

Recommended File Naming Standard for North Carolina Orthoimagery

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NORTH CAROLINA
DEPARTMENT OF
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1. How is North Carolina orthoimagery named currently?

1.1. Review of existing standards

North Carolina uses a single zone State Plane Coordinate System to name its orthoimagery.

What is a State Plane Coordinate System?

A State Plane Coordinate System (SPCS) or State Plane System (SPS) is a Cartesian grid¹ that allows for highly accurate measurement within a specified area. The United States (including Puerto Rico and the Virgin Islands) is divided into more than 120 grids or “zones” (Figure 1). Each state or territory contains one to six zones – based on the state’s shape. For example, California has six zones whereas North Carolina, Montana and others have one zone. States with one zone are referred to as single-zone states.

In the 1930s, the U.S. Coast and Geodetic Survey developed the State Plane Coordinate System to provide a common reference system to surveyors and mappers for large-scale mapping in the United States. Large-scale mapping refers to a mapping scale with a large ratio fraction. A ratio fraction is the relationship between how something is depicted on the map and the ground truth of the real world – such as one map inch is the equivalent of 100 inches in the “real world” (1:100). A map of a city would qualify as a large-scale map. Small-scale mapping (considered 1:250,000 and lower, for example, 1:5,000,000) provides less detail because a unit of map distance depicts greater “real world” distance than in large-scale mapping. A map of the United States is a small-scale map.

The primary goal of the developers of the State Plane Coordinate System was to design a conformal² mapping system for the country with a maximum scale distortion of one part in 10,000, which was then considered the limit of surveying accuracy³.

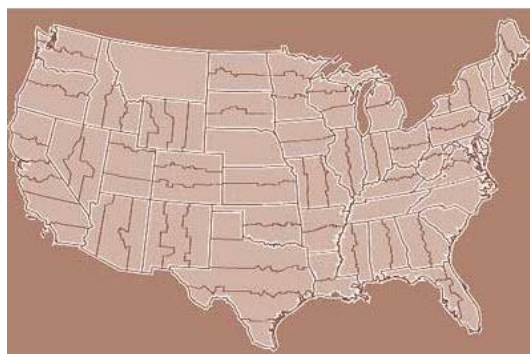


Figure 1. State Plane Coordinate System⁴

¹ A Cartesian grid is a coordinate system in which the coordinates of a point are its distances from a set of perpendicular lines that intersect at an origin, such as two lines in a plane or three in space.

² *Conformal projections preserve local shape.* To preserve individual angles describing the spatial relationships, a Conformal projection must show [lines of longitude and lines of latitude] lines intersecting at 90-degree angles on the map. The drawback is that the area enclosed by a series of arcs may be greatly distorted in the process. No map projection can preserve shapes of larger regions.

³http://webhelp.esri.com/arcgisdesktop/9.3/index.cfm?TopicName=State_Plane_Coordinate_System

Because the plane system “flattens” the earth, measurements are easier to make. Today, state and local governments and land surveyors use this system most. County boundaries, property boundaries, intersection of roads and streets, and any prominent feature of a region can be accurately located with definite Northing (y) and Easting (x) coordinates.

The NC State Plane Coordinate System

North Carolina has a single zone. The State Plane Coordinate System grid (Figure 2) covers the entire state and has its origin in northwest Georgia.

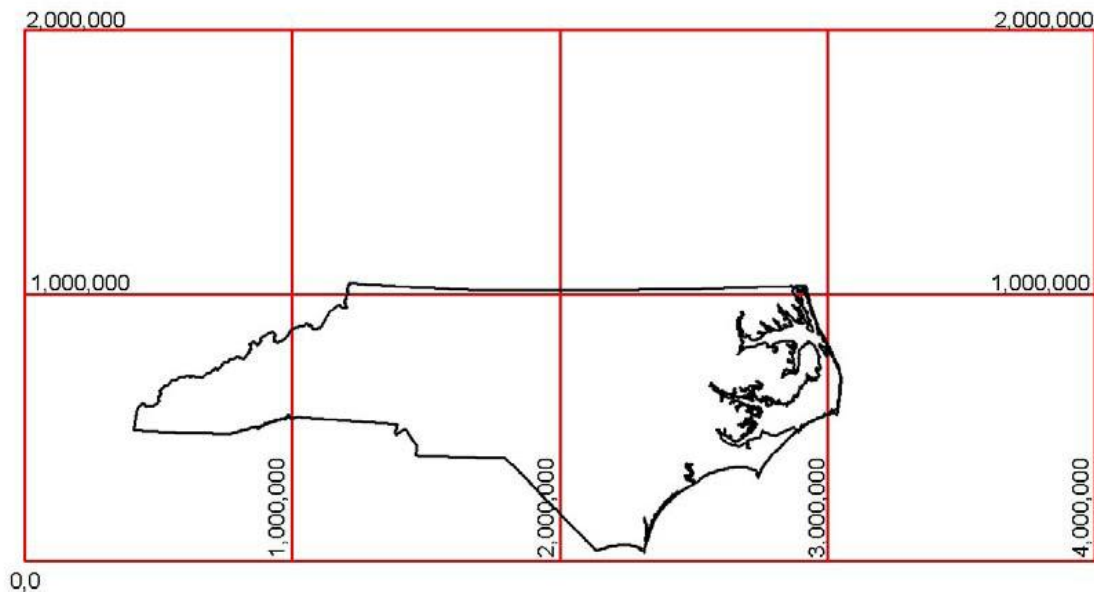


Figure 2. NC State Plane Coordinate System⁵

Based on the origin point in northern Georgia, the state is divided into 10,000 feet by 10,000 feet grid cells. This 10,000-square foot block is called a “Basic Modular Unit.” Each cell is given a four-digit identifier based on the measurement of feet of how far the southwest corner of the grid cell is both north and east of the origin. The scale of such maps or images is one inch equals four hundred feet (1” = 400’), which is referred to as “400 scale.”

Section 6.18 of the *North Carolina Technical Specifications for Digital Orthophoto Base Mapping* (2009)⁶ states that 10,000 feet by 10,000 feet cells are numbered by using the digits in the

⁴ Courtesy: http://geology.isu.edu/geostac/Field_Exercise/topomaps/state_plane.htm

⁵ Courtesy: *North Carolina Cooperating Technical State Mapping Program, Issue 21: North Carolina Digital Flood Insurance Rate Map (FIRM) Panel Numbering Scheme/Count*. Federal Geographic Data Committee Subcommittee for Cadastral Data) <http://www.nationalcad.org/data/documents/nc-parcel-id.pdf>

⁶ *North Carolina Technical Specifications for Digital Orthophoto Base Mapping, Land Records Management Division*, North Carolina Department of the Secretary of State, Edited by Thomas W. Morgan, Adopted on October 1, 2009. See <http://www.secretary.state.nc.us/land/>

100,000th place and 10,000th place of the measurements of how far east and how far north the cell's southwest corner is from the origin. The numbers in the 100,000th digit space of each east/north measurement are recorded first followed by the numbers in the 10,000th digit space of each east/north measurement.

