Overview

- Control Point Database Design
- 2006 UT NAIP Inspection Process
- Supplemental Data
- Digital Elevation Models (DEM)

Control Point Database Design

- The connecting factor in the move of NAIP from relative to absolute control specifications
  - 2006 NAIP has relative horizontal accuracy for production and inspection (except in UT)
    - Match deliverable to older baseline imagery
  - Future NAIP
    - Absolute horizontal accuracy (+/- 6 meters)
      - Meets or exceed NMAS for 1:12000, ASPRS class 2, and Imagery for the Nation (last iteration)
      - Makes for a “more valuable” dataset
      - Attracts more partners

Control Point Database Design

- Control Point Database: database of all photo-identifiable ground control points used for NAIP inspection
  - Start with UT pilot
  - Design geared towards National coverage (long term)
  - Flexibility
    - Can “handle” most data delivery formats
      - Numerous data sources (USGS, USFS, States, NGS, Private, etc.)
      - Accommodating field types and lengths
- Maintained as .dbf this year
  - Eventually will be an Oracle table
- Capable of adding x,y (lat,lon) “events” into ArcMap
- Not for public disbursement

POINT_ID1: Surveyor named identification of point (String 50)
POINT_ID2: Surveyor secondary identification of point (String 50)
APFO_ID: APFO's point identification name (String 50)
LAT: Latitude in Decimal Degrees (Double 19)
LON: Longitude in Decimal Degrees (Double 19)
ACCURACY: Survey accuracy information for point (String 50)
STATECTY: 5 digit FIPS of where the point is located (String 5)
ST: 2 digit State FIPS of where the point is located (Short 2)
DESCRIPT: textual description location of point (String 50)
UTM: UTM zone of where the point is located (Long 9)
COL_DATE: Original or most recent point collection/visit date (String 50)
MON: Is point monumented (String 50)
POS_DATUM: Positional datum (e.g NAD83) (String 50)
ELEV_DATUM: Elevation datum (String 50)
ELEV: Elevation of point (String 50)
QUALITY: APFO populated quality assessment of point for specific purpose of inspection. Is the point easy to use for inspection? 1=Excellent, 2=Good, 3=Average, 4=Difficult, 5=Recommend Removal from Inspection Database. This field will allow for APFO to keep current a quality inspection point database, based on inspector observations (String 50)
ADD_DATE: Date point added to the APFO control database (String 50)
SUP_DATA1: supplemental data field, including hyperlinks to websites, images, sketches, detailed descriptions, etc. (String 100)
SUP_DATA2: Same as SUP_DATA1 (String 100)
SUP_DATA3: Same as above (String 100)
SUP_DATA4: Same as above (String 100)
SUP_DATA5: Same as above (String 100)
SUP_DATA6: Same as above (String 100)
DATA_SRCE: Source of the control data (USGS, NGS, USFS, etc.) (String 50)
CNTCT_NAME: Name of primary contact for control point (String 50)
CNTCT_PHON: Phone for primary contact for control point (String 50)
CNTCT_EMAL: Email for primary contact for control point (String 50)

DB Fields

- Critical fields
  - LAT
  - LON
  - DESCRIPT
  - POS_DATUM
  - ACCURACY
  - SUP_DATA
  - DATA_SRCE
- Meets IT criteria

Inspection Process

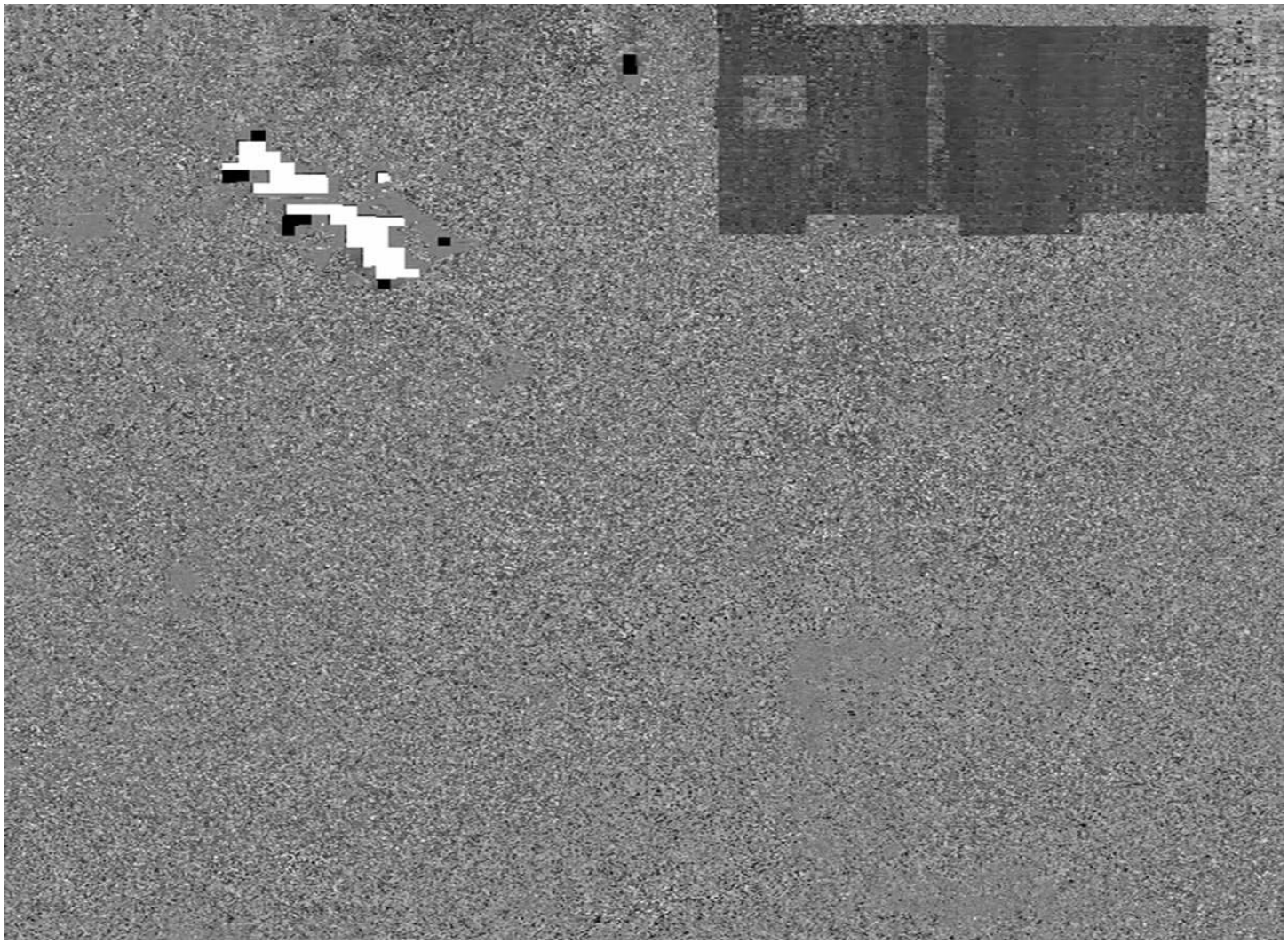
- Parameters
  - Inspect for horizontal accuracy only
  - Off-line process (local computer)
    - first year only
  - 1 meter resolution imagery
  - 2 independent inspectors
  - Inspect State as a whole
    - Inspect all points (approx 412)
    - Subset results later

