CENSUS DATA AND SQL SERVER 2008. WINNING!

Scott Rae and David Raybuck – NCTCOG

Census Uses in RIS

- Demographic Forecasting
- Annual Population Estimates
- Small Area Estimates
- Storm Impact Modeling
- Web Geographic Profiles
- Mitigation Planning
- Delineation of Geographies
- Alternative Futures/Scenarios

Census Data Design

Summary File 1 and Public Law

1990

2000

2010

Summary File 3

2000

American Community Survey

1 Year

3 Year

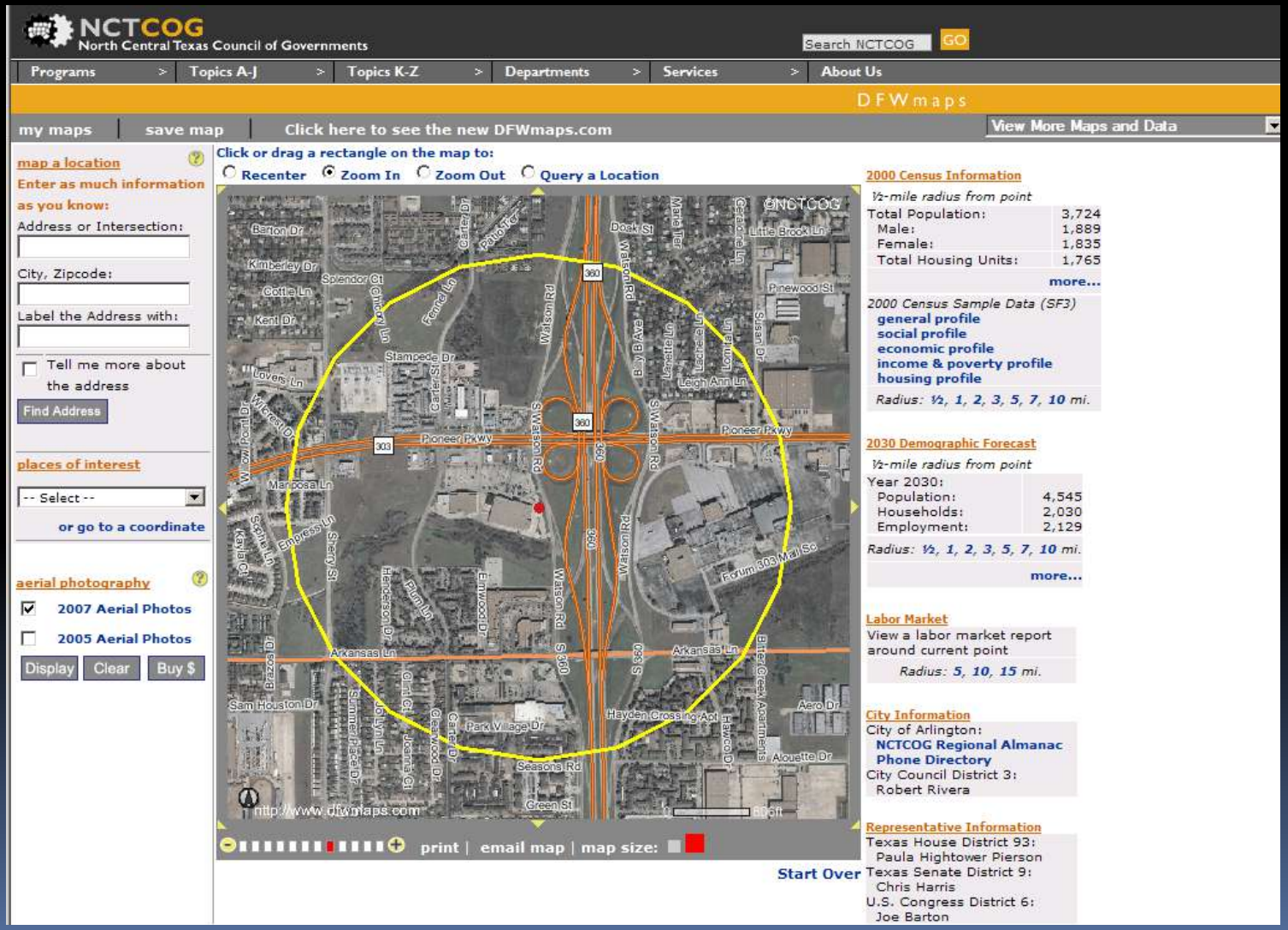
5 Year

Data Bank

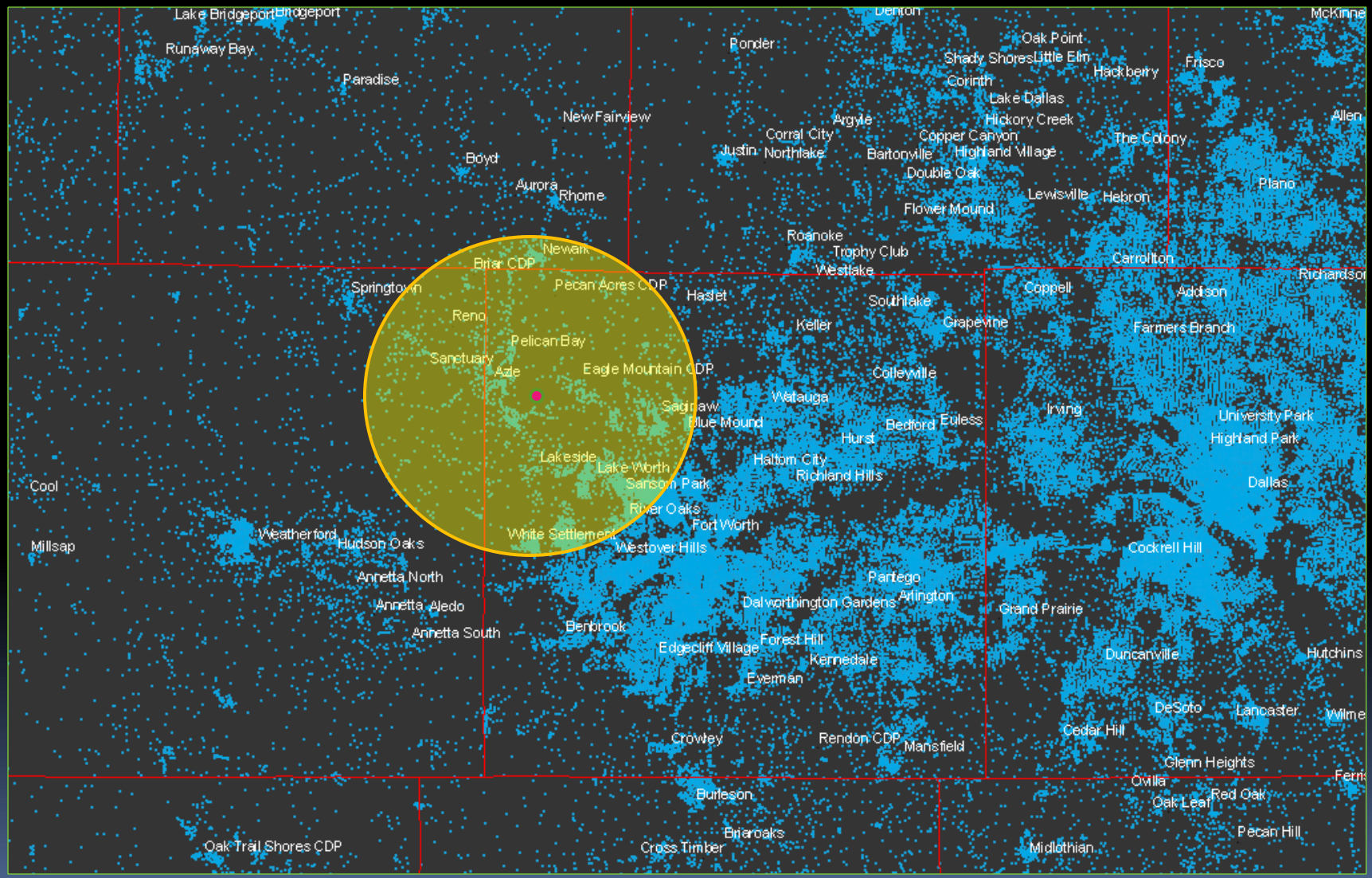
Internal Users

Web Users

Radius Summaries (emeritus) Circa 2001-2010

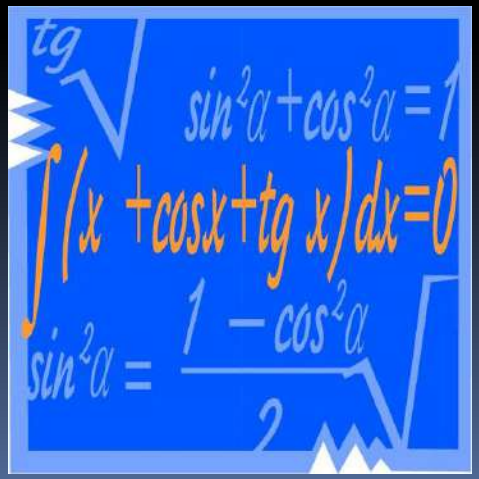


Census Block Centroids



Radius Summary Antiques

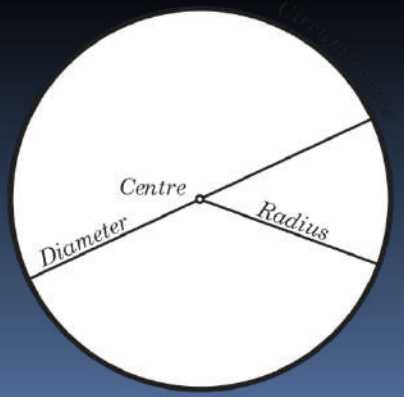
- ESRI Recordset (Loop Sum)
- ESRI Constructed Query (Loop Query Build)
- SQL Algebra