For example, the southwest corner of a grid cell in northeast Cherokee County is 490,000 feet east of the origin and 570,000 feet north of the origin point (Figure 3).



Figure 3. Cherokee shapefile index

In the grid cell described above, Cherokee County would be labeled 4597.

If a southwest corner point is greater than 1,000,000 feet east or north of the origin, the digit in the millionths position is dropped, and thus not included in the number label.

Images at a finer scale (e.g., 200 scale) are given six-digit identifiers (Figure 4) – the first four digits represent the identifier of its “parent” Basic Modular Unit 10,000 feet by 10,000 feet cell. The fifth and sixth digits indicate its position in the larger cell and its level of resolution. In 200-scale orthoimagery, cells are 5,000 feet by 5,000 feet, and in 100 scale (or 1”=100’), cells are 2,500 square feet by 2,500 feet.

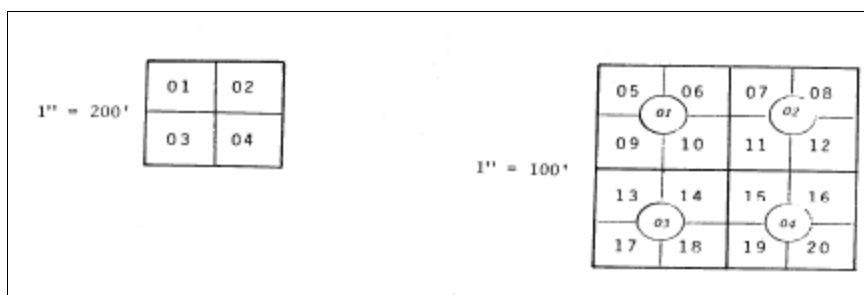


Figure 4. Six-digit identifier, from Attachment 3, *North Carolina Technical Specifications for Digital Orthophoto Base Mapping*

As an example, Dare County orthoimagery of Roanoke Island at the 1"=100" scale would be labeled (Figure 5):

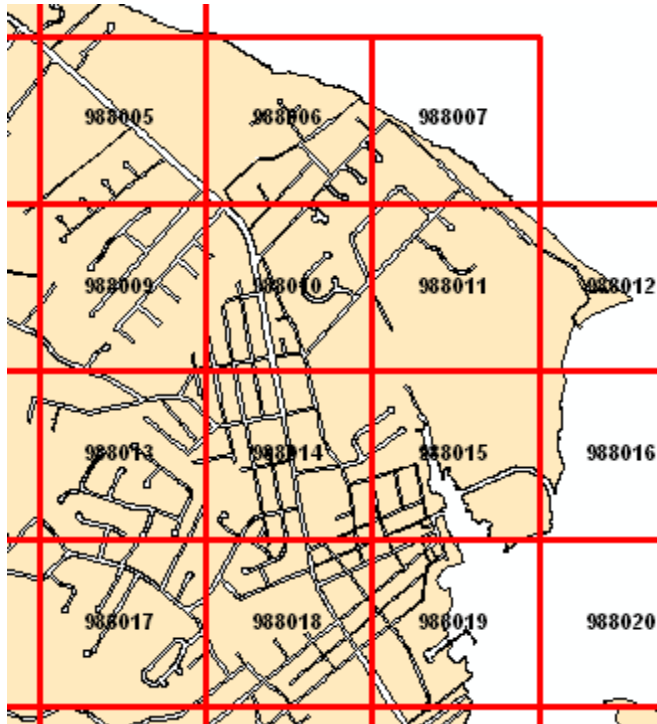


Figure 5. Dare County

North Carolina's guidelines for naming orthoimagery are clearly spelled out and are recommended to state agencies and counties in the North Carolina Technical Specifications for Digital Orthophoto Base Mapping⁷.

Two pertinent sections covering the naming of Digital Orthophotos are contained in Section 6 of the guidelines. Specifically:

6.17 Mapping Basic Modular Unit

The 1" = 400' map is the smallest scale map included in these specifications and is designated the "Basic Modular Unit" in a series of maps which provide for four map scales, as follows:

- a. 1" = 400'. The boundaries of each Basic Modular Unit shall be the grid ticks of the North Carolina State Plane Coordinate System evenly divisible by 10,000 ft. in north-south and east-west directions.
- b. 1" = 200'. Each map will be one-quarter (1/4) of a Basic Modular Unit

⁷ *North Carolina Technical Specifications for Digital Orthophoto Base Mapping*, Land Records Management Division, North Carolina Department of the Secretary of State, Edited by Thomas W. Morgan, Adopted on October 1, 2009. See <http://www.secretary.state.nc.us/land/>

(see subsection 6.16 a. and Attachment 3). The neat image area shall be bounded by the North Carolina grid ticks whose eastings and northings are evenly divisible by 5,000 feet.

c. 1" = 100'. Each map shall be one-sixteenth (1/16) of a Basic Modular Unit (see subsection 6.16 a. and Attachment 3). The neat image area of this unit shall be bounded by the North Carolina grid ticks with eastings and northings evenly divisible by 2,500 feet.

6.18 Numbering of the Basic Modular Units

Each Basic Modular Unit map shall be identified by a map number derived from selected paired digits of the east and north coordinates of the southwest corner of the module. For example, a *map with the lower left corner coordinates of E = 640,000 and N = 530,000 will be known as Map Number 6543. The digit "6" in the 100,000th place of the east coordinate is paired with the digit "5" in the 100,000th place of the north coordinate; the digit "4" in the 10,000th place of the east coordinate is paired with the digit "3" in the corresponding position in the north coordinate (emphasis added).* These four digits uniquely define the modular map unit in any one county. This map numbering system also forms an integral part of the parcel identifier number (PIN) system (see subsection 10.06). In counties where the coordinate values equal or exceed 1,000,000 feet, the digit in the millionth place is redundant and will be dropped. *However, the map must be clearly identified with its proper county name (emphasis added).* Thus, the map in Gates County having coordinates for its southwest corner of E = 2,660,000 and N = 1,010,000 can be identified as Gates County Map Number 6061. *The map numbers at the 1" = 400' scale will contain only four digits. The map numbers at the 1" = 200' scale and the 1" = 100' scale will contain only six digits (emphasis added).* For these larger scales, the first four digits of the map numbers shall be those of the Basic Modular Unit with the addition of a two-digit suffix determined according to the chart in Attachment 3. *There will be a decimal point between the four digits of the Basic Modular Unit and the suffix (emphasis added),* for example Gates County Map Number 6061.15.