Inspection Process

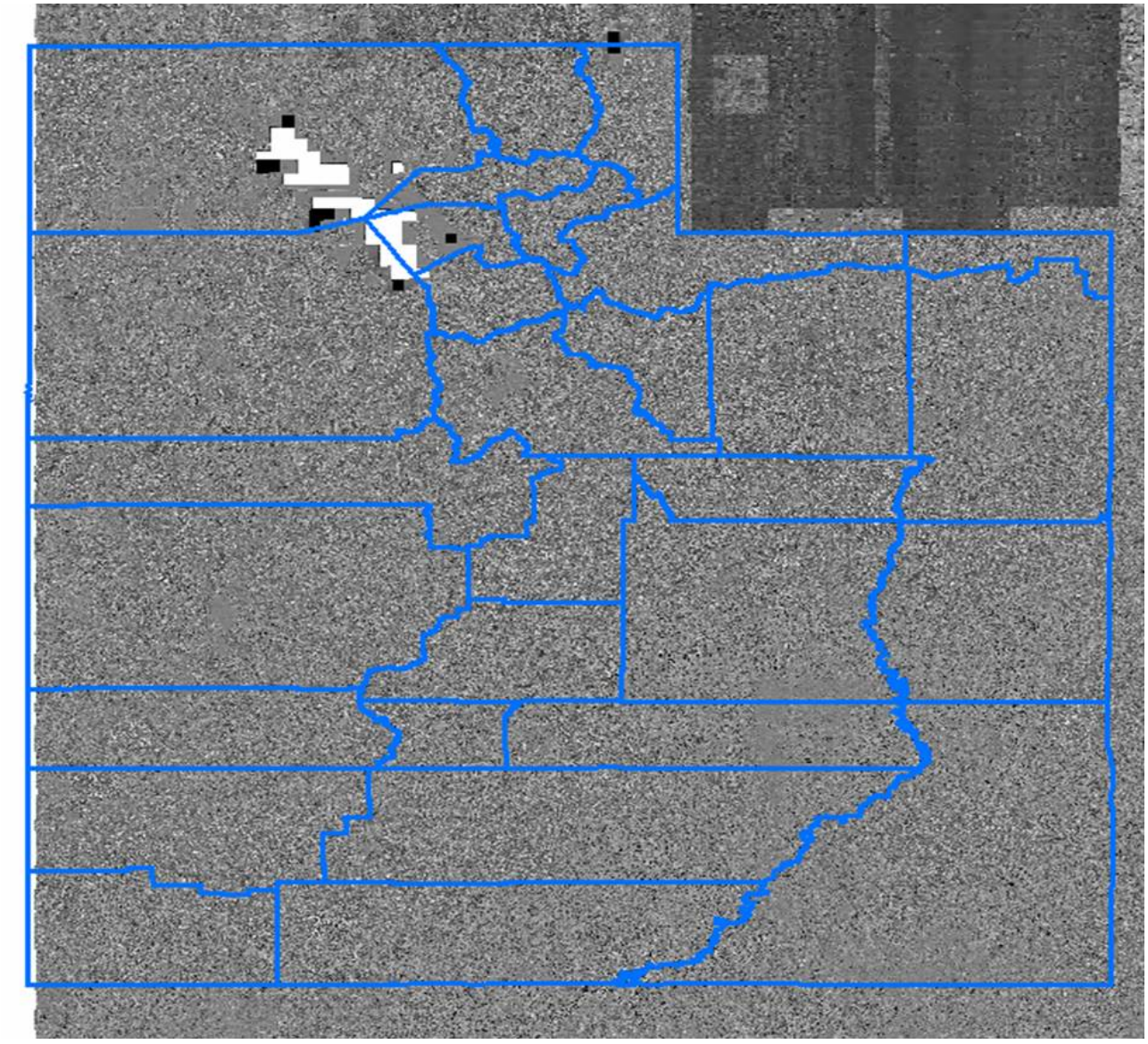
- Methodology
  - Inspection performed using ArcGIS 9.1
  - Add imagery (Compressed County Mosaic) & overlay control points
  - Overlay inspection shapefile and create points
    - Two fields to populate
      - POINT_ID1 (attribute transfer tool to populate)
      - QUALITY (evaluate quality of each point for inspection)
  - Use “Point Distance” tool
    - Creates distances table for distance from control point to its associated inspection point
  - Run statistics (RMSE, mode, average, points over 6 meters off, by whole State, County, DATA_SRCE, Accuracy, etc.)
  - Determine whether imagery meets specifications… **“95% of all well-defined points tested shall fall within six (6) meters of true ground as measured against an independent source of higher accuracy”**
  - Letter language **- “95% of points tested must fall within six (6) meters of pre-determined quality assurance ground control points”**
  - With 412 tested points, allows for 21 point to be greater that 6 meters off