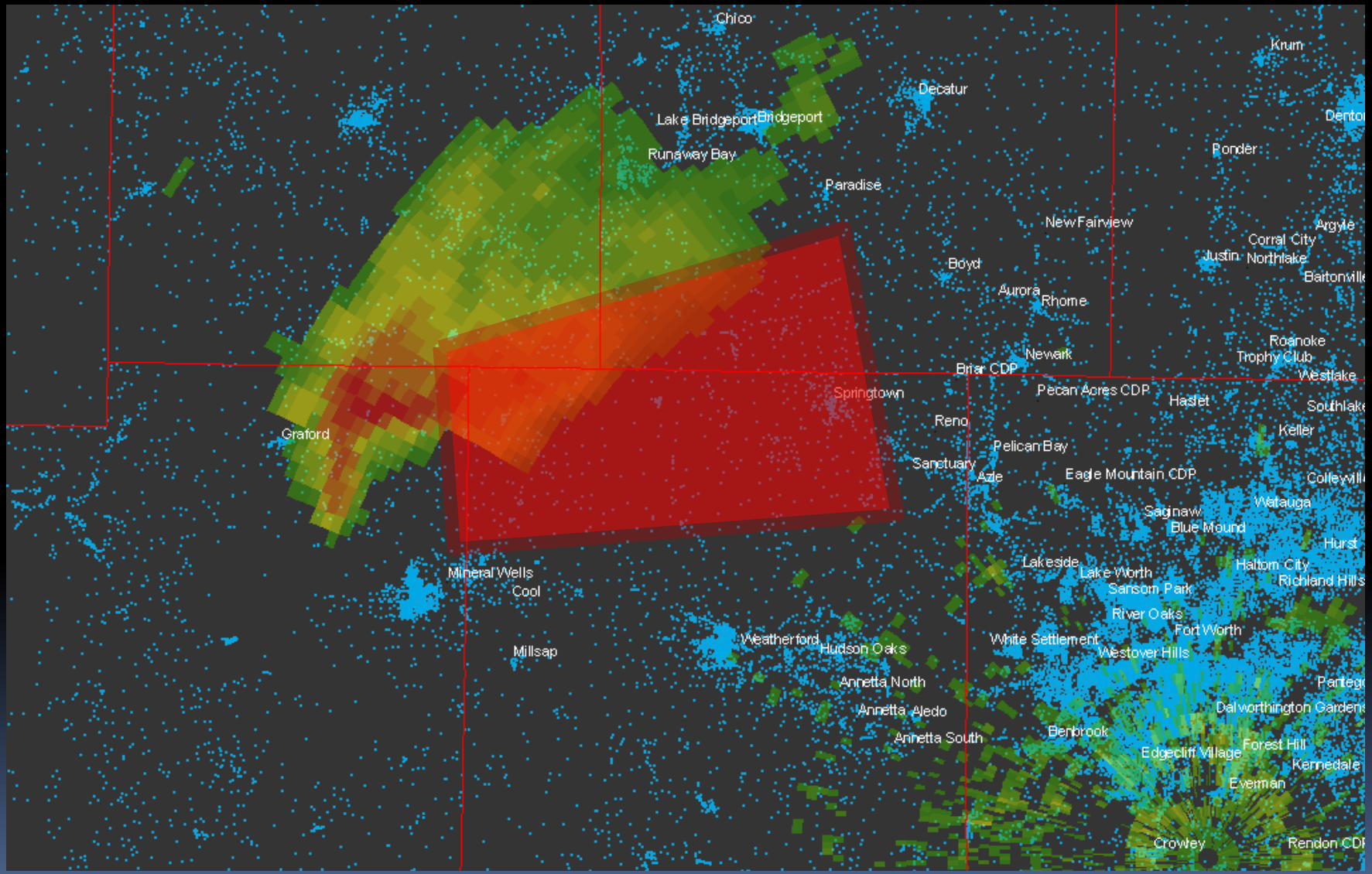
Selecting by Circle

	ID	LOGRECNO	PLACE	TRACT	BLKGRP	BLOCK	NAME	INTPTLAT	INTPTLON	xcoord	ycoord	Latitude	Longitude
1	4	0117289	0130	030200	1	1027	Block 1027	+33363931	-096535088	2567834.25	7184611.5	33.363931	-96.535
2	5	0117290	0130	030200	1	1028	Block 1028	+33363866	-096538650	2567355	7185342	33.363866	-96.5386
3	6	0117291	0130	030200	1	1029	Block 1029	+33366374	-096539762	2566768	7185614.5	33.366374	-96.5397
4	7	0117292	0130	030200	1	1040	Block 1040	+33346979	-096553154	2562707	7178874	33.346979	-96.5531
5	8	0117293	0130	030200	1	1041	Block 1041	+33351688	-096553018	2563017.75	7180391.5	33.351688	-96.553
6	9	0117294	0130	030200	1	1042	Block 1042	+33349424	-096552831	2563095.25	7179475	33.349424	-96.5528
7	10	0117295	0130	030200	1	1043	Block 1043	+33349408	-096551857	2563383.5	7179471	33.349408	-96.5518
8	11	0117296	0130	030200	1	1044	Block 1044	+33350338	-096551829	2563389.25	7179802.5	33.350338	-96.5518
9	13	0117297	0130	030200	1	1045	Block 1045	+33351573	-096551783	2563397.75	7180248	33.351573	-96.5517
10	14	0117298	0130	030200	1	1046	Block 1046	+33355234	-096552289	2563160.5	7181648	33.355234	-96.5522

- power((power((@ptdx - [xcoord]),2) + power((@ptdy -[ycoord]),2)),0.5) < @bufferstring



Census Block Centroids



Selecting by Polygon

```
select @pointtext = " 0 "
select @cn = 0
select @i =1

while @i < @vertexcount
begin
select @vtx = convert(varchar(16),(select x from #vertex where idx = @i))
select @vty = convert(varchar(16),(select y from #vertex where idx = @i))
select @vtx1 = convert(varchar(16),(select x from #vertex where idx = (@i + 1)))
select @vty1 = convert(varchar(16),(select y from #vertex where idx = (@i + 1)))

select @pointtext = @pointtext + " + "
select @pointtext = @pointtext + "( Case when ((" + @vty + " <= " + @pty + ") and (" + @vty1 + " > " + @pty + ")) or ((" + @vty + " >
      " + @pty + ") and (" + @vty1 + "<= " + @pty + ")) THEN "
select @pointtext = @pointtext + " (Case when " + @ptx + " < (" + @vtx + " + ( ((" + @pty + " - " + @vty + ") / (" + @vty1+ " - " +
      @vty + " )) * (" + @vtx1 + " - " + @vtx + "))) then 1 else 0 end )"
select @pointtext = @pointtext + " else 0 end )"
set @i = @i + 1
end

exec("insert into #geotemp2 select *  from #geotemp
where charindex('.5',(" + @pointtext + ") / 2.0) > 0" )
```

SQL 2008 Spatial

NAME	INTPTLAT	INTPTLON	xcoord	ycoord	Latitude	Longitude	geog
Block 1027	+33363931	-096535088	2567834.25	7184611.5	33.363931	-96.535	0xE6100000010C13807F4A95AE40400AD7A3703D2258C0
Block 1028	+33363866	-096538650	2567355	7185342	33.363866	-96.5386	0xE6100000010C2C103D2993AE40400A68226C782258C0
Block 1029	+33366374	-096539762	2566768	7185614.5	33.366374	-96.5397	0xE6100000010C670DDE57E5AE4040AD69DE718A2258C0
Block 1040	+33346979	-096553154	2562707	7178874	33.346979	-96.5531	0xE6100000010C0BB3D0CE69AC4040BADA8AFD652358C0
Block 1041	+33351688	-096553018	2563017.75	7180391.5	33.351688	-96.553	0xE6100000010CA532C51C04AD404008AC1C5A642358C0
Block 1042	+33349424	-096552831	2563095.25	7179475	33.349424	-96.5528	0xE6100000010C0038F6ECB9AC4040A54E4013612358C0
Block 1043	+33349408	-096551857	2563383.5	7179471	33.349408	-96.5518	0xE6100000010CFA7ABE66B9AC4040B37BF2B0502358C0
Block 1044	+33350338	-096551829	2563389.25	7179802.5	33.350338	-96.5518	0xE6100000010CE54526E0D7AC4040B37BF2B0502358C0
Block 1045	+33351573	-096551783	2563397.75	7180248	33.351573	-96.5517	0xE6100000010C0C94145800AD4040014D840D4F2358C0
Block 1046	+33355234	-096552289	2563160.5	7181648	33.355234	-96.5522	0xE6100000010CB136C64E78AD40407A36AB3E572358C0

- update test2008.dbo.TxGeo_Logrecno set geo9= geography::STPointFromText('POINT(' + STR(Longitude, 20, 16) + ' ' + STR(Latitude, 20, 16) + ')', 4326)

SQL 2008 Spatial Selecting by Polygon

- set @g = geography::STGeomFromText('POLYGON ((-96 31.4,-97 32.1,-97.1 32.1,-97.5 31.7 ,-97.8 31.7, -96 31.4))', 4326);

- SELECT * FROM dbo.txgeo_B
  WHERE (@g.STIntersects(geog)) = 1

Microsoft SQL Server Management Studio

File Edit View Query Project Debug Tools Window Community Help

New Query | master | Execute

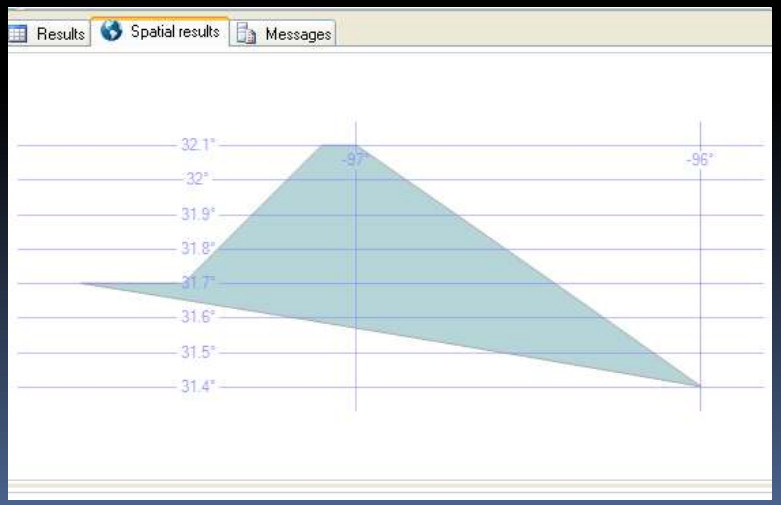
SQLQuery5.sql ...sus (sa (214)) | SQLQuery4.sql ...ensus (sa (62)) | SQLQuery3.sql ...sus (sa (163)) | **SQLQuery2.sql -...ster (sa (63))*** | SQLQuery1.sql ...sus (sa (268))

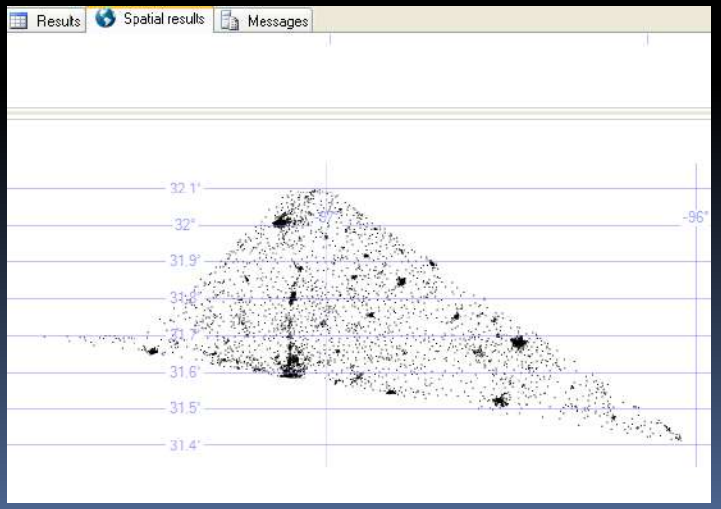
```
/****** Script for SelectTopNRows command from SSMS  ******/
declare @g geography

set @g = geography::STGeomFromText('POLYGON ((-96 31.4,-97 32.1,-97.1 32.1,-97.5 31.7 ,-97.8 31.7, -96 31.4))', 4326);

select @g

SELECT * FROM census.dbo.txgeo_B
      WHERE (@g.STIntersects(geog)) = 1
```

Results | Spatial results | Messages

	(No column name)
1	0xE6100000010406000000666666666663F400000000000...

	ID	fileid	STUSAB	SUMLEV	GEOCOMP	CHARITER	CIFSN	LOGRECNO	REGION	DIVISION	STATECE	STATE	COUNTY	COUNTYSC	COUSUB	COUSUBCC	COUSUBSC	PLA
1	36951	uSF1	TX	101	00	000	NULL	0471481	3	7	74	48	309	18	94140	Z5	13	NU
2	36952	uSF1	TX	101	00	000	NULL	0471482	3	7	74	48	309	18	94140	Z5	13	NU
3	36953	uSF1	TX	101	00	000	NULL	0471483	3	7	74	48	309	18	94140	Z5	13	NU
4	36954	uSF1	TX	101	00	000	NULL	0471484	3	7	74	48	309	18	94140	Z5	13	NU
5	36955	uSF1	TX	101	00	000	NULL	0471485	3	7	74	48	309	18	94140	Z5	13	NU
6	36956	uSF1	TX	101	00	000	NULL	0471486	3	7	74	48	309	18	94140	Z5	13	NU