Counties use this method in creating names for orthoimagery as shown in Figure 6.

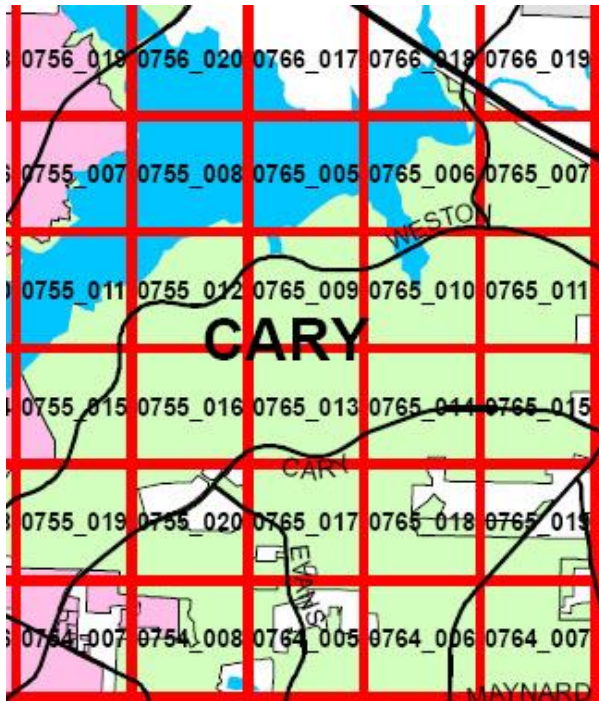
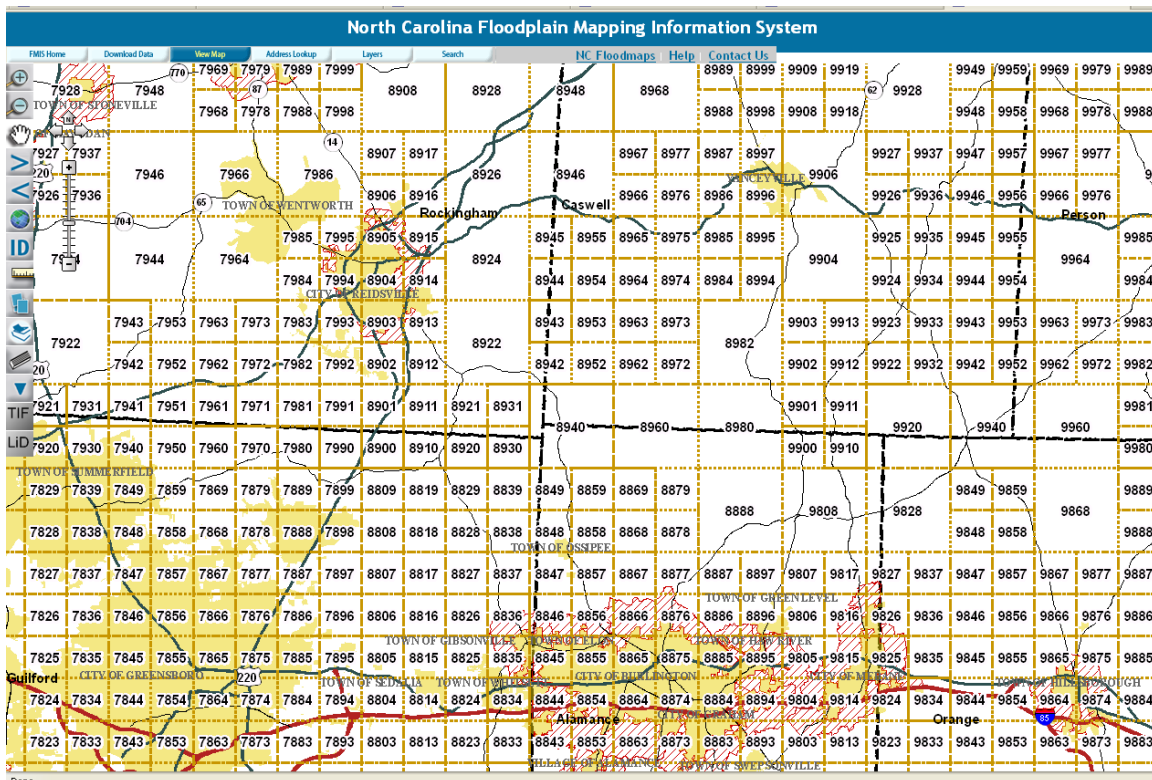


Figure 6. Names for Town of Cary in Wake County

As shown below, the North Carolina Floodplain Mapping Program also uses this naming method.



While progress was being made with developing a standard for naming orthoimagery, the members of the Archival and Long Term Access Ad Hoc Committee⁸, a committee established by the North Carolina Geographic Information Coordinating Committee (GICC), studied challenges associated with preserving geospatial data. The committee identified semantic issues as one of the preservation challenges to digital geospatial data. Specifically:

Widely ranging approaches to dataset naming, attribute naming, and attribute classification schemes create both short- and long-term barriers to understanding and use of content. While good metadata can make it possible to interpret these components, such metadata is unfortunately often absent or may not include the data dictionaries associated with names and codes found in the data.⁹

In 2008, the GICC adopted the Final Report of its Archival and Long Term Access Ad Hoc Committee. Page 5 of this document addresses naming for raster data:

Consistent use of file naming schemes in the community facilitates the development of an efficient archival process. *Data should be named in such a way to make the characteristics of the data easily discernable from the name (emphasis added)*. Such information should include (at a minimum):

- Keyword for jurisdiction or geographic extent
- Keyword for theme content or layer name
- Date created

Example: WAKE_PARCELS_2008_01¹⁰

On page 6, the report further details the value of having a unique file name for each file in outlining the danger during data retrieval that “if the files are identical in name to files currently on their system, the old files will be overwritten.”

⁸ See <http://www.ncgicc.com/CurrentActivities/ArchivalandLongTermAccess/tabid/422/Default.aspx> for more information on the committee.

⁹ http://www.ncgicc.com/Portals/3/documents/Archival_LongTermAccess_FINAL11_08_GICC.pdf, page 11.