Inspection Process (Example)

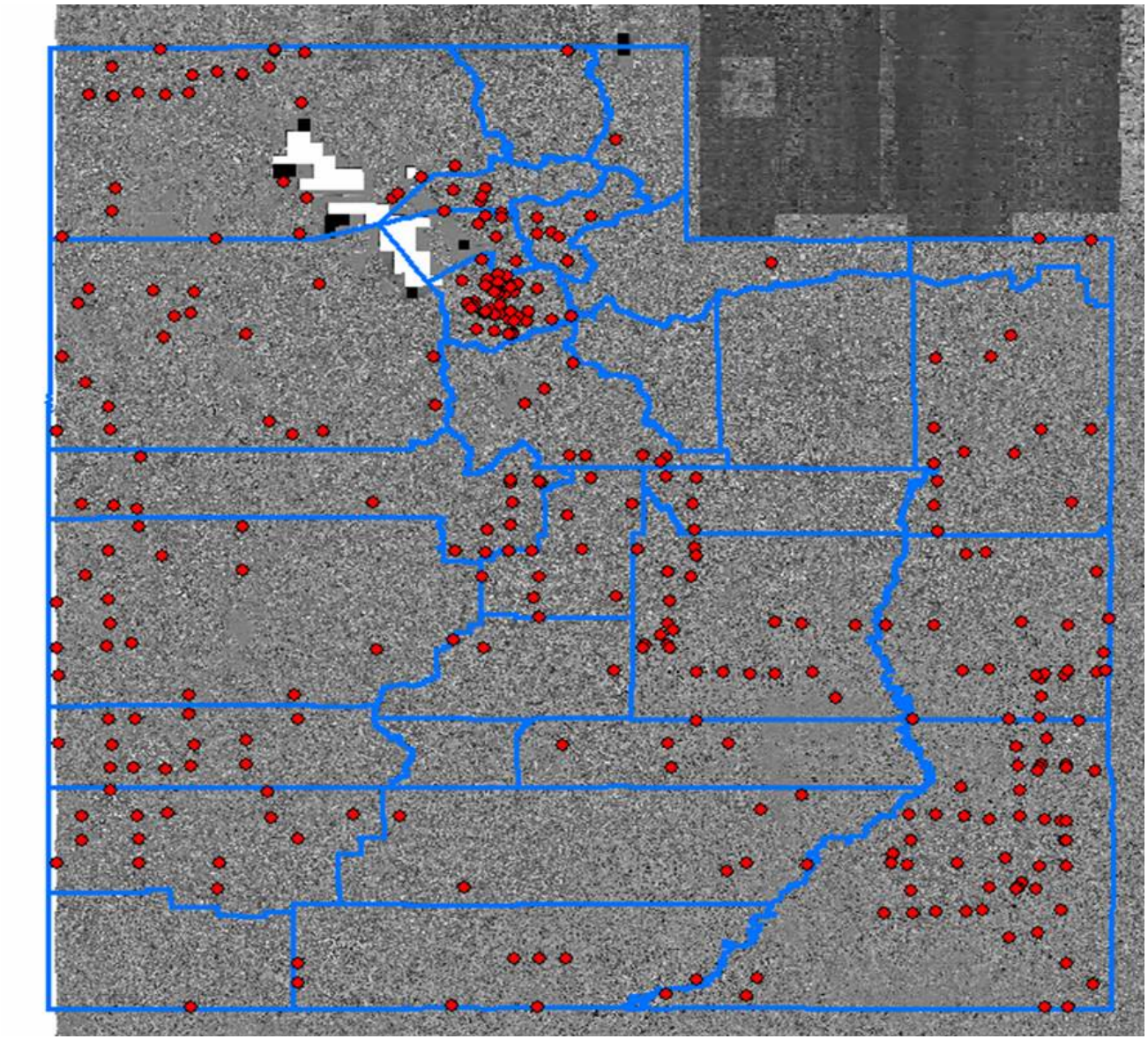
Add Imagery