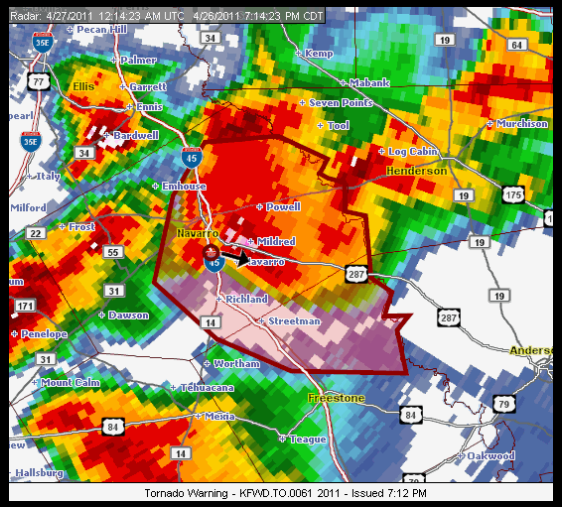


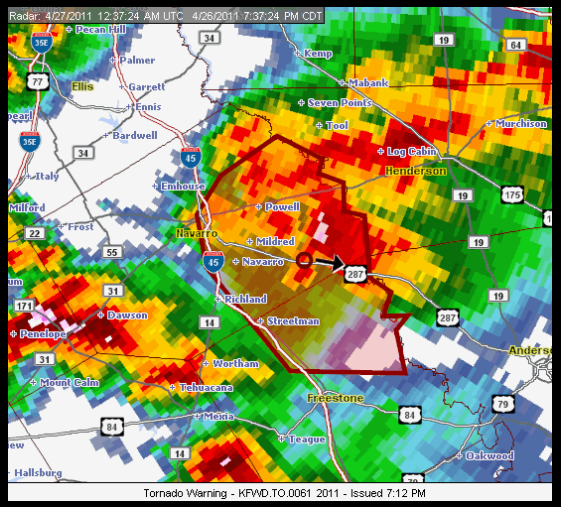


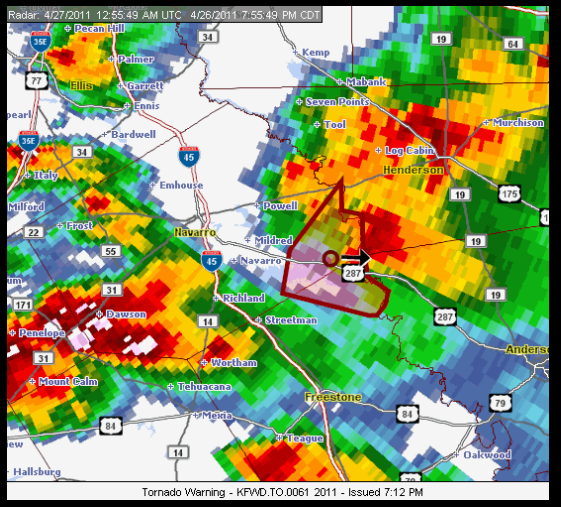
Advantages

- Speed
- Indexing
- Expand to Millions of Records
- No Geodatabase Overhead
- TSQL
- Spatial types on Spatial Types

Polygon Updating

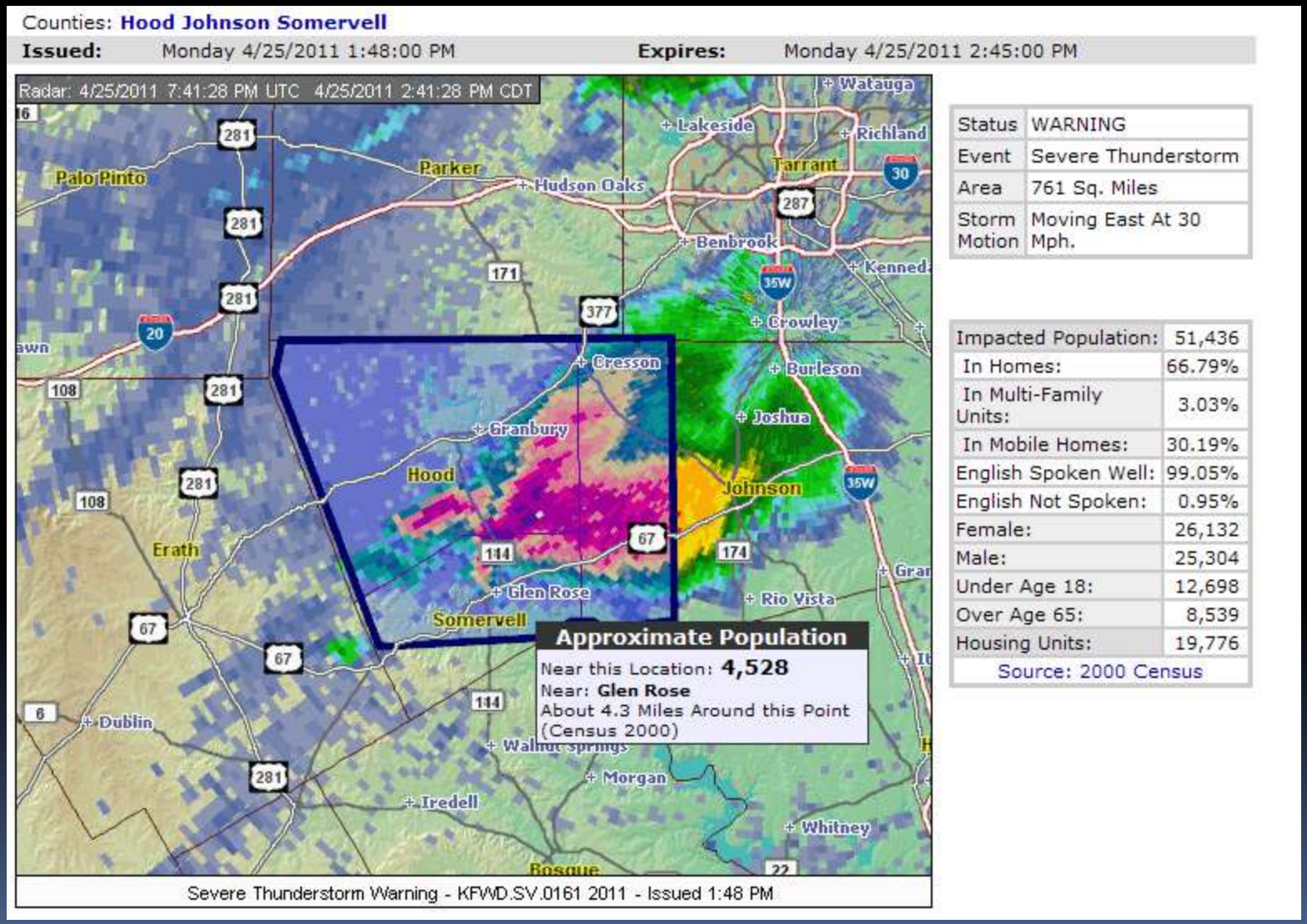






Updated	Area Impacted	Storm Direction	Storm Speed	Persons in Path	Housing Units in Path
7:12:00 PM	855.36 sq miles	East-southeast	32 mph	36,468	13,346
7:22:00 PM	770.81 sq miles	East	25 mph	33,074	12,187
7:38:00 PM	644.52 sq miles	East	33 mph	12,001	4,544
7:50:00 PM	156 sq miles	East	21 mph	954	407

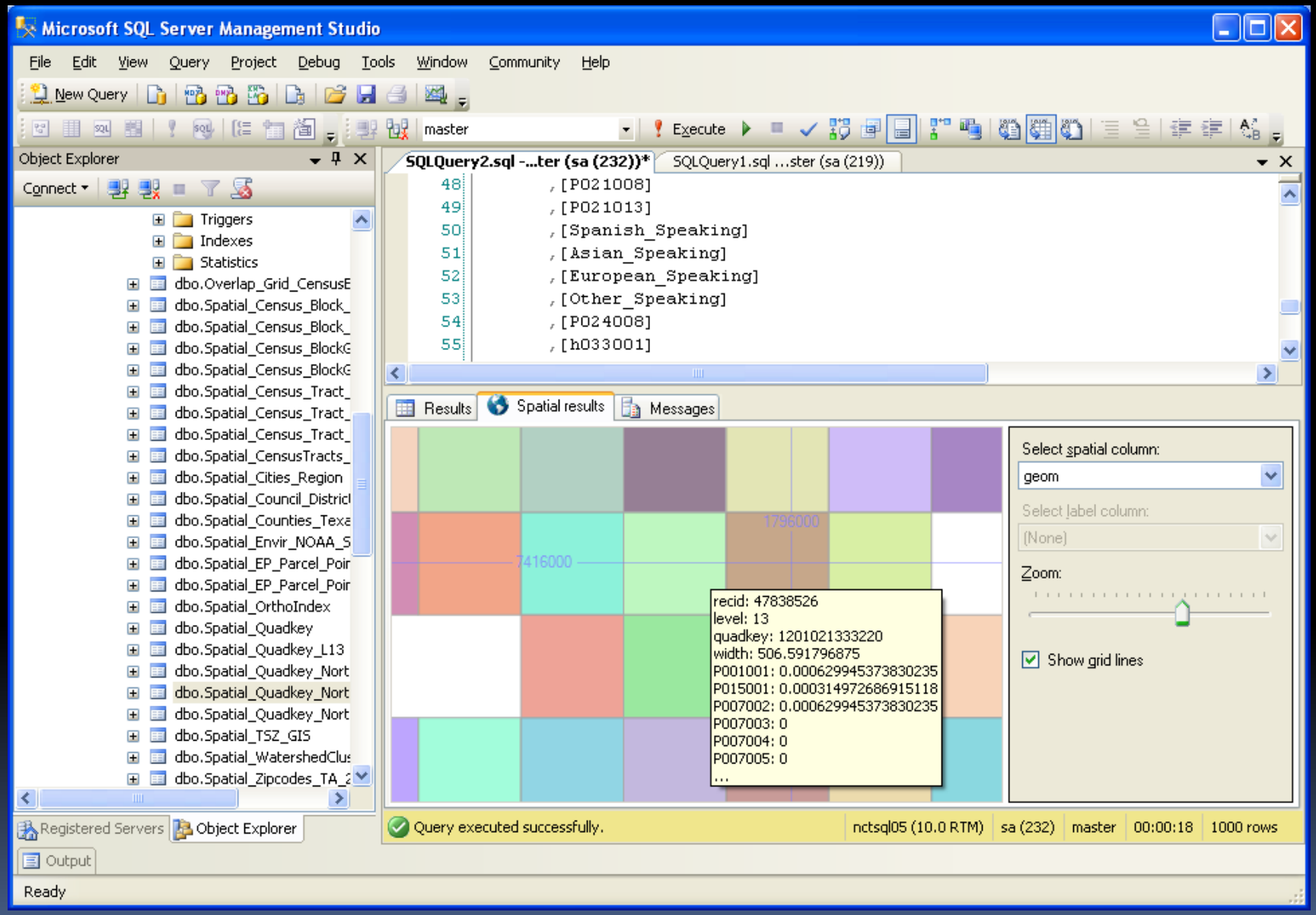
Dynamic Census Image Map



Status	WARNING
Event	Severe Thunderstorm
Area	761 Sq. Miles
Storm Motion	Moving East At 30 Mph.

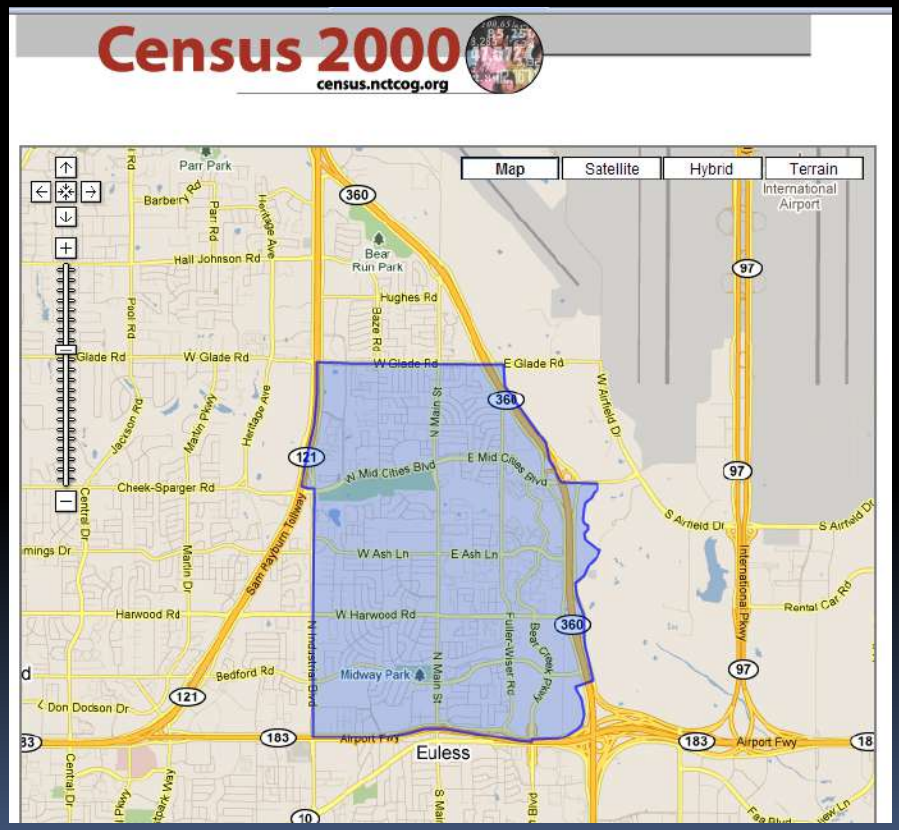
Impacted Population:	51,436
In Homes:	66.79%
In Multi-Family Units:	3.03%
In Mobile Homes:	30.19%
English Spoken Well:	99.05%
English Not Spoken:	0.95%
Female:	26,132
Male:	25,304
Under Age 18:	12,698
Over Age 65:	8,539
Housing Units:	19,776