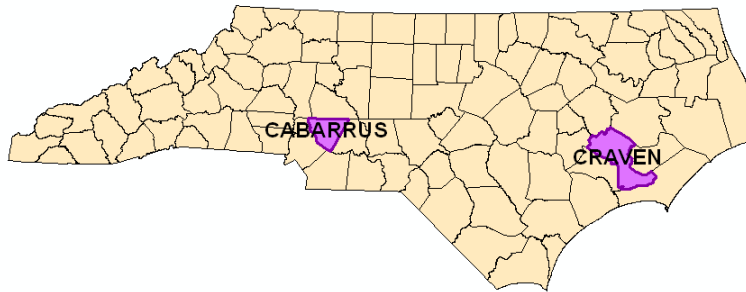
¹⁰ http://www.ncgicc.com/Portals/3/documents/Archival_LongTermAccess_FINAL11_08_GICC.pdf

1.2 Issues with current standard

Potential to triplicate names

Because North Carolina measures both more than 1,000,000 feet east to west and north to south, and the digit in the millionths position is dropped and thus not included in the number label, a number identifier could be repeated up to three times. For example, Cabarrus County and Craven County share identical identifier number ranges. The Basic Modular Units numbers are used in both counties because, using existing standards, the identifiers for a cell 1,500,000 feet east of the origin and 580,000 feet north of the origin and a cell 2,500,000 feet east of the origin and 580,000 feet north of the origin are both 5508.

Example: 5508_01.sid¹¹ (200 resolution)



5508_01.sid

Cabarrus County

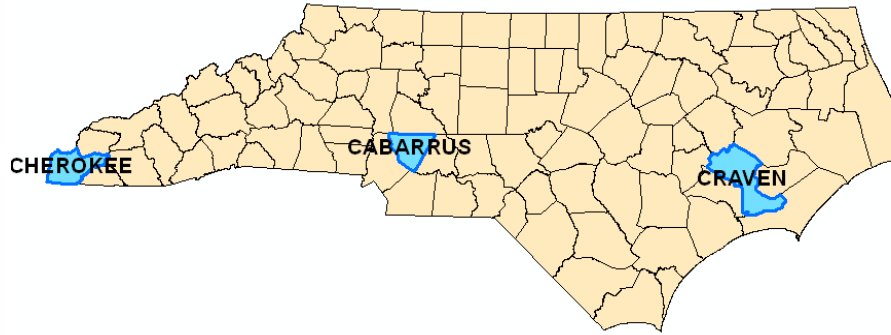


5508_01.sid

Craven County

While such repetition will not occur in a single county because no county measures more than 1,000,000 feet in either north-south or east-west direction, a 4-digit number could potentially be repeated as many as three times within the state. In fact, the Basic Modular Unit identifier 5508 is also shared with Cherokee County – since a cell contained in Cherokee County is 500,000 feet east of the origin and 580,000 feet north of the origin.

¹¹ All images and shapefiles from NCOneMap <http://www.nconemap.com/Default.aspx?tabid=286>



5508.sid

Cherokee County

Some counties have acted to correct this duplication. For their 2008 orthoimagery, several counties past the 2 millionth foot line, including Camden, Edgecombe, Lenoir, Nash, Pamlico, Pasquotank, Perquimans, Scotland and Wayne counties, took into account the millionth digit of easting measurements from the origin and added these two additional digits to the front of the Basic Modular Unit identifier (e.g., Edgecombe = 20374602.sid) – even though the current standards state to disregard the millionth digit.

Under such a system of incorporating the millionth digits of into an expanded, six-digit unit identifier, the id 207704 would represent a Basic Modular Unit with the coordinates:

- East : 2,700,000 feet
- North: 0,740,000 feet

Other counties, including Rutherford (2005), Watauga (2005) Vance (2009), and Scotland (2008) also have added two digits (“10”) to the front of image names for the 1 millionth digits of easting and northing measurements. In total, 12 of 100 NC counties used this method to name their local orthophotography (NCOneMap).

For its 2007 orthoimagery, Henderson County partially adopted this naming convention, but dropped the northing measurement millionth digit. As an example, an image depicting the Basic Modular Unit 0506 is named “10506-01.sid”, where the “1” represents the millionth digit of the

easting measurement. The northing measurement millionth digit – “0” is not recorded. If it were, the file name would become 100506-01.sid.

Unclear of what county an image depicts

The *North Carolina Technical Specifications for Digital Orthophoto Base Mapping* (2009) states that maps must be labeled with its county name to lessen confusion over where grid cell with a shared Basic Modular Unit identifier are geographically in the state. However, the county name or a county identifier is not incorporated into the file name of the digital orthoimagery. Identifying where an image exists spatially can be determined by looking at metadata detailing the county name and/or bounding coordinates – if either is included in the metadata record for the dataset. Images also may be grouped together by county in folders but during use and/or manipulation in a digital environment images may become disassociated with a folder.

Additionally, the labeling of images that straddle one or more county lines is potentially a problem. As shown in Figure 7, three different files from three different counties (Alamance, Rockingham and Guilford) overlap. All three files have different naming conventions, with no indication of what counties – and further that three counties – are being depicted in the image.