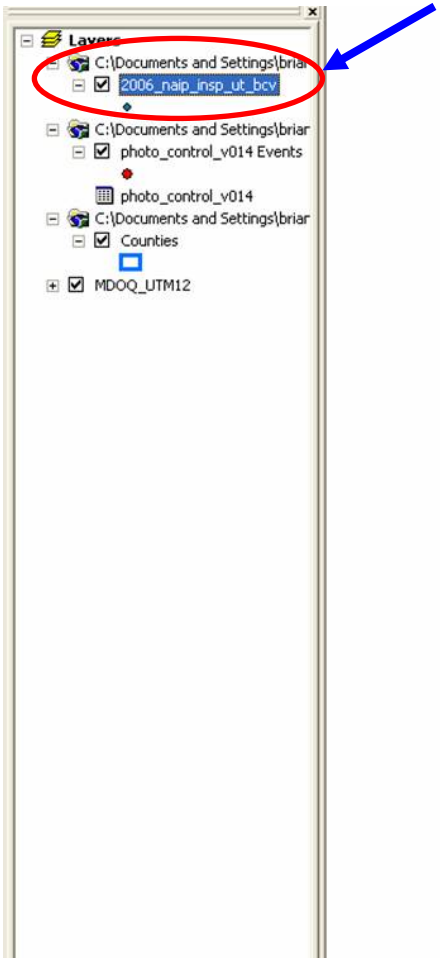
Add Counties For Reference

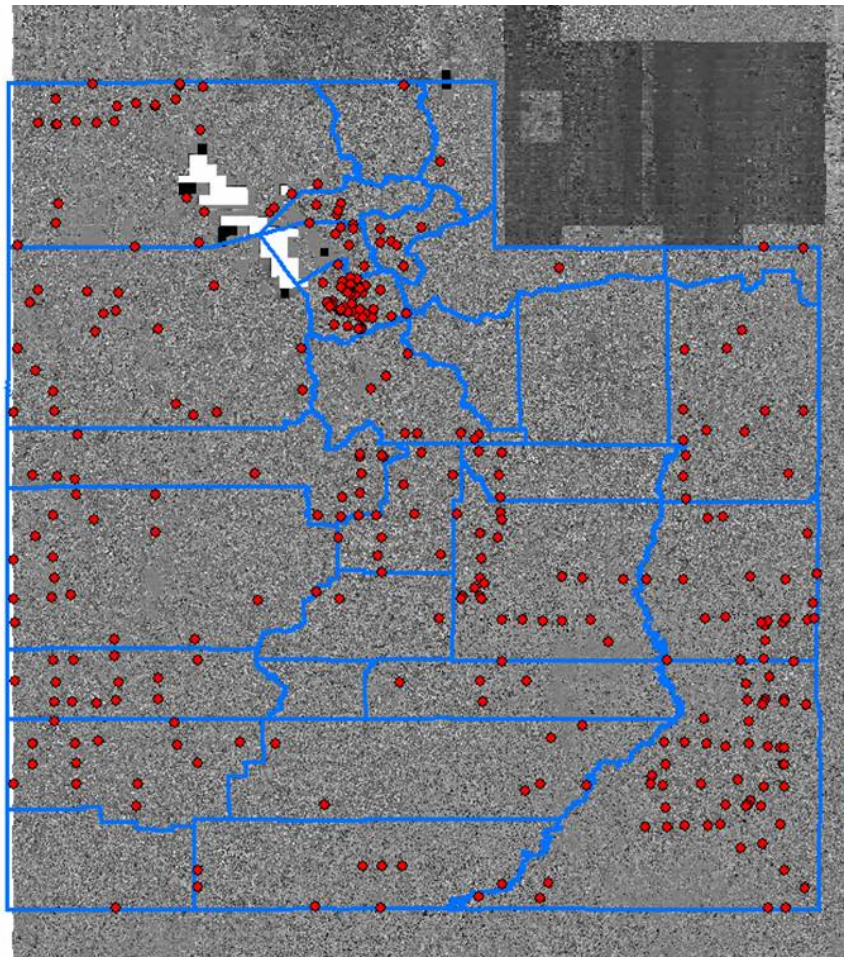


