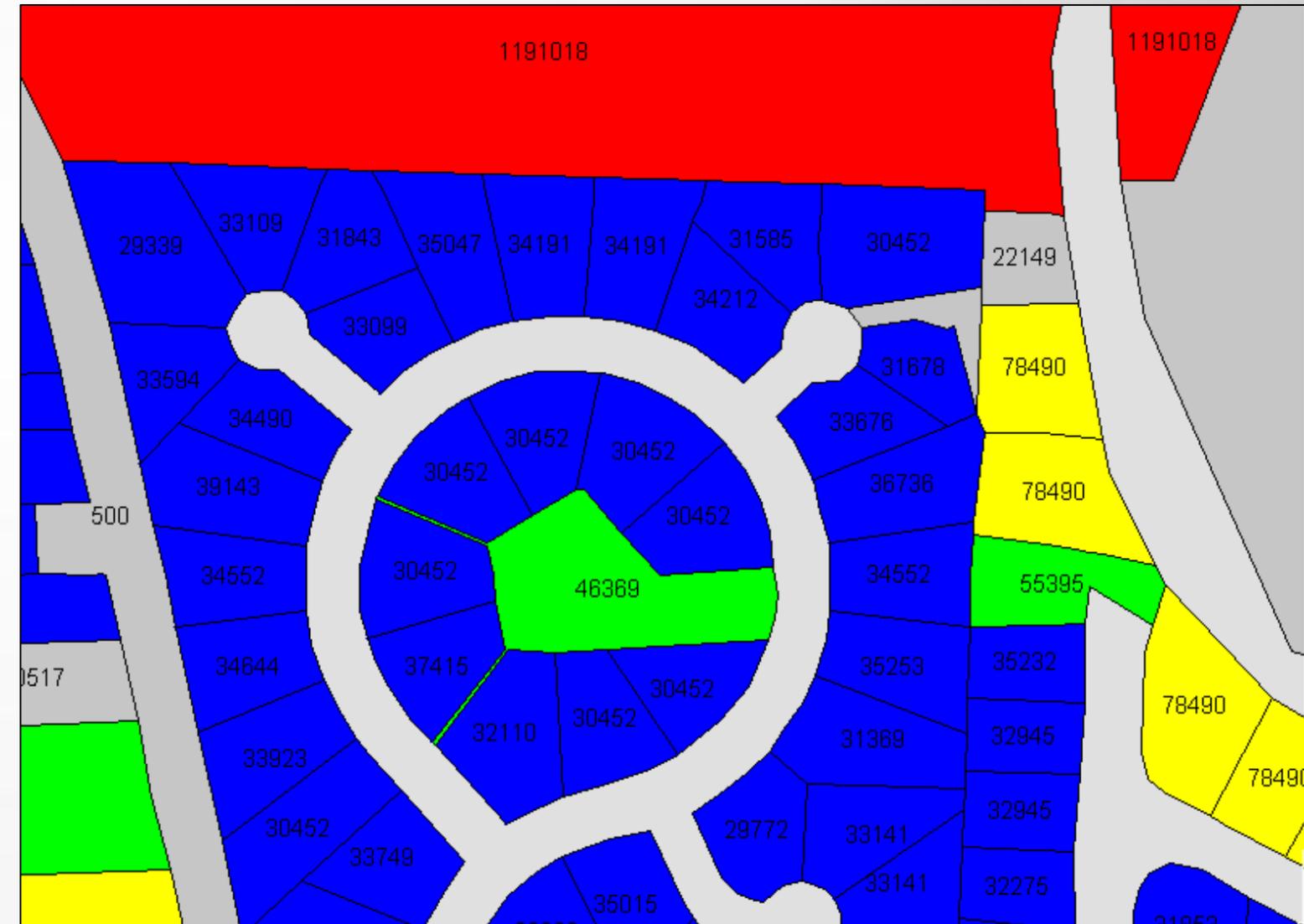
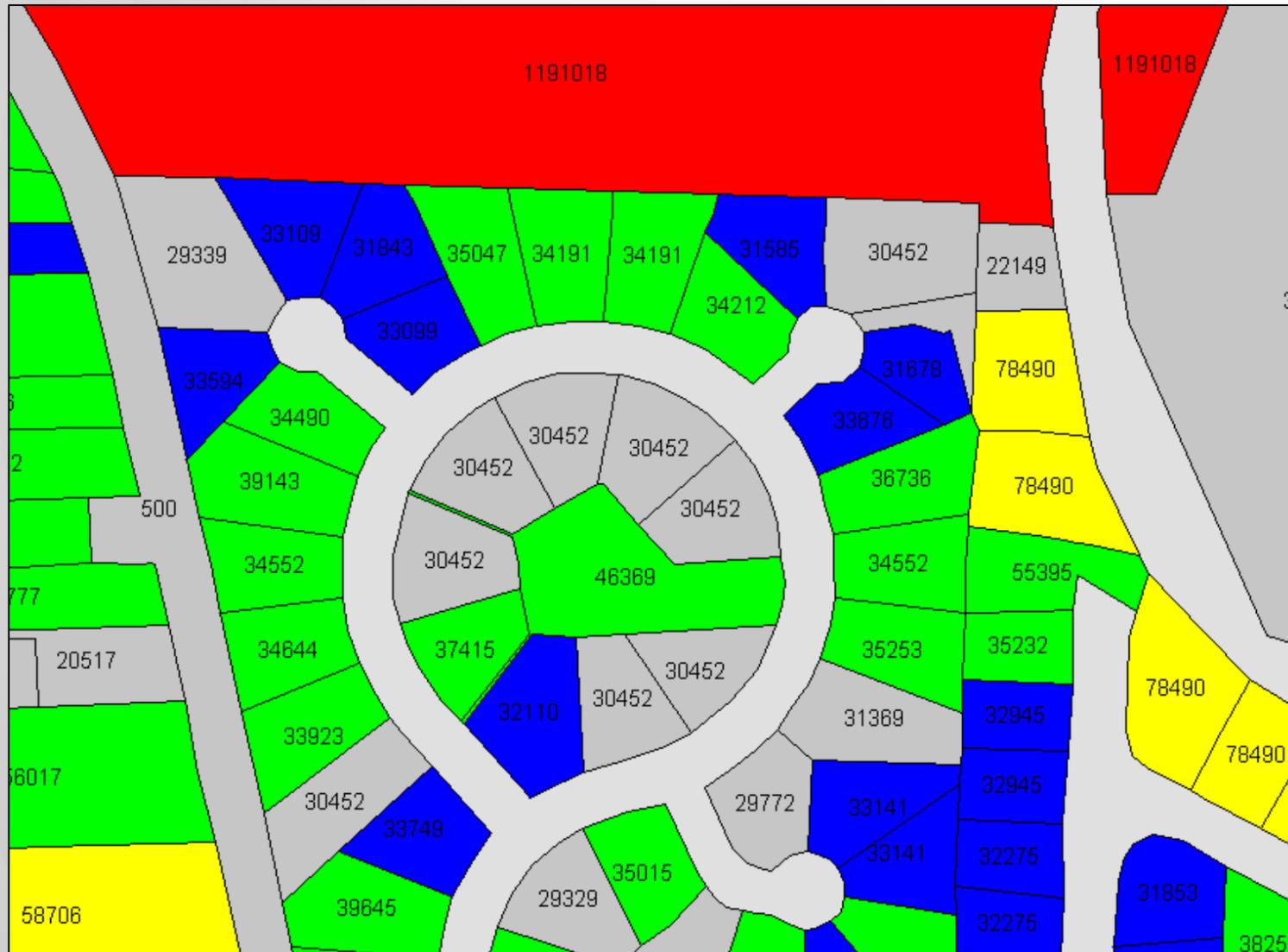
Manipulation: Appears to show more land values at the lower levels.