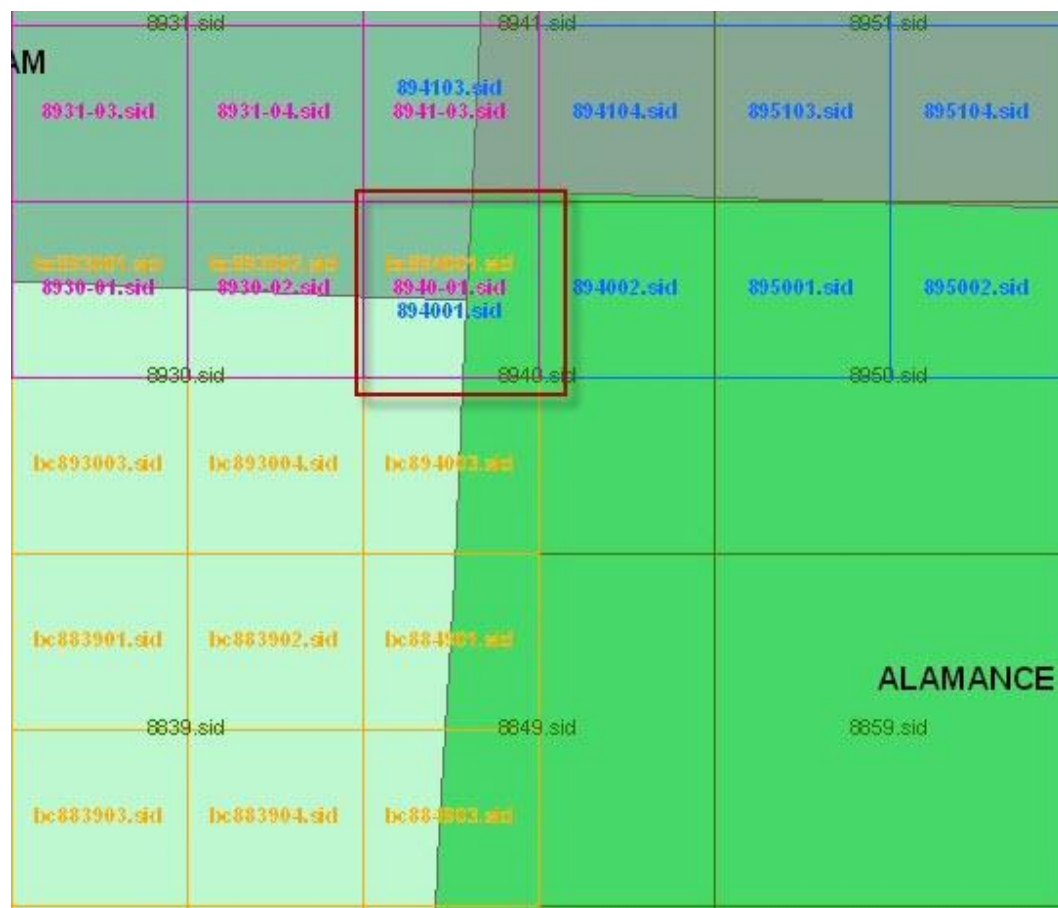


Figure 7. County lines

County-level use of standards is inconsistent

Counties tend to be inconsistent in their use of the recommended standards. As mentioned above, some counties have begun incorporating millionth digits into their file naming. Aside from differences in content included in a file name, the structures of file names are inconsistent across the state. For 200-scale imagery, the range of variations include (b = Basic Modular Unit number; x = location identifier):

1. bbbbxx
2. bbbb_xx
3. bbbb-xx
4. bbbbxxC
5. bbbbxxc
6. bbbbxx_R
7. bbbbxxc
8. bbbb-x
9. bbbb-xx
10. Tbbbbxx_20
11. tbbbbxx_20
12. c2005_bbbb_0xx
13. bbbb_0xx

Year

The year of capture is included in only one post-2004 orthoimagery set. For its 2005 orthoimagery, Wake County labeled images using the structure: c2005_bbbb_0xx.

Custody

Presently there is no indication of what jurisdiction or agency is responsible for the capture or care of the data.

2. How do others name their orthoimagery?

2.1 Kentucky

Like North Carolina, Kentucky uses a single zone state plane coordinate system (Kentucky Single Zone – KY1Z) to name imagery. The Kentucky Single Zone was created during the 1990s to replace the use of two zones.

The origin point is in central Illinois (or northwest corner, see Figure 8). The state is divided into 20,000 square foot cells and cells are given the name of its position in the grid. Values increase west to east and north to south. (Note: Kentucky also has 5,000 and 10,000 feet grids, but the most commonly used is the 20,000 feet)

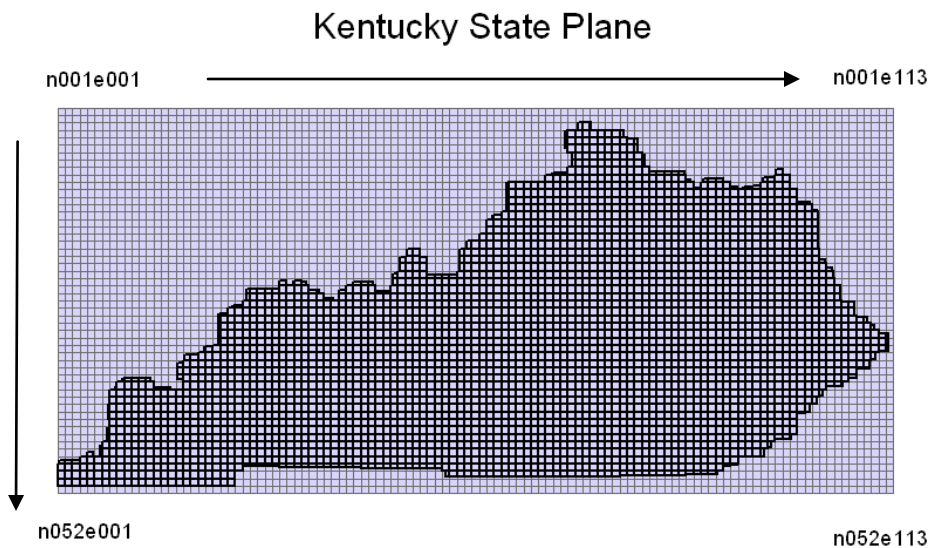


Figure 8. Kentucky Grid

The incorporation of “n” for Northing and “e” for Easting makes the position of the grid cell more apparent (Figure 9). The first half of the name indicates the north-south position and the second half indicates its east-west position. Unlike in the North Carolina grid, there is no transposing of numbers based on digit position.

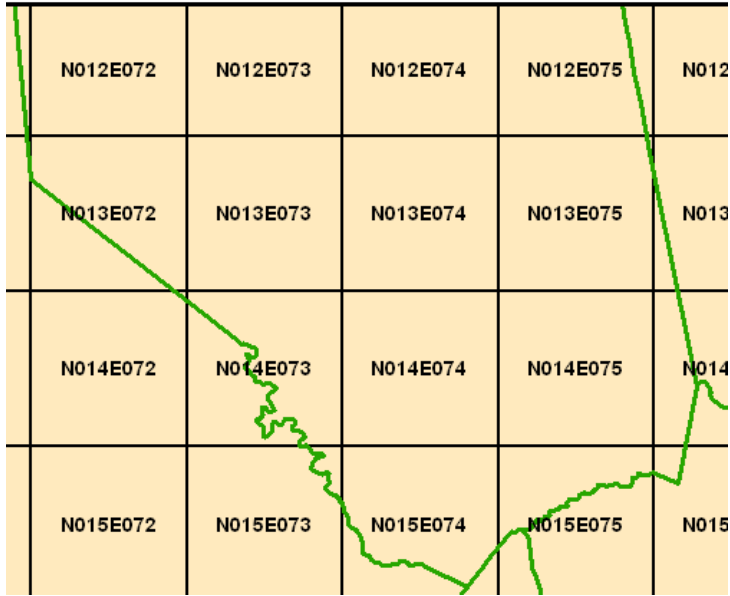


Figure 9. Central Kentucky (county boundaries shown)

2.2 Farm Service Agency (FSA): National Agricultural Imagery Program (NAIP)

The names given to the NAIP imagery aggregates the most information about the image, its capture, its location and its position. **Included are quadrangle id, quadrangle quadrant, Universal Transverse Mercator zone, resolution, date of capture and verification date.** These practices eliminate concerns of redundancy in file names¹².