Add Control Data and Display X,Y

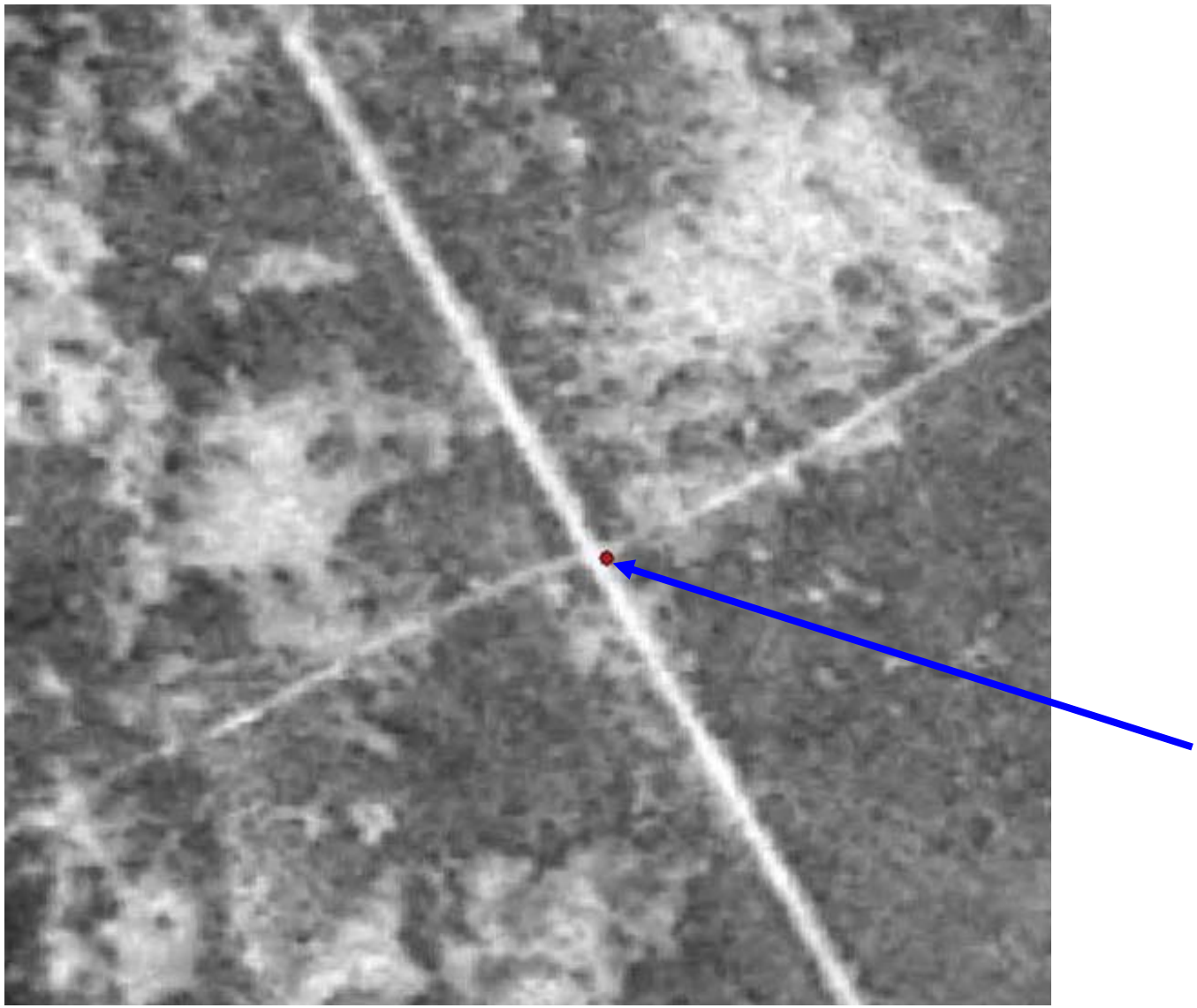


Add Inspection Shapefile