| Style | Legend Label |
|---|---------------------|
|  | 500 to 31451 |
|  | 31451 to 33768 |
|  | 33768 to 58000 |
|  | 58000 to 109933.5 |
|  | 109933.5 to 5535213 |

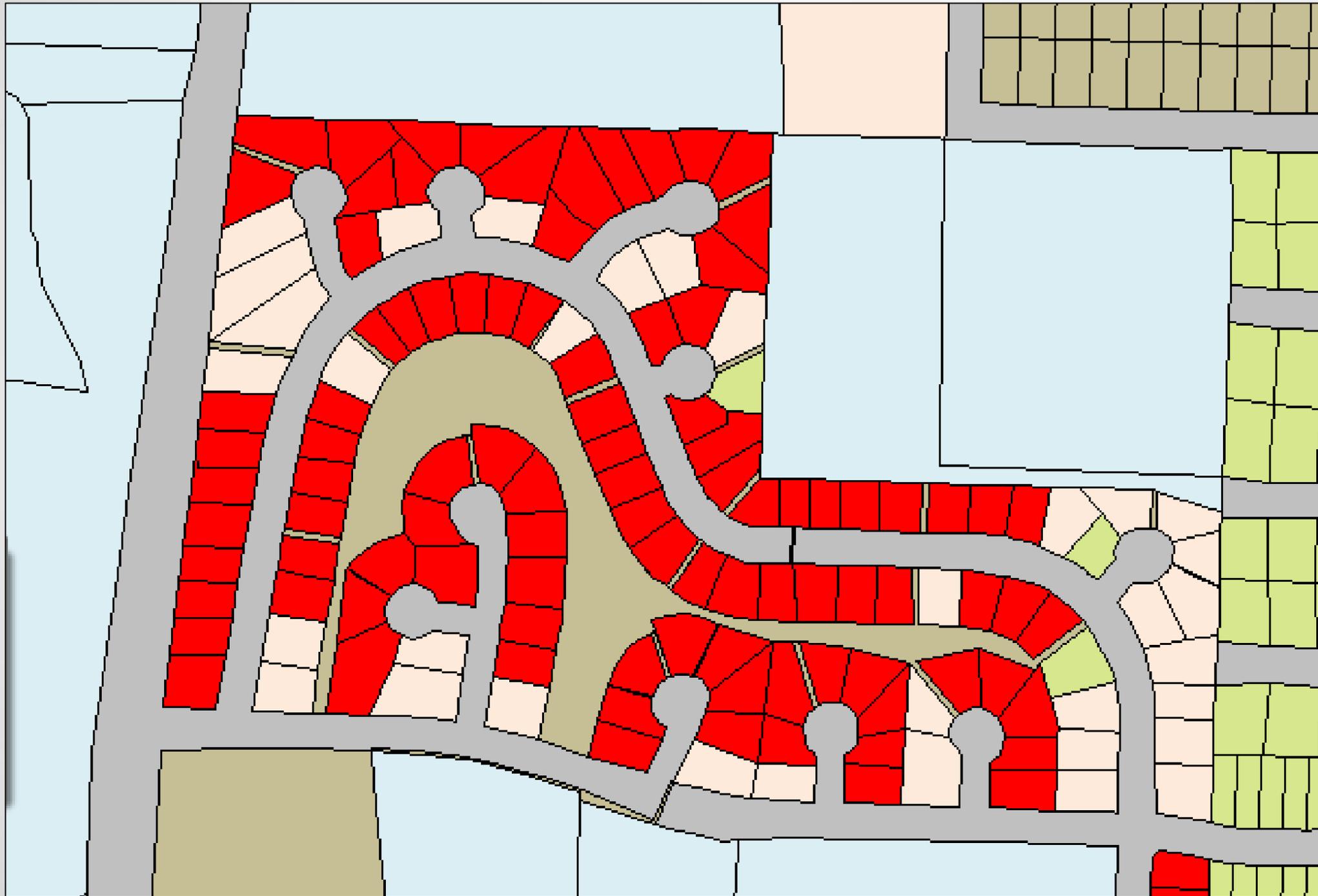
Map Explorer

Parcel_Data

-  500 to 25000
-  25000 to 45000
-  45000 to 58000
-  58000 to 150000
-  150000 to 5535213



Manipulation: Colors; Vivid vs Dull



Your Techniques?

Class summary

- Sorting through the amount of data that you download can be tedious. Using Query Filters can reduce the amount of data displayed in the table to just the task at hand. Then applying Thematic Rules will group like attributes together and display them as such.
- To follow a golden rule of cartography: It is not what you put on a map that makes it useful. It's what you leave off. So come learn how to create a map that tells the story that you want told.

Don't Forget to fill out
your Survey



Scott Mizsak

Application Engineer

scottm@cadtechnologycenter.com