For example, the file name:

n_3908450_se_16_1_20040919_20050218

is based on:

n_USGSID_Qdrint_UTM_Res_SrcImgDate_VerDate

The USGSID is a truncation of the Quadrangle Quadrant key which is derived from the latitude and longitude measures of the grid cell.

2.3 U.S. Geological Survey (USGS)

The USGS uses standardized names to describe the position a digital orthoimage quadrangle. An image is 7.5 minutes latitude by 7.5 minutes longitude. The image is then sliced into quadrangle-quadrants or “quarter-quadrangles”– 3.75 minutes by 3.75 minutes.

USGS’ naming documentation states:

¹² For full report, see: <http://gis.apfo.usda.gov/naipcoverage/Help/NAIP%20Coverage%20Map%20Instructions.pdf>

Images are named after the USGS quadrangle abbreviation¹³. The number in the image name represents the quadrangle quadrant (see below). There are 4 images per USGS quadrangle.

1 = Northwest

2 = Northeast

3 = Southwest

4 = Southeast

The following (2.3.1 and 2.3.2) are examples of superseded North Carolina orthophotos. The examples include both the reference map and the metadata associated with the orthophotos.

2.3.1 Digital Orthophoto Quadrangles, 1993 Black and White (U.S. Geological Survey)

The NC OneMap clearinghouse provides access to 3.75 by 3.75 minute quadrangles of North Carolina DOQ imagery. A reference grid¹⁴ is included with the orthophotos (Figure 10), which includes the quadrangle grid names (abbreviated city/town names). If a city/town covers more than 1 quadrangle, an “E” for east or “W” for west is added to the end of the name, as in the case of Raleigh.

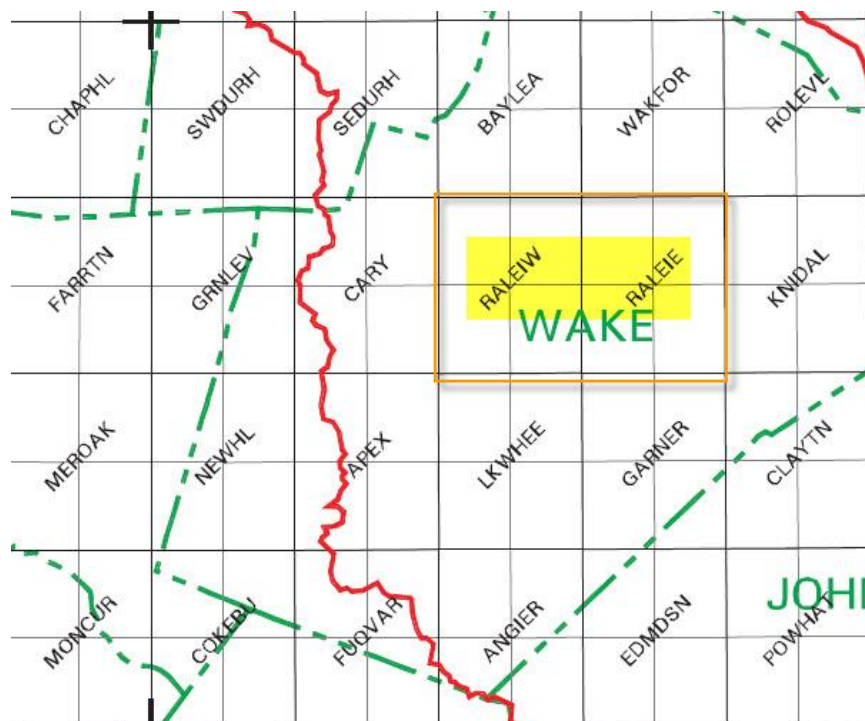


Figure 10. 1993 DOQ

¹³ See: ftp://204.211.239.203/outgoing/raster/doqq/bw_1993/README.txt

¹⁴ For entire grid, see: ftp://204.211.239.203/outgoing/raster/doqq/bw_1993/doqq_reference.pdf

To see the individual tile names, one must select the directory of the images (Figure 11). Using Cary as an example, the file name begins with the county name (sometimes abbreviated), followed by a 1, 2, 3, or 4, where 1 = Northwest, 2 = Northeast, etc.

07/20/1998	08:36AM	16,486,470	carvcp4.jpg
07/20/1998	08:37AM	222	cary1.jgw
07/20/1998	08:37AM	13,839,583	cary1.jpg
07/20/1998	08:37AM	222	cary2.jgw
07/20/1998	08:37AM	13,654,636	cary2.jpg
07/20/1998	08:38AM	222	cary3.jgw
07/20/1998	08:38AM	13,926,199	cary3.jpg
07/20/1998	08:39AM	222	cary4.jgw
07/20/1998	08:39AM	14,462,370	cary4.jpg
07/20/1998	08:39AM	222	casar1.jgw
07/20/1998	08:39AM	16,087,763	casar1.jpg
07/20/1998	08:40AM	222	casar2.jgw
07/20/1998	08:40AM	15,096,926	casar2.jpg
08/10/1998	09:55AM	222	casar3.jgw
08/10/1998	09:55AM	13,227,575	casar3.jpg
08/10/1998	09:56AM	222	casar4.jgw

Figure 11. 1993 File Names

2.3.2 1998 Color Infrared Digital Orthophoto Quadrangles (USGS)

As with the 1993 DOQ's, the 3.75 by 3.75 minute quadrangles are in NCOneMap. A reference grid¹⁵ is included with the orthophotos (Figure 12), which includes the quadrangle grid names (abbreviated city/town names). This grid is identical to the 1993 DOQ grid as are the individual file names.