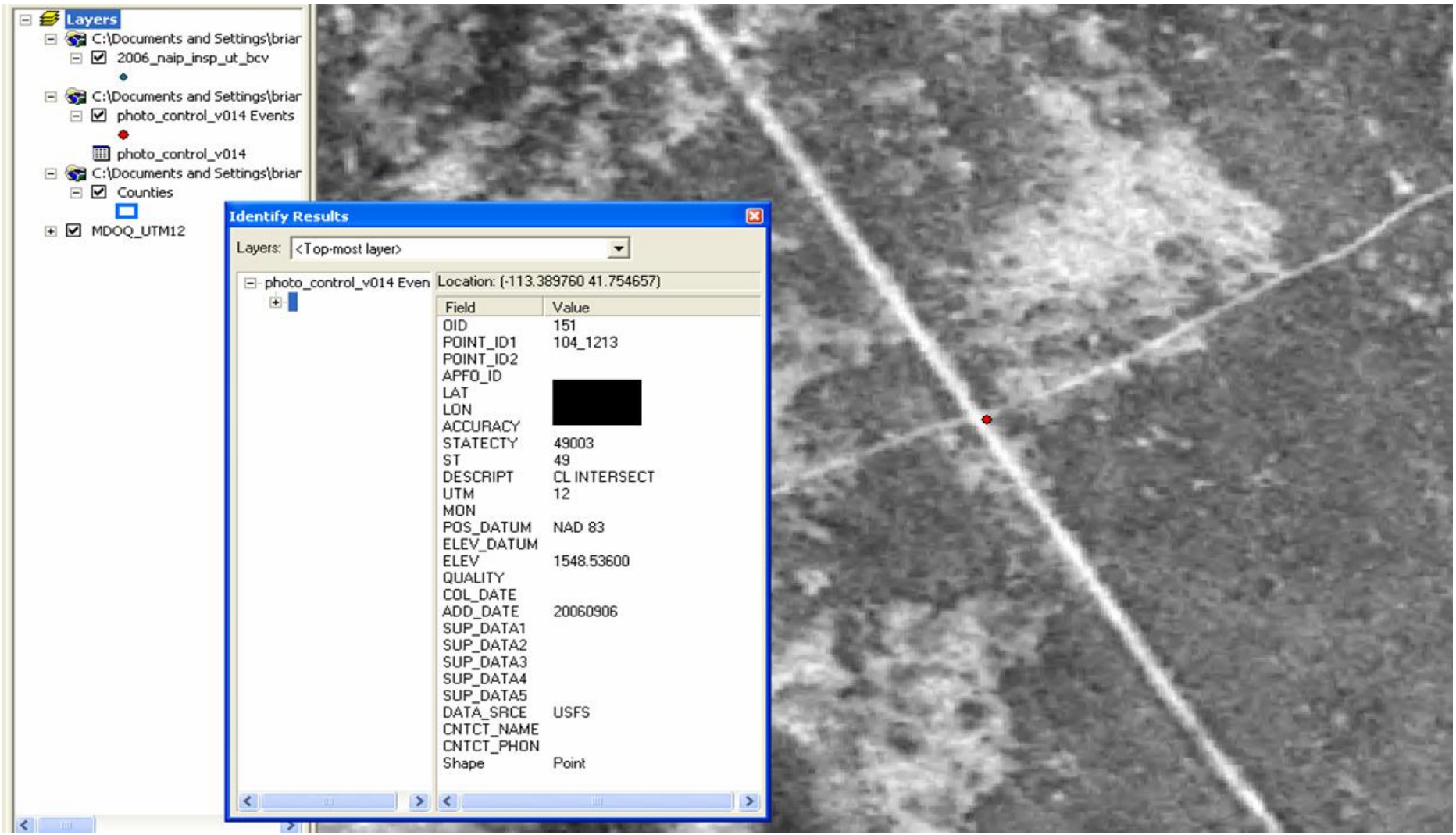




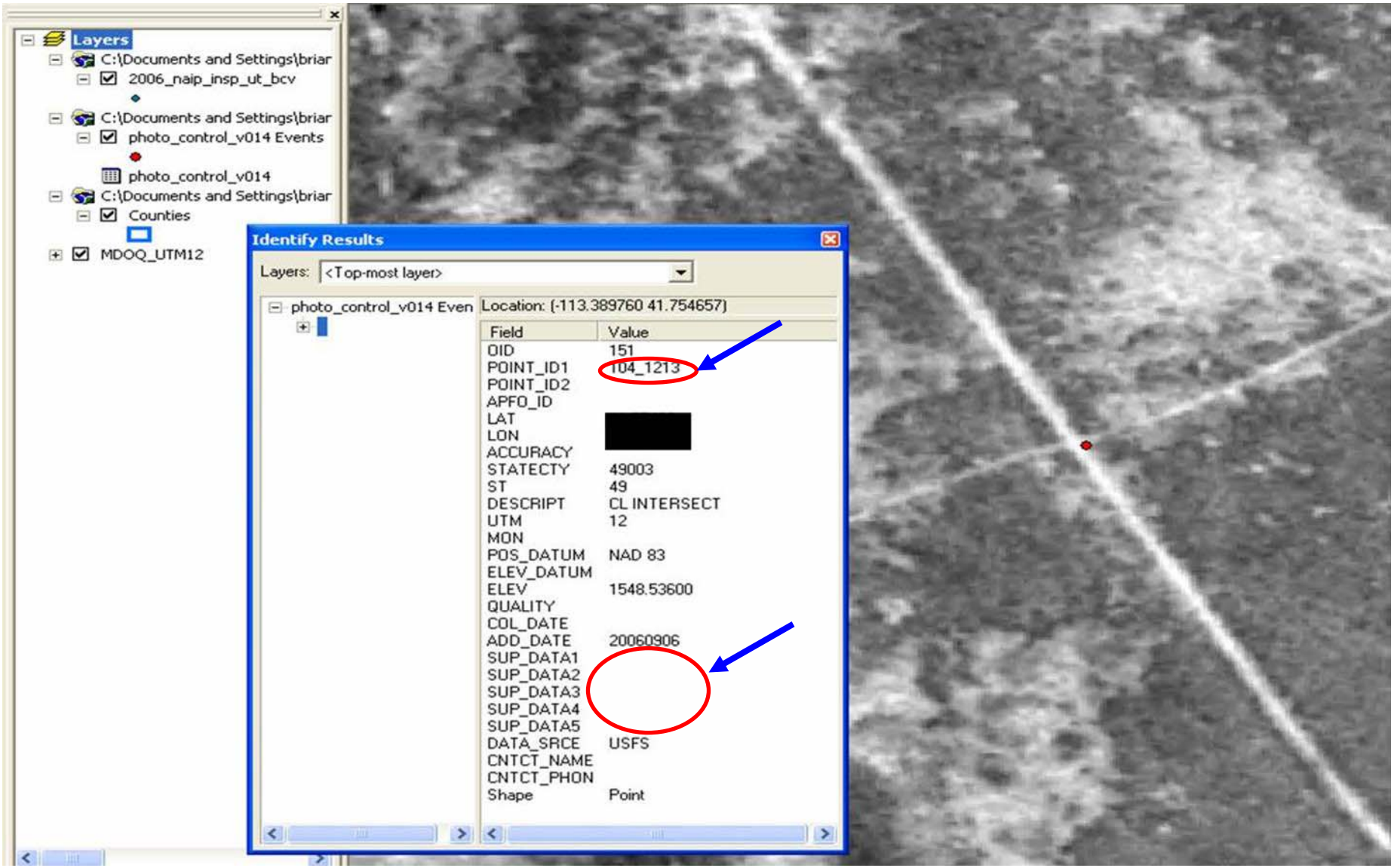
Zoom to a Control Point