Source: 2000 Census


Microsoft SQL Server Management Studio
File Edit View Query Project Debug Tools Window Community Help
New Query
master
Execute
Object Explorer
Connect
Triggers
Indexes
Statistics
dbo.Overlap_Grid_CensusE
dbo.Spatial_Census_Block_
dbo.Spatial_Census_Block_
dbo.Spatial_Census_BlockG
dbo.Spatial_Census_BlockG
dbo.Spatial_Census_Tract_
dbo.Spatial_Census_Tract_
dbo.Spatial_Census_Tract_
dbo.Spatial_CensusTracts_
dbo.Spatial_Cities_Region
dbo.Spatial_Council_Distric
dbo.Spatial_Counties_Texa
dbo.Spatial_Envir_NOAA_S
dbo.Spatial_EP_Parcel_Poir
dbo.Spatial_EP_Parcel_Poir
dbo.Spatial_OrthoIndex
dbo.Spatial_Quadkey
dbo.Spatial_Quadkey_L13
dbo.Spatial_Quadkey_Nort
dbo.Spatial_Quadkey_Nort
dbo.Spatial_Quadkey_Nort
dbo.Spatial_TSZ_GIS
dbo.Spatial_WatershedClus
dbo.Spatial_Zipcodes_TA_Z
Registered Servers
Object Explorer
SQLQuery2.sql -...ter (sa (232))*
SQLQuery1.sql ...ster (sa (219))
48 ,[P021008]
49 ,[P021013]
50 ,[Spanish_Speaking]
51 ,[Asian_Speaking]
52 ,[European_Speaking]
53 ,[Other_Speaking]
54 ,[P024008]
55 ,[h033001]
Results
Spatial results
Messages
1796000
7416000
recid: 47838526
level: 13
quadkey: 1201021333220
width: 506.591796875
P001001: 0.000629945373830235
P015001: 0.000314972686915118
P007002: 0.000629945373830235
P007003: 0
P007004: 0
P007005: 0
...
Select spatial column:
geom
Select label column:
(None)
Zoom:
Show grid lines
Query executed successfully.
nctsql05 (10.0 RTM)
sa (232)
master
00:00:18
1000 rows
Output
Ready