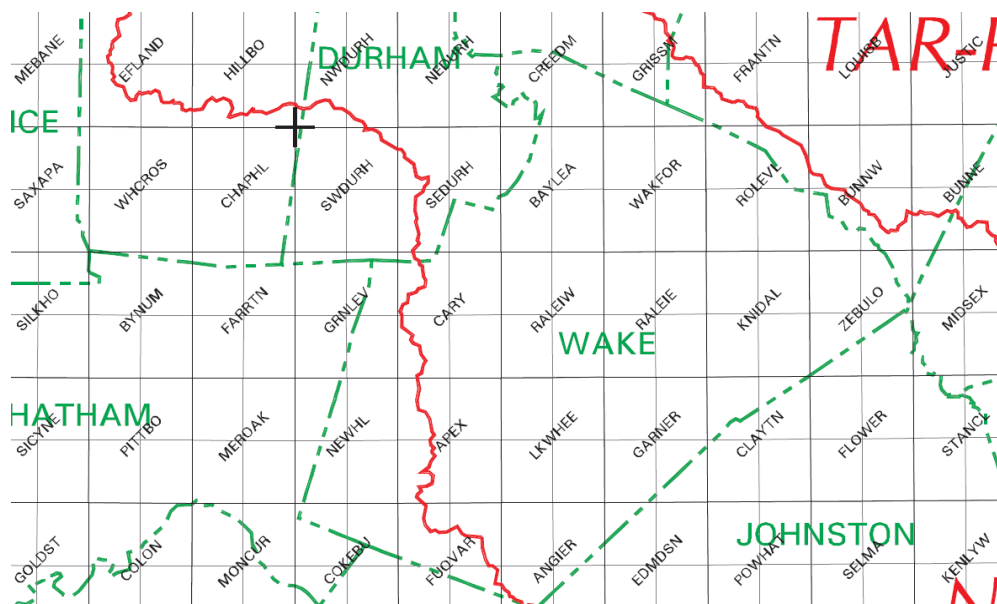


Figure 12. 1998 DOQ

¹⁵ For entire grid, see: ftp://204.211.239.203/outgoing/raster/doqq/cir_1998/doqq_reference.pdf

Such use of standard geographic names would make the spatial location of a tile more readily apparent to user unfamiliar with the way Basic Modular Units identifiers are constructed. However, this practice alone does not make the file distinguishable through time as the 1993 and 1998 captures share file names – albeit the formats used are different (1993 are saved as jpegs, while 1998 are saved as MrSIDs).

2.4 North Carolina Floodplain Mapping Program

The North Carolina Floodplain Mapping Program has sought to resolve the Basic Modular Unit identifier dilemma, the potential to overwrite superseded data and difficulty in locating what a tile spatially depicts with a complex naming scheme.

■ **D53720765400WC20020301.ZIP**

- **D5** – representing Digital Elevation Model 50
- **37** -- representing the FIP Zone
- **20765400** -- representing the Secretary of State Land Records Management (SOS LRM) Numbering of the Basic Modular Unit including the Millionth place digit. In this example, the Basic Modular Unit depicted has the coordinates: 2,750,000 feet east and 0,640,000 feet north. The final two digits are reserved for the two-digit indication of scale and location within the Basic Modular Unit.

■ Grid Panel	Mapping Scale	integer code
■ 10,000	1" = 400'	00 - 00
■ 5,000	1" = 200'	01 - 04
■ 2,500	1" = 100'	05 - 20
■ 1,250	1" = 50'	21 - 84

- **WC or GO** -- representing the contractor (Watershed Concepts or Greenhorne & O'Mara)
- **20020301** -- representing the year\month\day

While this approach addressed the issue of redundancy, it did not address the recommendations for naming standards made by the Archival and Long Term Access Ad Hoc Committee. In particular, the data was not named in such a way to make the characteristics of the data easily discernable from the name.

3. Recommendations

In order to make the file name more informative and decrease the risk of overwriting data, the following recommendations should be considered. These recommendations are based on the Archival and Long Term Access Ad Hoc Committee's recommendations for naming raster data.

Incorporation of indication of type of product and pixel size

The Archival and Long Term Access Ad Hoc Committee's Final Report recommends the inclusion of a "[k] eyword for theme content or layer name" in a file name. Specifying the type of product in the file name would accomplish this aim¹⁶.

The inclusion of pixel size would inform the user of the spatial resolution of the image and would help users download or access images of the proper granularity for their purposes without downloading irrelevant data. Also in instances of contemporaneous data capture at different spatial resolutions, pixel size information in the file name would decrease chances of overwrite.

Use of custodian code

Addition of a custodian code would allow for quick identification of what agency or jurisdiction was responsible for the creation of the image. This practice would allow the user to locate where an image "lives" more easily by narrowing the area it could reside to one of 100 counties and not the entire state – in the event of local orthoimagery capture. This recommendation does not resolve the issue of detailing in the file name what area is being depicted but, again, does narrow possibilities.

For county-maintained data, a custodian code would be the county ANSI (FIPS) code. Data from other sources would receive the identifier 000 for statewide, a city code (e.g., RAL) or an agency code (e.g., DOT). ANSI codes exist for all NC counties [e.g., Alamance (001), Alexander (003), Alleghany (005), Yadkin (197), Yancey (199).]

The U.S. Census Bureau also uses ANSI codes to identify counties. The county codes for North Carolina counties: <http://www.census.gov/geo/www/fips/fips65/data/37000.html>.

Such a system would presuppose the user has knowledge of the ANSI (FIPS) county codes and that selected alphabetic identifiers are easily understood.

<http://www.census.gov/geo/www/ansi/ansi.html>

Use of millionth digits in Basic Modular Unit identifiers

The use of millionth digits in the construction of Basic Modular Unit identifiers prevents redundancy across the state.

Indication of process date

Adding a month, day and year would eliminate the chances to overwrite superseded files in addition to allowing for quick identification of time of capture.

¹⁶ http://www.ncgicc.com/Portals/3/documents/Archival_LongTermAccess_FINAL11_08_GICC.pdf, page 5.

Example¹⁷:

OC6i0_37_000_20765400_20100601R0

- **OC** -2-digit product code: O= orthoimagery, C = color. Other product codes OB (B&W) OI (Infrared) DE (DEM)†
- **6i0** – 3-digit pixel size: Use the unit indicator code (i = Inch, f = Foot, m = Meter, c = Centimeter) as the decimal point. 6 Inch = 6i0, 1.5 feet = 1f5, 1.5 meter = 1m5, 15 centimeters = 15c. Note the unit indicator code is always lower case. ††
- **37** – 2-digit NC ANSI (FIPS) Code †††
- **000** – 3-digit alphanumeric custodian code. ‡
- **20765400** – Map Index Number -8 digit SOS LRM Numbering of the Basic Modular Unit with Millionth place digits. As in the NC Floodplain Mapping Program, the final two digits are reserved for the two-digit indication of scale and location within the Basic Modular Unit.‡‡
- **20100601R0** – 10 digit tile project date (YYYYMMDD)(RN) (RN=revision number, 0 is no revisions, R1,R2, etc to be used as needed.)
- Additional user generated info can be appended at the **END** of the file name; an underscore will be used between the date field and the additional information. While there is no limitation to the number of characters a user can append to a file name, users must be cognizant that the maximum length of a file name (which typically includes the entire file path and not just the file name) can be limited by an operating system or software application.