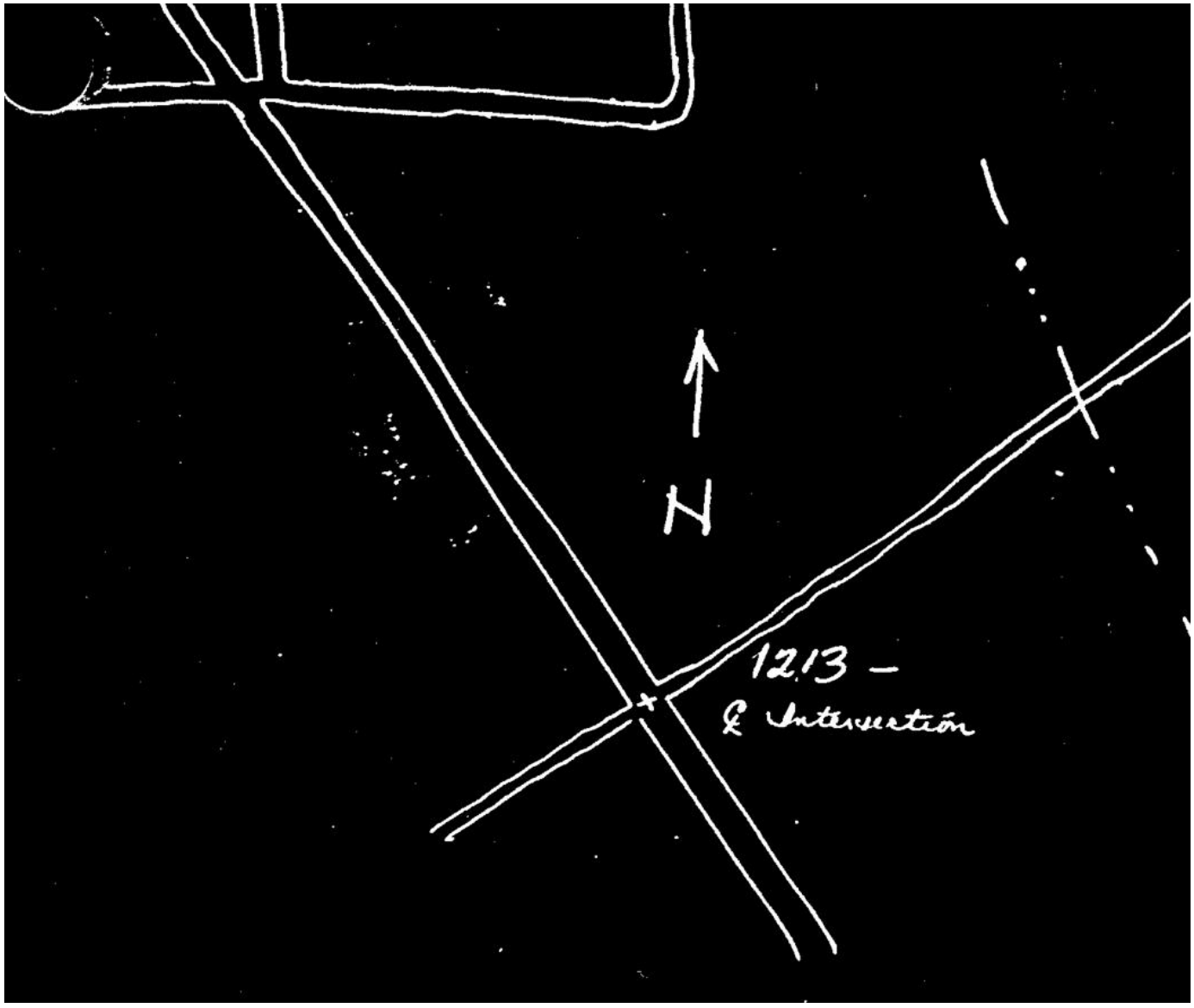
ID the Photo Control Point