Mapping Spatial Data Type

Google Maps/Internet



.NET Handler
GeoRSS

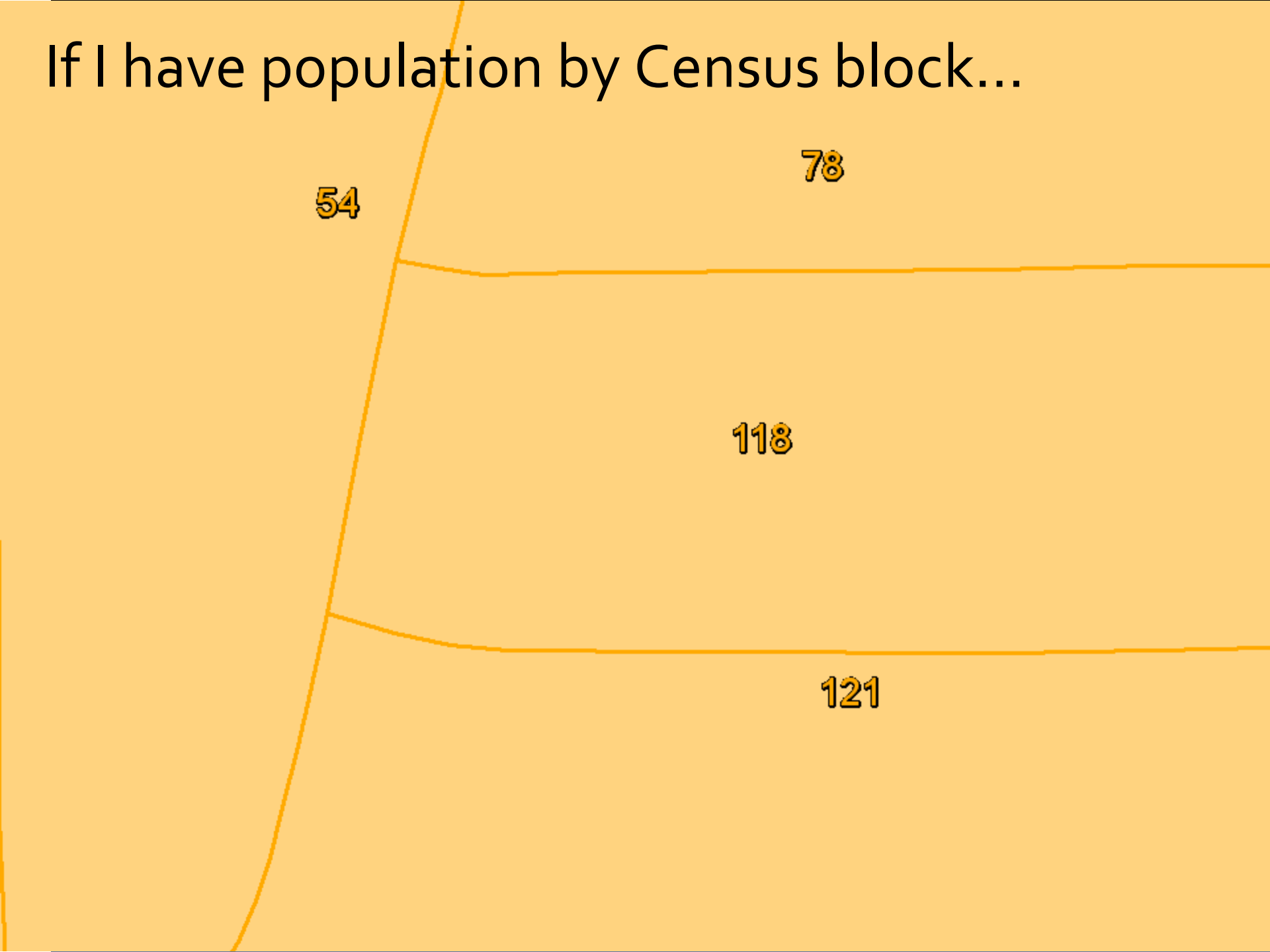
SQL 2008

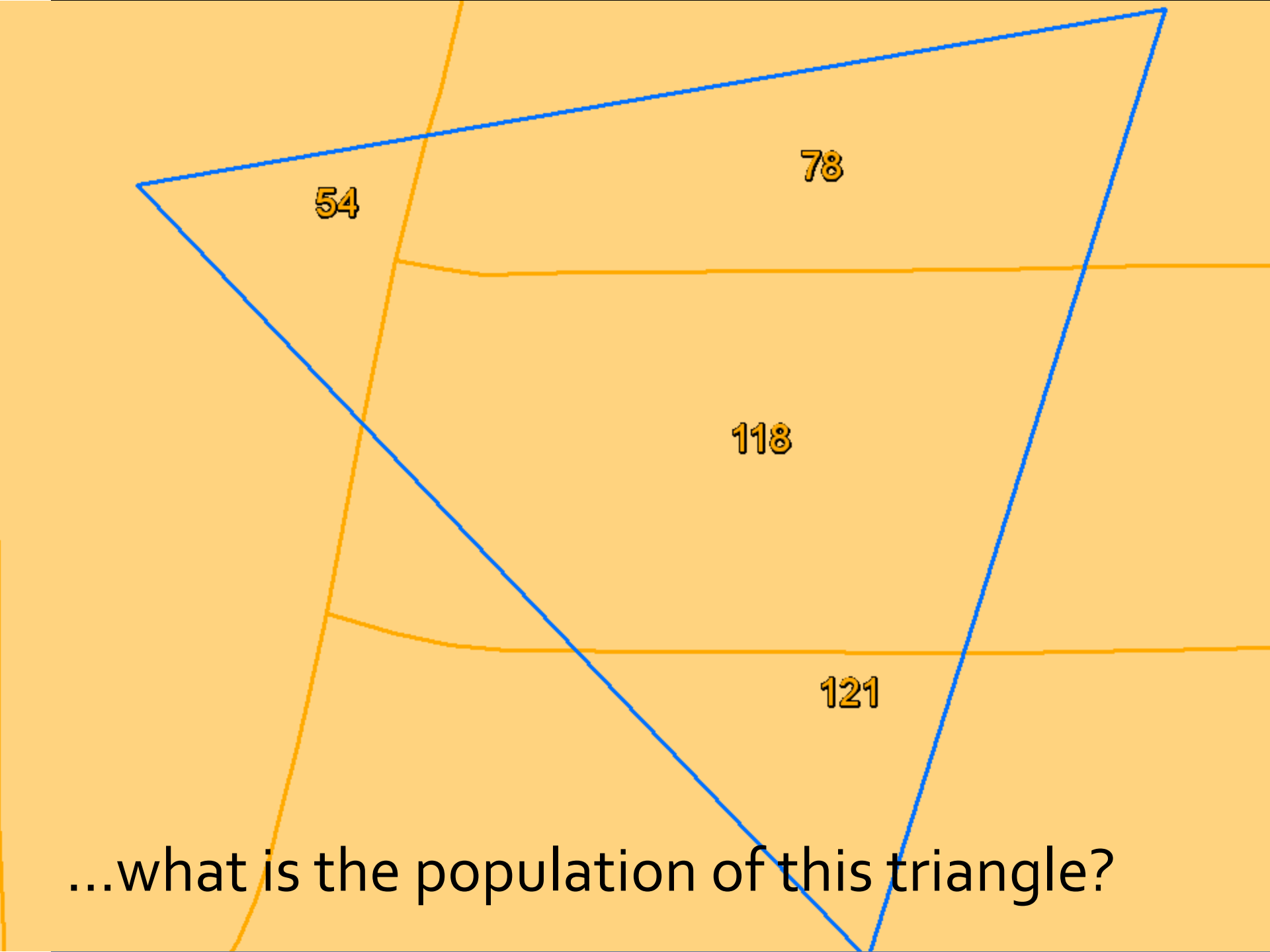
FME Workbench

The Logic

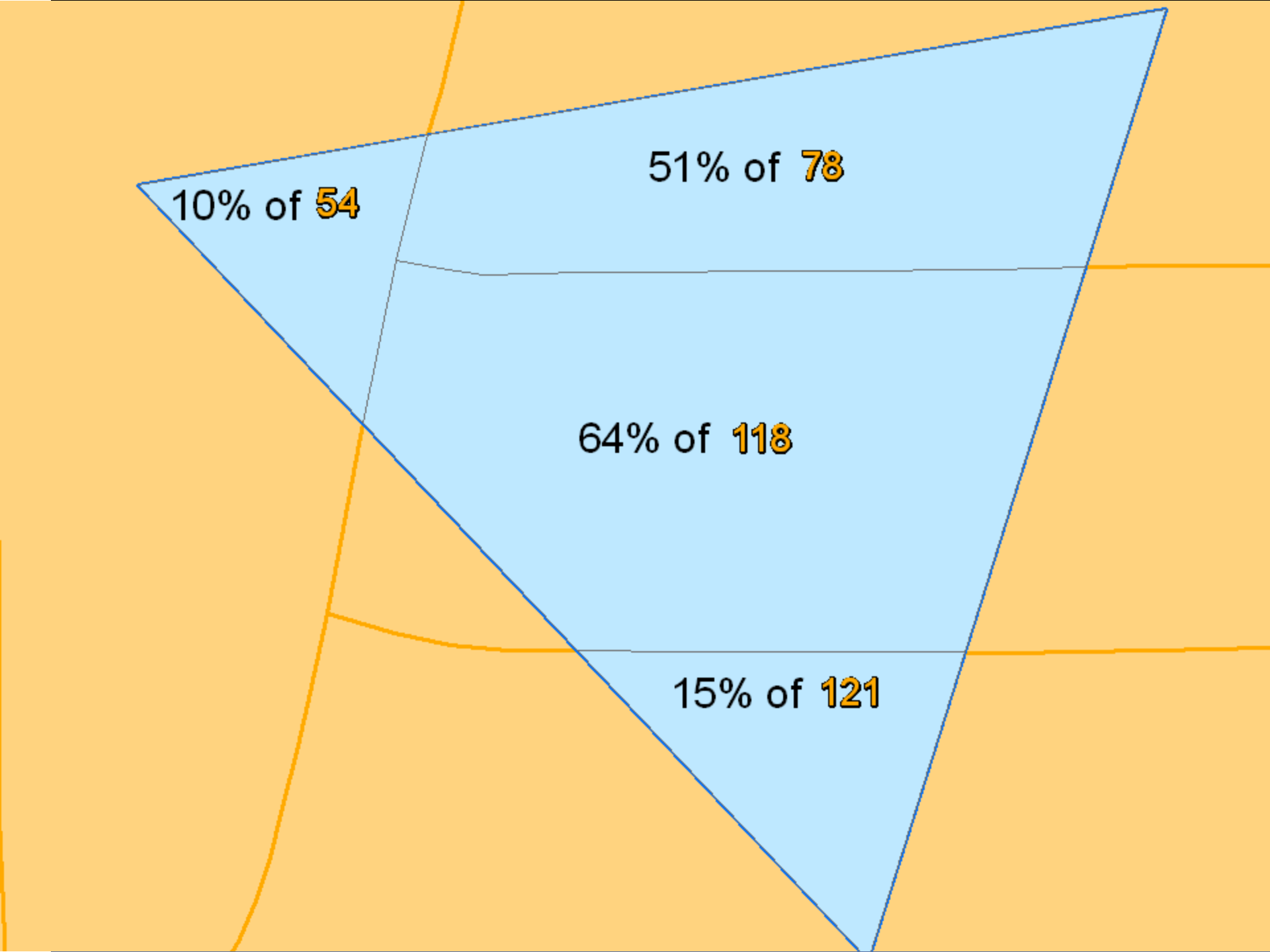
Inferring numeric polygon values from another polygon layer

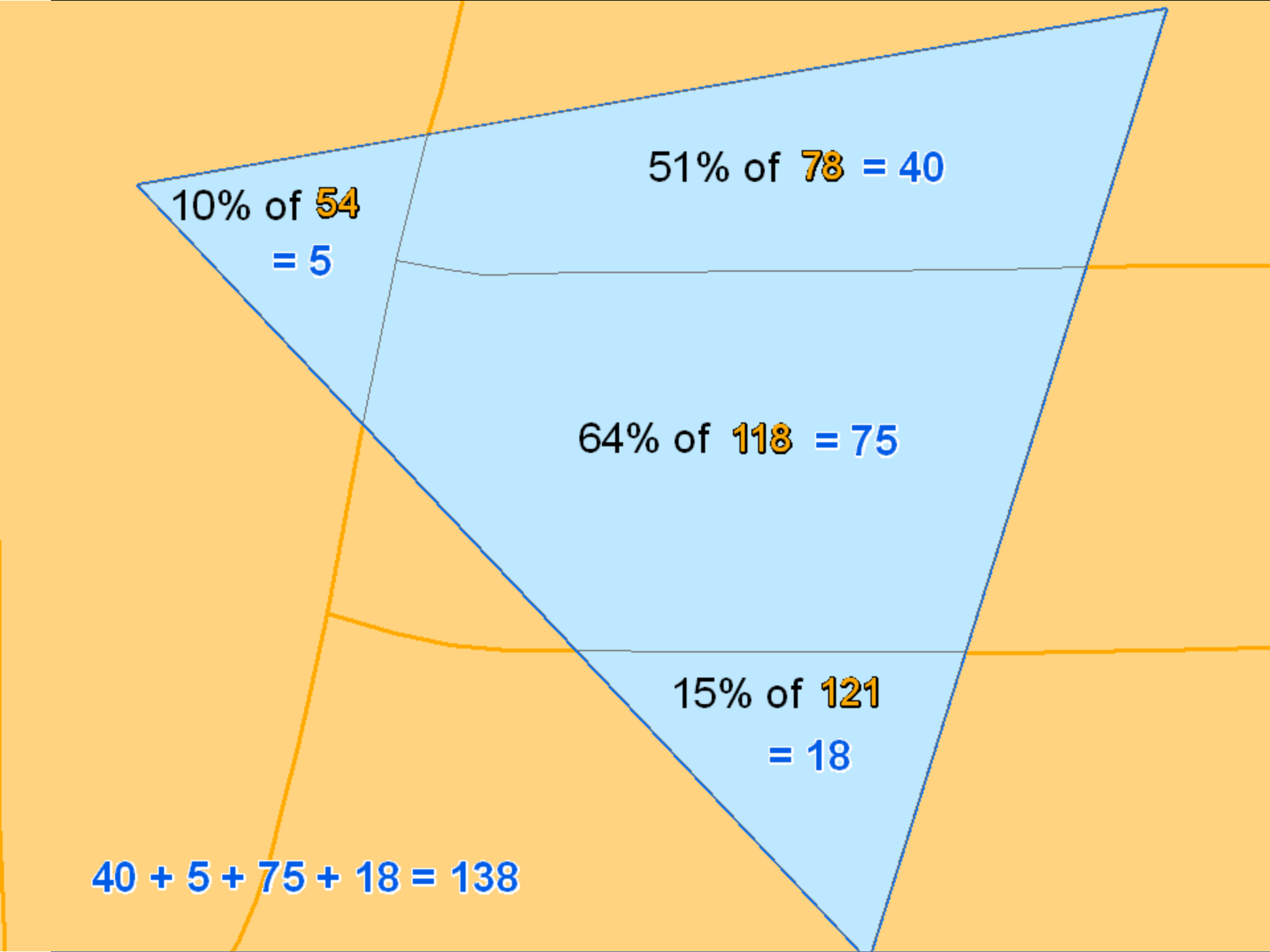
If I have population by Census block…





…what is the population of this triangle?


10% of 54
51% of 78
64% of 118
15% of 121


51% of 78 = 40
10% of 54
= 5
64% of 118 = 75
15% of 121
= 18
40 + 5 + 75 + 18 = 138

The ArcGIS Way

1. Calculate original area into source field
2. ArcToolbox→Intersect source with target
3. Calculate new area into result field
4. Calculate overlap % (result area / original area)
5. Multiply this % by value(s) to infer
6. Summary Statistics→Sum (group by Unique ID of target)

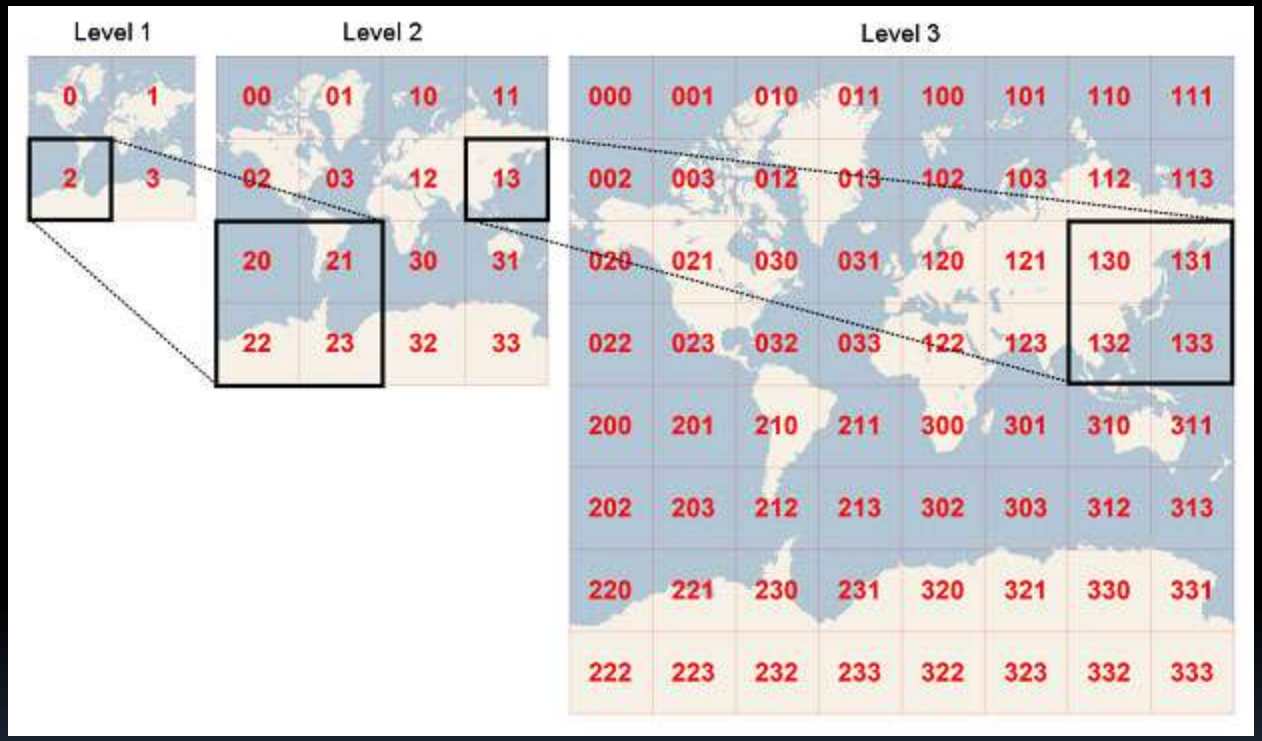
The SQL Server 2008 Way

```
SELECT Target.UniqueID, SUM(PercentOfTarget
  * SourceValue) FROM
(
SELECT Source.UniqueID, Target.UniqueID,
  Source.SourceValue,
  Source.geom.STIntersection(Target.geom).ST
  Area() / Target.geom.STArea() AS
  PercentOfTarget FROM Target INNER JOIN
  Source on
  Source.geom.STIntersects(Target.geom) = 1
)
GROUP BY Target.UniqueID
```