Further Explanatory Notes:

† **OC** -2-digit product code: Other product codes OB (B&W) OI (Infrared) DE (DEM)

- OC (O = Orthoimagery, C = color)
- OB (O = Orthoimagery, B = Black and White)
- O4 (O = Orthoimagery, 4 = 4 Band)
- OR (O = Orthoimagery, R = Infrared)
- DL (D = Digital Elevation Model, L = LiDAR)

¹⁷ Developed in cooperation with Thomas W. Morgan, Land Records Manager, North Carolina Department of the Secretary of State.

- DP (D = Digital Elevation Model, P = Photogrammetric)
- LA (L = LiDAR Point Data, A = All Return)
- LF (L = LiDAR Point Data, F = First Return)
- LG (L = LiDAR Point Data, G = Ground or Bare Earth)
- LI (L = LiDAR Point Data, I = Intensity)
- LW (L = LiDAR Point Data, W = Waveform)
- HL (H = Hill Shade Model, L = LiDAR)
- Note: Codes for other data sets will be added as needed. If the product is a primary deliverable of a technology process use the technology code as the first character. If the product is a derived product from a technology process use the product term as the first character and the technology process as the second character.

†† **6u0** – 3-digit pixel size: for Raster Data; **VRD**: for Vector Data; **PTD**: for Point Data

- 6u0 = pixel size, u= unit indicator code
- 6i0 = 6 inches.
- 1f0= 1foot,
- 1m5= 1.5 meter,
- 15c = 15 Centimeter, etc.

††† **37** – 2-digit NC ANSI (FIPS) Code

- The North Carolina ANSI (FIPS) Code will be used for all data using the North Carolina Grid paneling convention to facilitate its incorporation into national mapping systems.

‡ **000** – 3-digit alphanumeric custodian code.

- For county maintained data this would be county ANSI (FIPS) code,

<http://www.lib.ncsu.edu/gis/countfips.html>

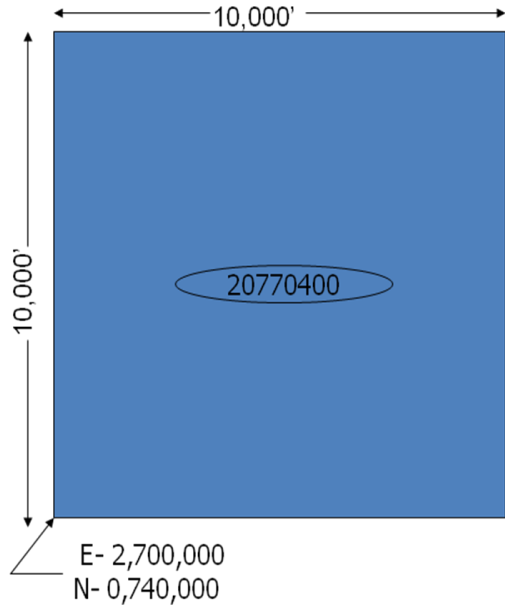
<http://www.census.gov/geo/www/fips/fips65/download.html>

- 000 for statewide,

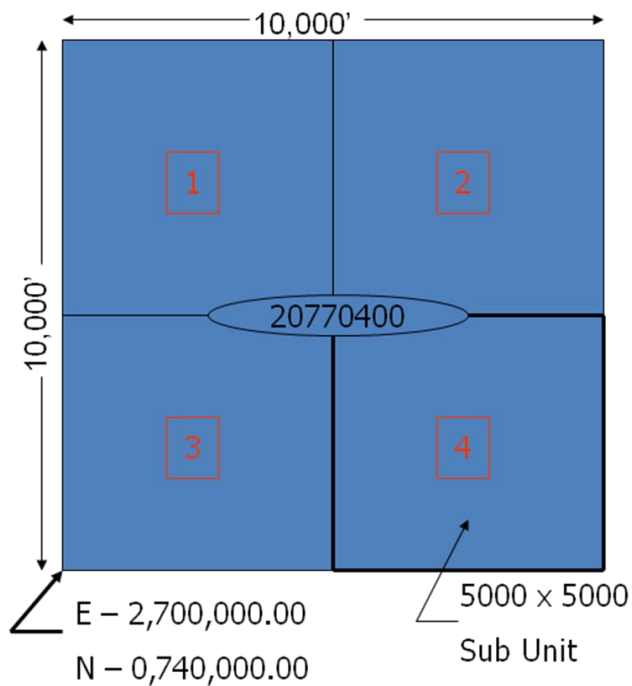
- city code (RAL)
- agency code (DOT)

00 – 2-digit indication of scale and location within the Basic Modular Unit

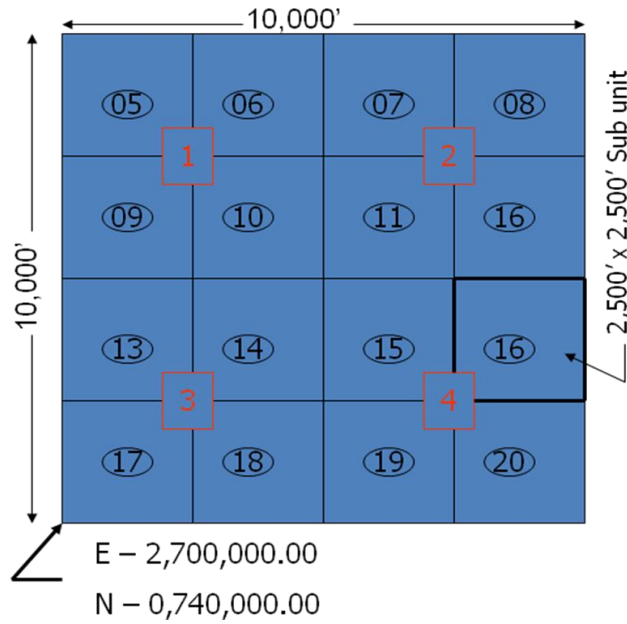
- 10,000 x10,000 Map Panel Graphic layout of Integer Codes
Ex. 20770400



- 5,000 x5,000 Map Panel Graphic layout of Integer Codes Ex. 20770404



- 2,500 x 2,500 Map Panel Graphic layout of Integer Codes
Ex. 20770416



- 1,250 x 1,250 Map Panel Graphic layout of Integer Codes
Ex. 20770460