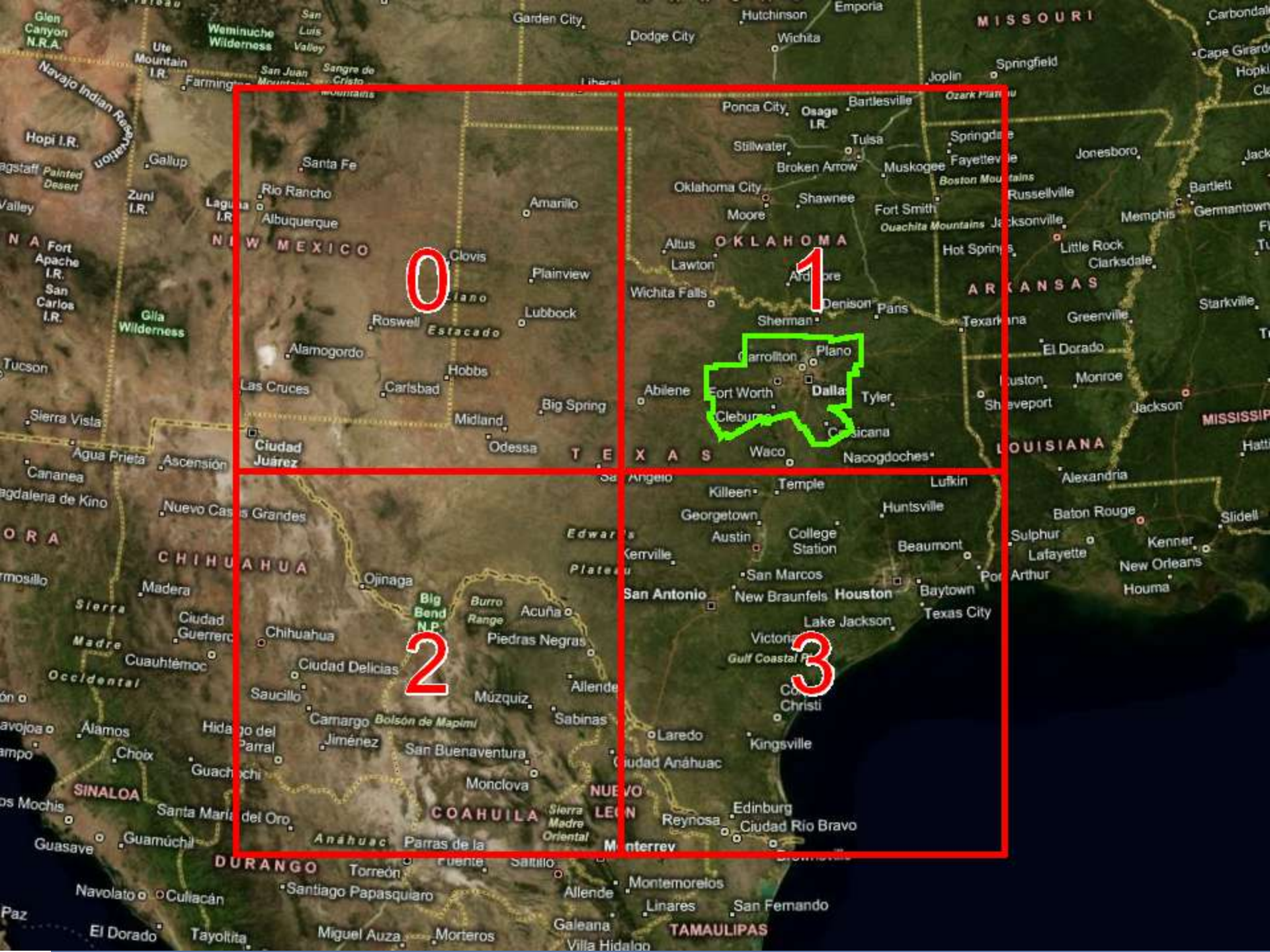
The Grid

Optimizing for the web

Bing Maps Tile Quadkeys



- Length of the key in digits indicates the level of detail (aka zoom level)
- Each quadkey starts with the quadkey of the parent grid (the next largest square containing it)


0
1
2
3
NEW MEXICO
OKLAHOMA
TEXAS
ARKANSAS
LOUISIANA
MISSOURI
MISSISSIPPI
CHIHUAHUA
COAHUILA
NUEVO LEON
TAMAULIPAS
SINALOA
DURANGO
Santa Fe
Albuquerque
Rio Rancho
Amarillo
Clovis
Plainview
Lubbock
Roswell
Alamogordo
Las Cruces
Carlsbad
Hobbs
Midland
Odessa
Big Spring
Ciudad Juárez
Oklahoma City
Tulsa
Lawton
Wichita Falls
Denison
Sherman
Plano
Dallas
Fort Worth
Abilene
Tyler
Waco
Nacogdoches
Texarkana
Shreveport
Monroe
Jackson
Greenville
Little Rock
Memphis
Jonesboro
Fayetteville
Springfield
Joplin
Bartlesville
Ponca City
Stillwater
Broken Arrow
Muskogee
Shawnee
Moore
Fort Smith
Russellville
Hot Springs
Clarksdale
El Dorado
Starkville
Alexandria
Lufkin
Temple
Killeen
Georgetown
Austin
College Station
Huntsville
Beaumont
Baton Rouge
Sulphur
Lafayette
Kenner
New Orleans
Houma
Slidell
San Marcos
New Braunfels
San Antonio
Houston
Baytown
Texas City
Lake Jackson
Victoria
Corpus Christi
Kingsville
Laredo
Edinburg
Reynosa
Ciudad Río Bravo
Monclova
Piedras Negras
Acuña
Ojinaga
Chihuahua
Ciudad Delicias
Saucillo
Múzquiz
Sabinas
Allende
Jiménez
Camargo
San Buenaventura
Parras de la
Torreón
Saltillo
Monterrey
Montemorelos
Linares
San Fernando
Galeana
Villa Hidalgo
Miguel Auza
Morteros
Santiago Papasquiaro
Culiacán
Navolato
Guasave
Guamúchil
Los Mochis
Choix
Álamos
Madera
Ciudad Guerrero
Cuauhtémoc
Nuevo Casas Grandes
Agua Prieta
Ascensión
Cananea
Nogales
Sierra Vista
Tucson
Gallup
Farmington
Hopi I.R.
Navajo Indian Reservation
Zuni I.R.
Laguna I.R.
Fort Apache I.R.
San Carlos I.R.
Gila Wilderness
Weminuche Wilderness
Ute Mountain I.R.
Glen Canyon N.R.A.
Garden City
Dodge City
Wichita
Hutchinson
Emporia
Liberal
Big Bend N.P.
Burro Range
Sierra Madre Occidental
Sierra Madre Oriental
Gulf Coastal Plains
Ouachita Mountains
Ozark Plateau
Boston Mountains
Osage I.R.
Bolsón de Mapimí
Anáhuac
Edwards Plateau
Kerrville
Angelo
Carrollton
Denton
Ardmore
Altus
Hobbs
Midland
Odessa
Big Spring
Roswell
Clovis
Plainview
Lubbock
Amarillo
Santa Fe
Albuquerque
Rio Rancho
Gallup
Farmington
Las Cruces
Carlsbad
Alamogordo
Tucson
Sierra Vista
Nogales
Agua Prieta
Ascensión
Cananea
Nuevo Casas Grandes
Madera
Ciudad Guerrero
Cuauhtémoc
Chihuahua
Ojinaga
Ciudad Delicias
Saucillo
Camargo
Jiménez
Parras de la
Monclova
San Buenaventura
Múzquiz
Sabinas
Allende
Piedras Negras
Acuña
Del Rio
Laredo
Kingsville
Corpus Christi
Victoria
Lake Jackson
Texas City
Baytown
Houston
New Braunfels
San Antonio
San Marcos
Beaumont
Port Arthur
Lafayette
New Orleans
Houma
Slidell
Baton Rouge
Alexandria
Lufkin
Temple
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Austin
College Station
Huntsville
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Waco
Nacogdoches
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Little Rock
Memphis
Jonesboro
Fayetteville
Springfield
Joplin
Bartlesville
Ponca City
Stillwater
Broken Arrow
Muskogee
Shawnee
Moore
Fort Smith
Russellville
Hot Springs
Clarksdale
El Dorado
Starkville
Oklahoma City
Lawton
Wichita Falls
Denison
Sherman
Plano
Dallas
Fort Worth
Abilene
Garden City
Dodge City
Wichita
Hutchinson
Emporia
Liberal
Cape Girardeau
Carbondale
Navajo Indian Reservation
Hopi I.R.
Zuni I.R.
Laguna I.R.
Fort Apache I.R.
San Carlos I.R.
Gila Wilderness
Weminuche Wilderness
Ute Mountain I.R.
Glen Canyon N.R.A.
Painted Desert
Valley
Navajo Nation
Ute Mountain I.R.
San Juan Mountains
Sangre de Cristo Mountains
San Luis Valley
Big Bend N.P.
Burro Range
Sierra Madre Occidental
Sierra Madre Oriental
Gulf Coastal Plains
Ouachita Mountains
Ozark Plateau
Boston Mountains
Osage I.R.
Bolsón de Mapimí
Anáhuac
Edwards Plateau
Kerrville
Angelo
Carrollton
Denton
Ardmore
Altus
Hobbs
Midland
Odessa
Big Spring
Roswell
Clovis
Plainview
Lubbock
Amarillo
Santa Fe
Albuquerque
Rio Rancho
Gallup
Farmington
Las Cruces
Carlsbad
Alamogordo
Tucson
Sierra Vista
Nogales
Agua Prieta
Ascensión
Cananea
Nuevo Casas Grandes
Madera
Ciudad Guerrero
Cuauhtémoc
Chihuahua
Ojinaga
Ciudad Delicias
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Camargo
Jiménez
Parras de la
Monclova
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Múzquiz
Sabinas
Allende
Piedras Negras
Acuña
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Laredo
Kingsville
Corpus Christi
Victoria
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Texas City
Baytown
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New Braunfels
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Beaumont
Port Arthur
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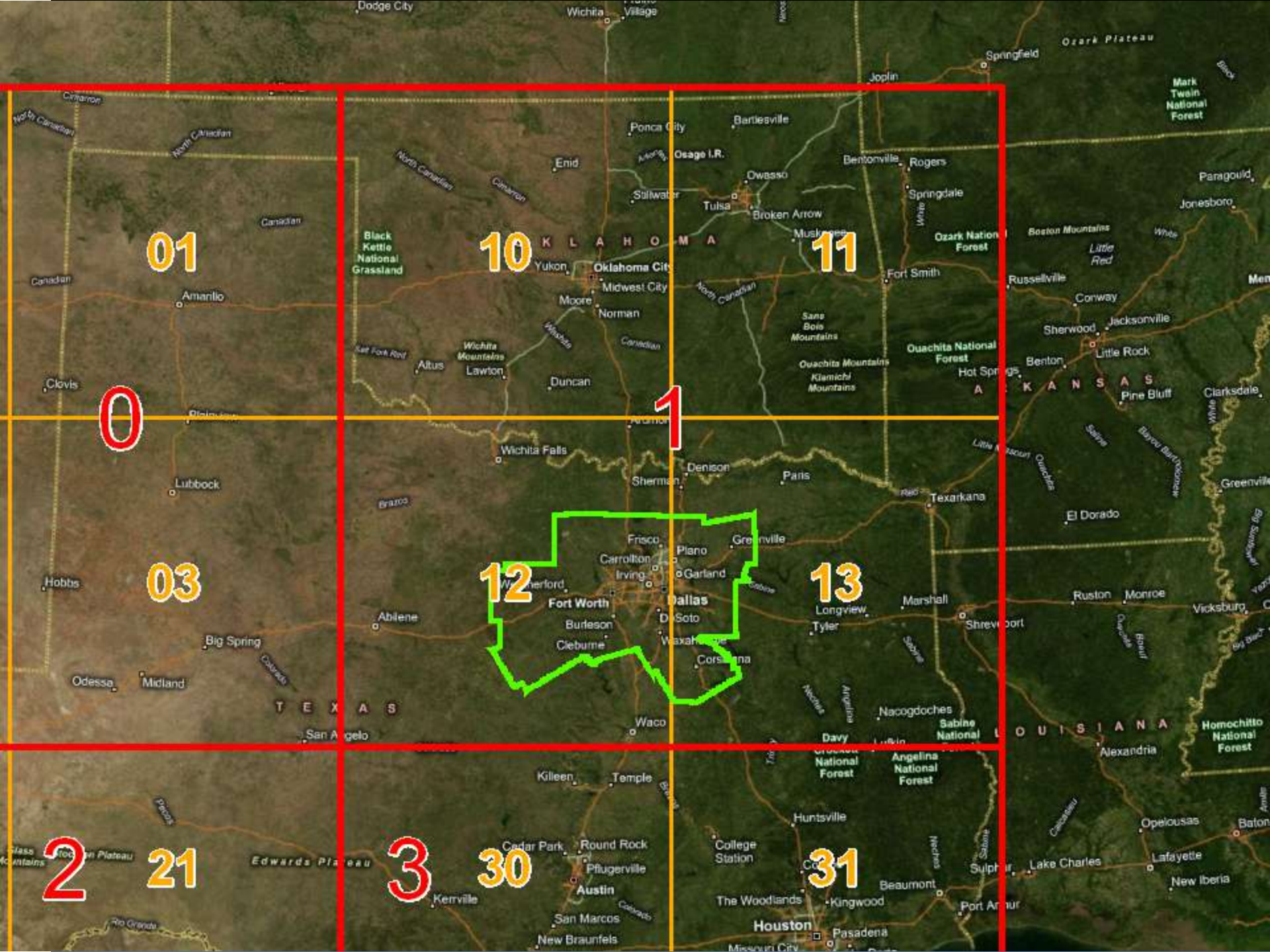
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Beaumont
The Woodlands
Kingwood
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Pasadena
Lake Charles
Lafayette
New Iberia
Opelousas
Alexandria
Homochitto National Forest
Angelina National Forest
Sabine National Forest
TEXAS
OKLAHOMA
ARKANSAS
LOUISIANA

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Lake Kemp
Lake Diversion
Ardmore
Lake Murray
Lake Texoma
Denison
Sherman
Paris
Lake Crook
Clear Boggy Creek
Broken Bow Lake
Sulphur
West Fork Trinity
Clear Fork Brazos
Denton
Frisco
The Colony
McKinney
Allen
Plano
Greenville
Carrollton
Keller
Coppell
Garland
Rowlett
Irving
North Richland Hills
Weatherford
Fort Worth
Arlington
Dallas
Benbrook
Cedar Hill
Lancaster
DeSoto
Burleson
Clear Fork Trinity
Lake Granbury
Clebume
Waxahachie
Cedar Creek
Tyler
Longview
Abilene
US Hwy 281
Proctor Reservoir
Corsicana
Waco Lake
Waco
Leon
Copperas Cove
Killeen
Temple
Lampasas
Davy Crockett National Forest
Nacog
Martin Lak

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Six Flags Dr
Arlington Downs Rd
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E Randol Mill Rd
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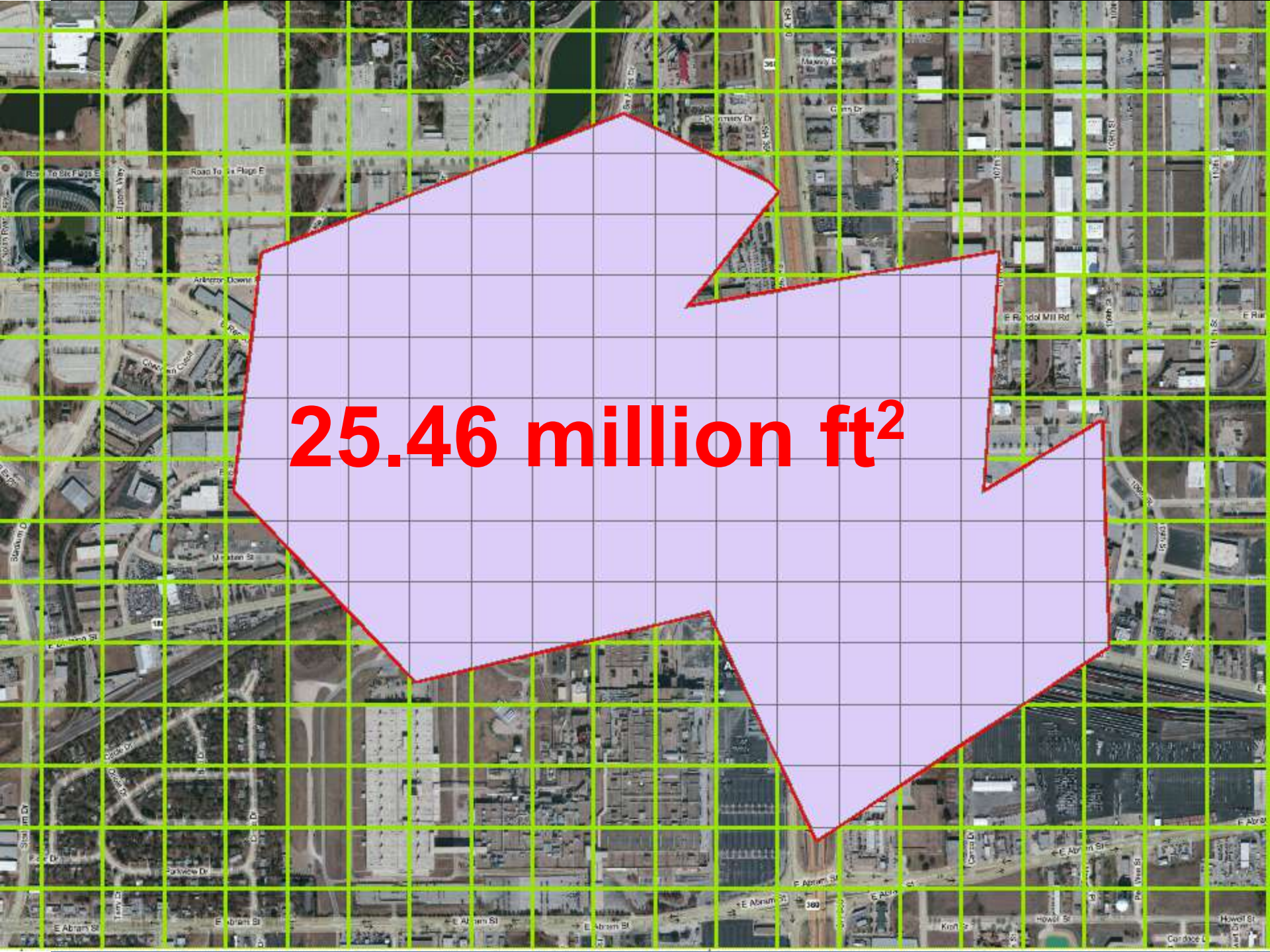
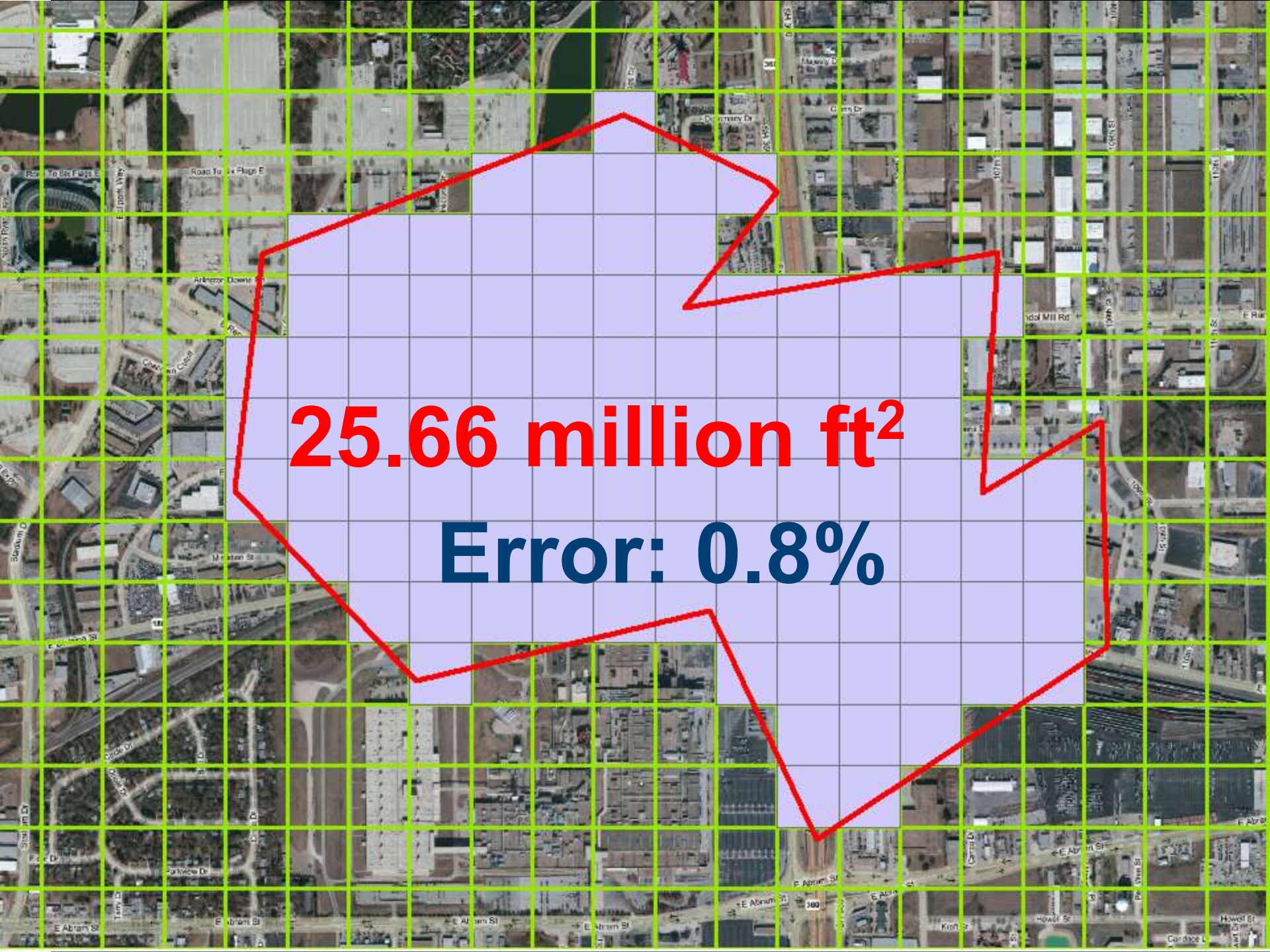
1231102110320

Building the Grid

```
--*** ADJUSTABLE VARIABLES ****--

--use the appropriate unit of measurement for the projection you are using (ie feet if state plane):
  declare @sidelength float = 100 --length of one side of largest grid
  declare @originX float = 0 --left X coordinate of largest grid cell
  declare @originY float = 0 --bottom Y coordinate of largest grid cell

declare @levels int = 4 --number of tiers to subdivide into 2x2 grids

--**** END OF ADJUSTABLE VARIABLES***

declare @leftX float = @originX
declare @rightX float = @leftX + @sidelength
declare @bottomY float = @originY
declare @topY float = @bottomY + @sidelength

--create largest grid
declare @g geometry
set @g = geometry::STGeomFromText('POLYGON((' +  str(@leftX, 20, 5) + ' ' + str(@bottomY, 20, 5) + ', '
                                  + str(@rightX, 20, 5) + ' ' + str(@bottomY, 20, 5) + ', '
                                  + str(@rightX, 20, 5) + ' ' + str(@topY, 20, 5) + ', '
                                  +  str(@leftX, 20, 5) + ' ' + str(@topY, 20, 5) + ', '
                                  +  str(@leftX, 20, 5) + ' ' + str(@bottomY, 20, 5) + '))',2276)
```

Etc…


25.46 million ft²


25.66 million ft²
Error: 0.8%

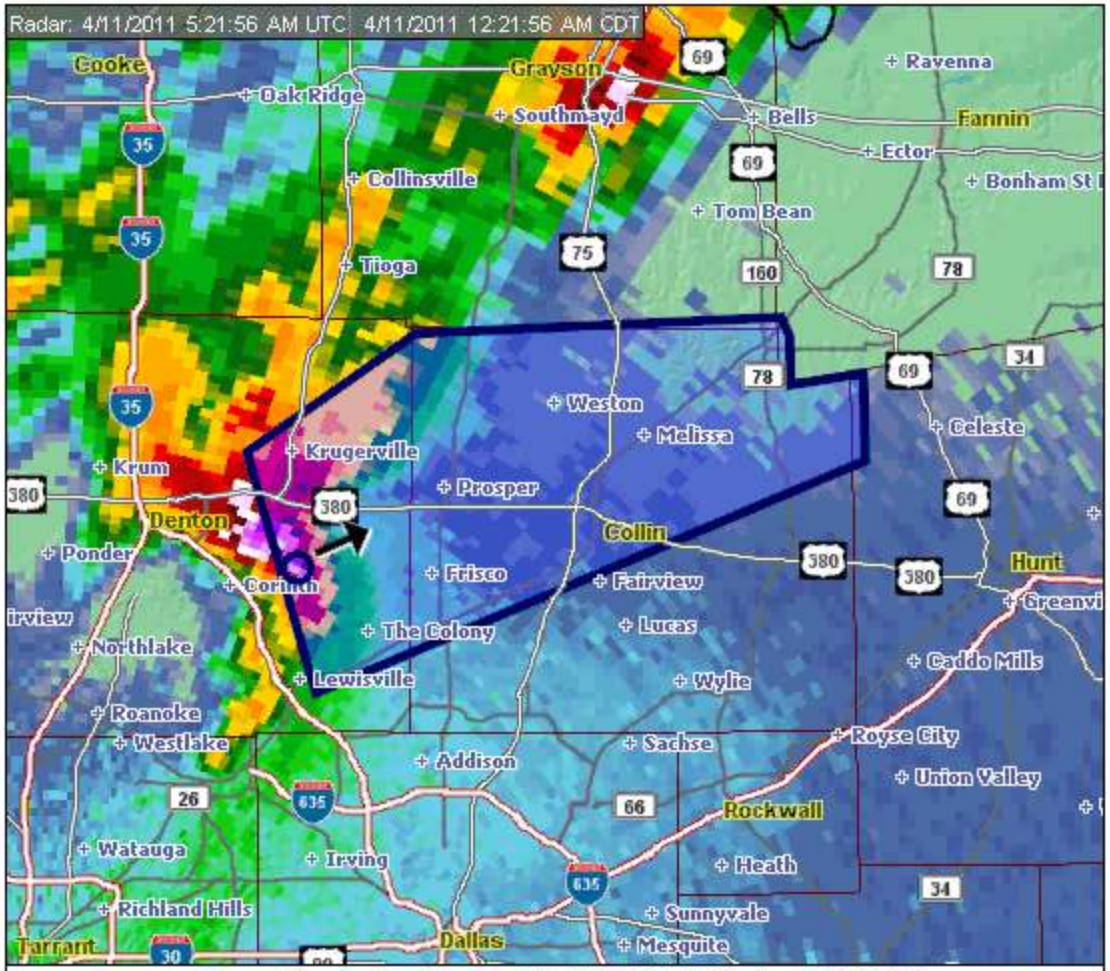
NCTCOG
North Central Texas Council of Governments

weather

Severe Thunderstorm Warning

Counties: **Collin Denton**

Issued: Monday 4/11/2011 12:23:00 AM **Expires:** Monday 4/11/2011 12:52:00 AM (Originally 1:15:00 AM)

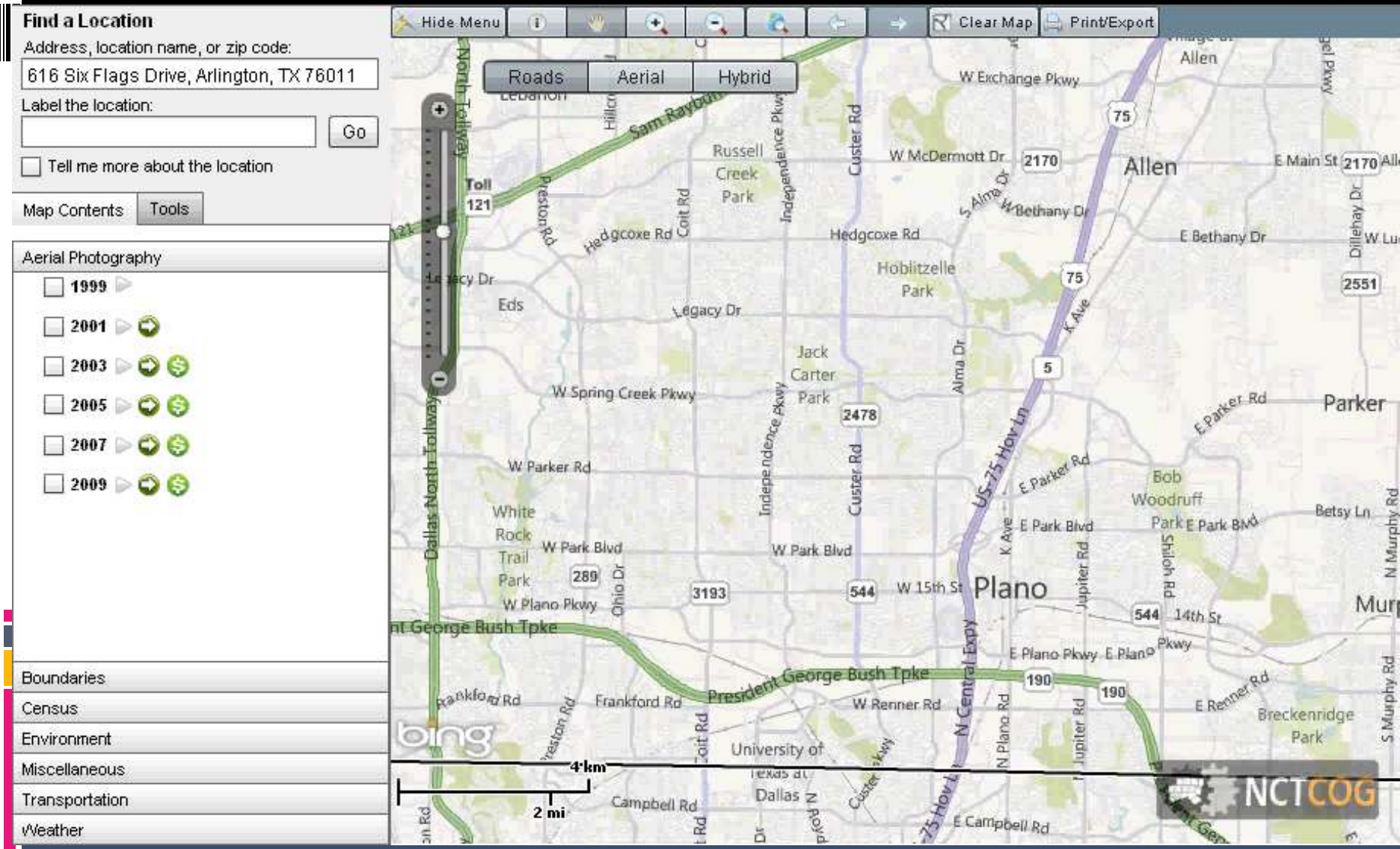


Severe Thunderstorm Warning - KFWD.SV.0041 2011 - Issued 12:23 AM

Status	WARNING
Event	Severe Thunderstorm
Area	708 Sq. Miles
Storm Motion	Moving Northeast At 50 Mph.

Impacted Population:	36,896
In Homes:	77.67%
In Multi-Family Units:	1.42%
In Mobile Homes:	20.91%
English Spoken Well:	98.42%
English Not Spoken:	1.58%
Female:	17,780
Male:	19,116
Under Age 18:	10,520
Over Age 65:	3,174
Housing Units:	12,416

Source: 2000 Census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Address, location name, or zip code:
616 Six Flags Drive, Arlington, TX 76011
Label the location:
Go
Tell me more about the location
Map Contents
Tools
Aerial Photography
1999
2001
2003
2005
2007
2009
Boundaries
Census
Environment
Miscellaneous
Transportation
Weather
Hide Menu
Clear Map
Print/Export
Roads
Aerial
Hybrid
Allen
Plano
Parker
Russell Creek Park
Hoblitzelle Park
Jack Carter Park
White Rock Trail Park
Bob Woodruff Park
Breckenridge Park
University of Texas at Dallas
President George Bush Tpke
Dallas North Tollway
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Sam Rayburn
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W Spring Creek Pkwy
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Frankford Rd
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W 15th St
14th St
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W Exchange Pkwy
W McDermott Dr
E Main St
E Bethany Dr
Custer Rd
Independence Pkwy
Preston Rd
Coit Rd
Alma Dr
Jupiter Rd
Shiloh Rd
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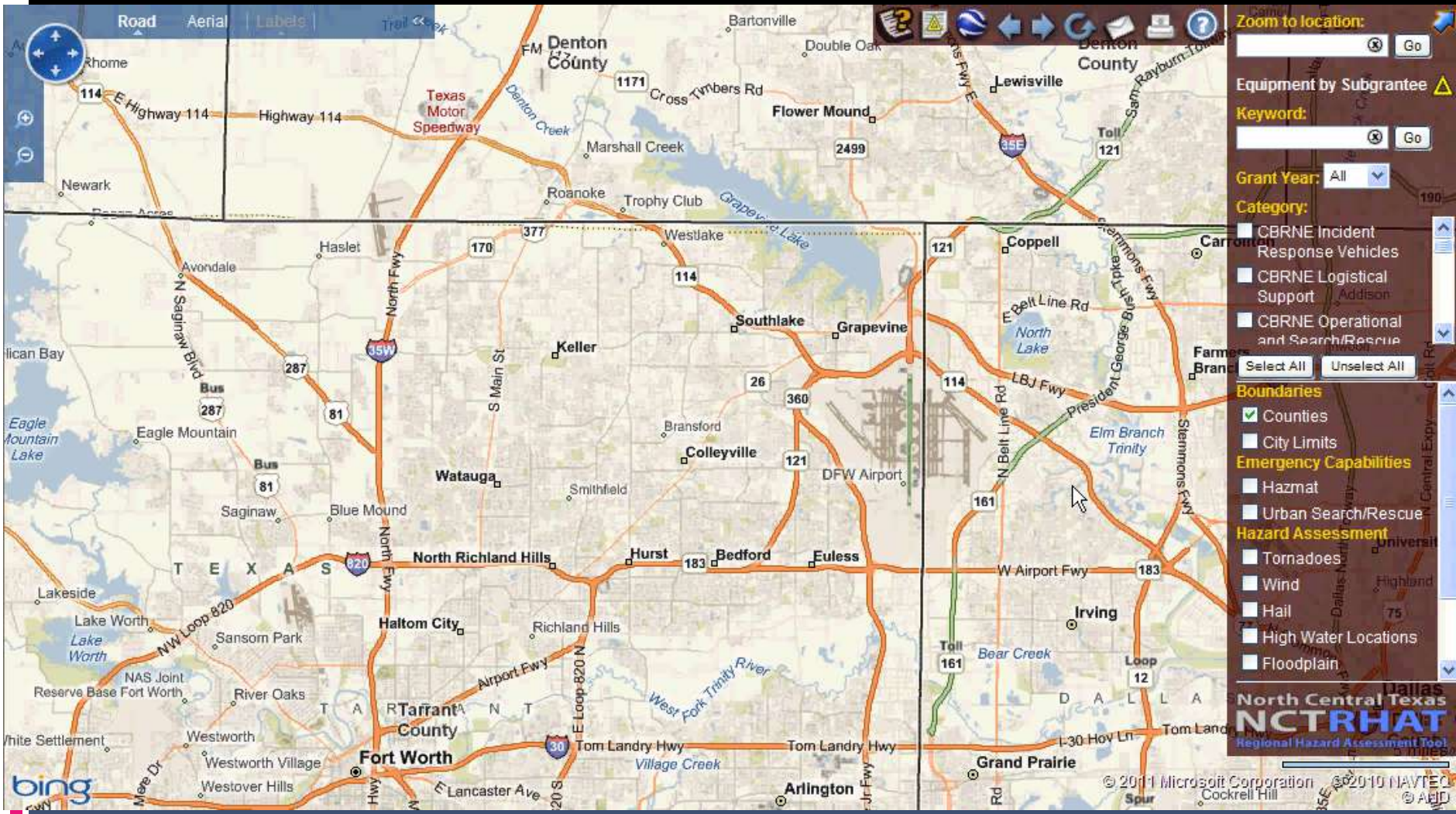
NCTCOG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CBRNE Logistical Support
CBRNE Operational and Search/Rescue
Select All
Unselect All
Boundaries
Counties
City Limits
Emergency Capabilities
Hazmat
Urban Search/Rescue
Hazard Assessment
Tornadoes
Wind
Hail
High Water Locations
Floodplain
North Central Texas
NCTRHAT
Regional Hazard Assessment Tool
Denton County
Texas Motor Speedway
Flower Mound
Lewisville
Coppell
Southlake
Grapevine
Keller
Watauga
Colleyville
North Richland Hills
Hurst
Bedford
Euless
Haltom City
Fort Worth
Tarrant County
Irving
Grand Prairie
Arlington
Eagle Mountain
Saginaw
Blue Mound
Lake Worth
Sansom Park
River Oaks
Westworth
Westworth Village
Westover Hills
Richland Hills
Bear Creek
Elm Branch Trinity
Village Creek
West Fork Trinity River
Grapevine Lake
Denton Creek
Marshall Creek
Roanoke
Trophy Club
Westlake
Haslet
Avondale
Newark
Rhome
Bartonville
Double Oak
Cross Timbers Rd
E Highway 114
Highway 114
Tom Landry Hwy
W Airport Fwy
Airport Fwy
Loop 820
NW Loop 820
E Lancaster Ave
I-30 Hov Ln
LBJ Fwy
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Questions?

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