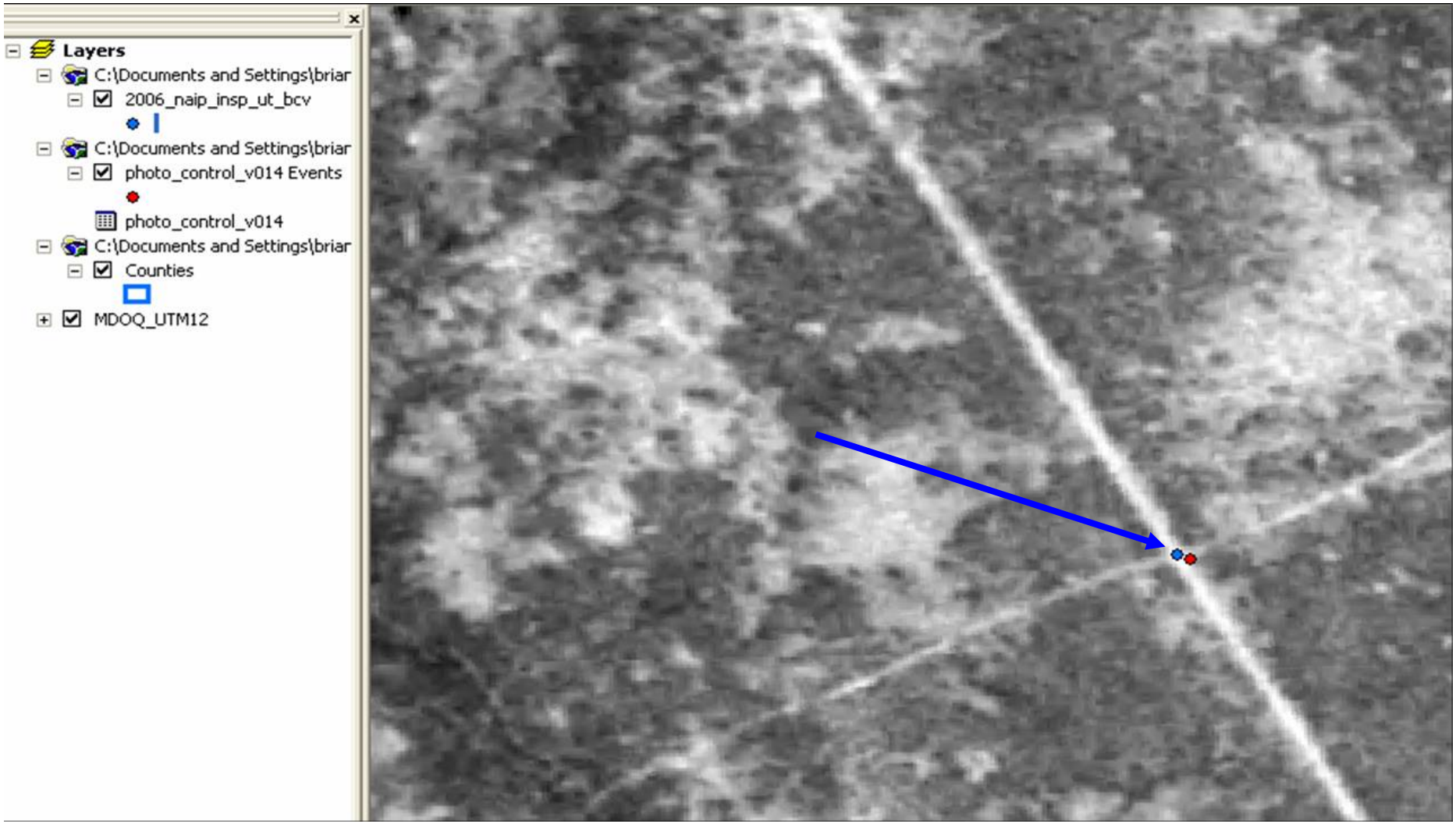
Check SUP_DATA



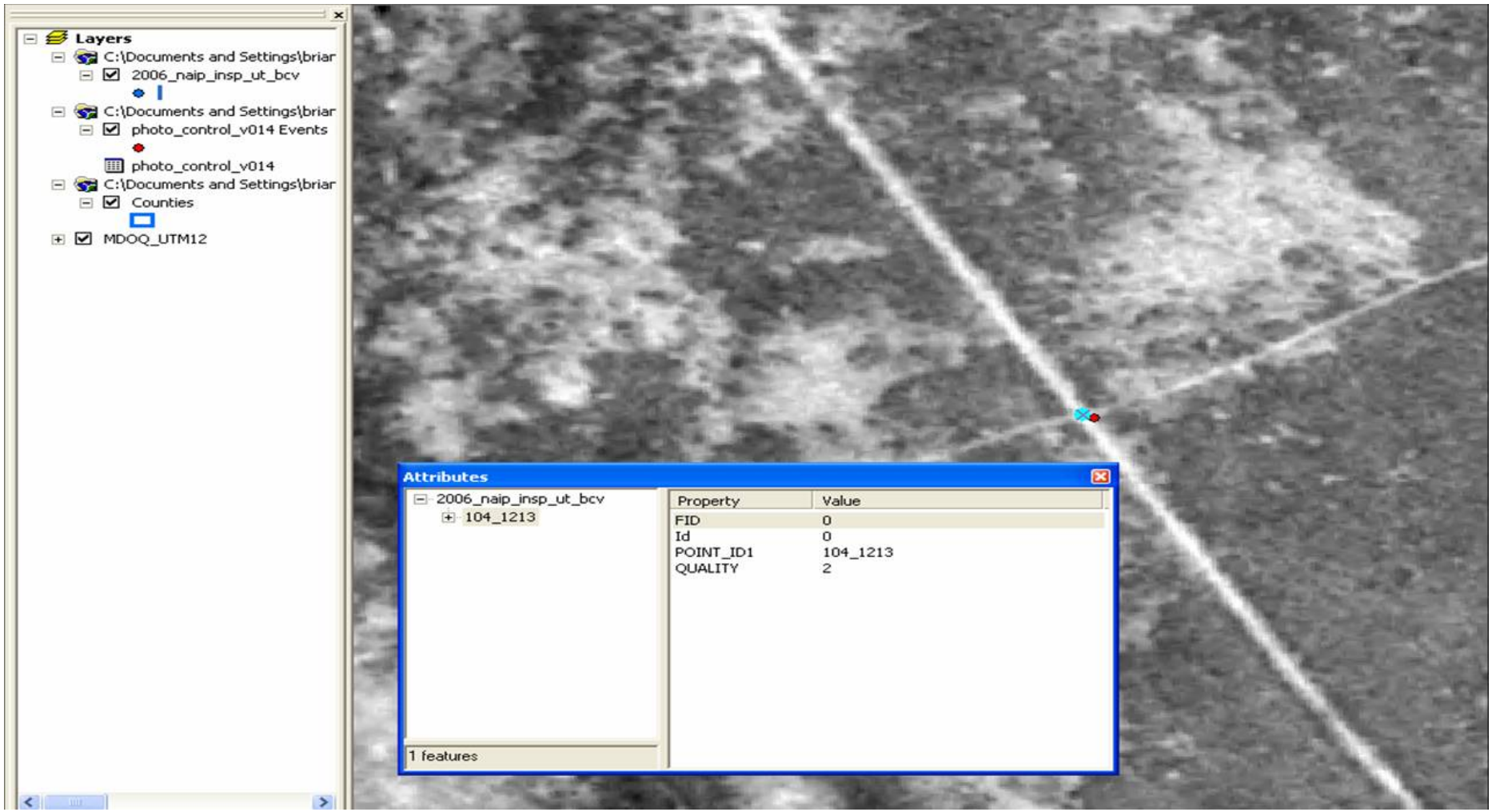
Check SUP_DATA



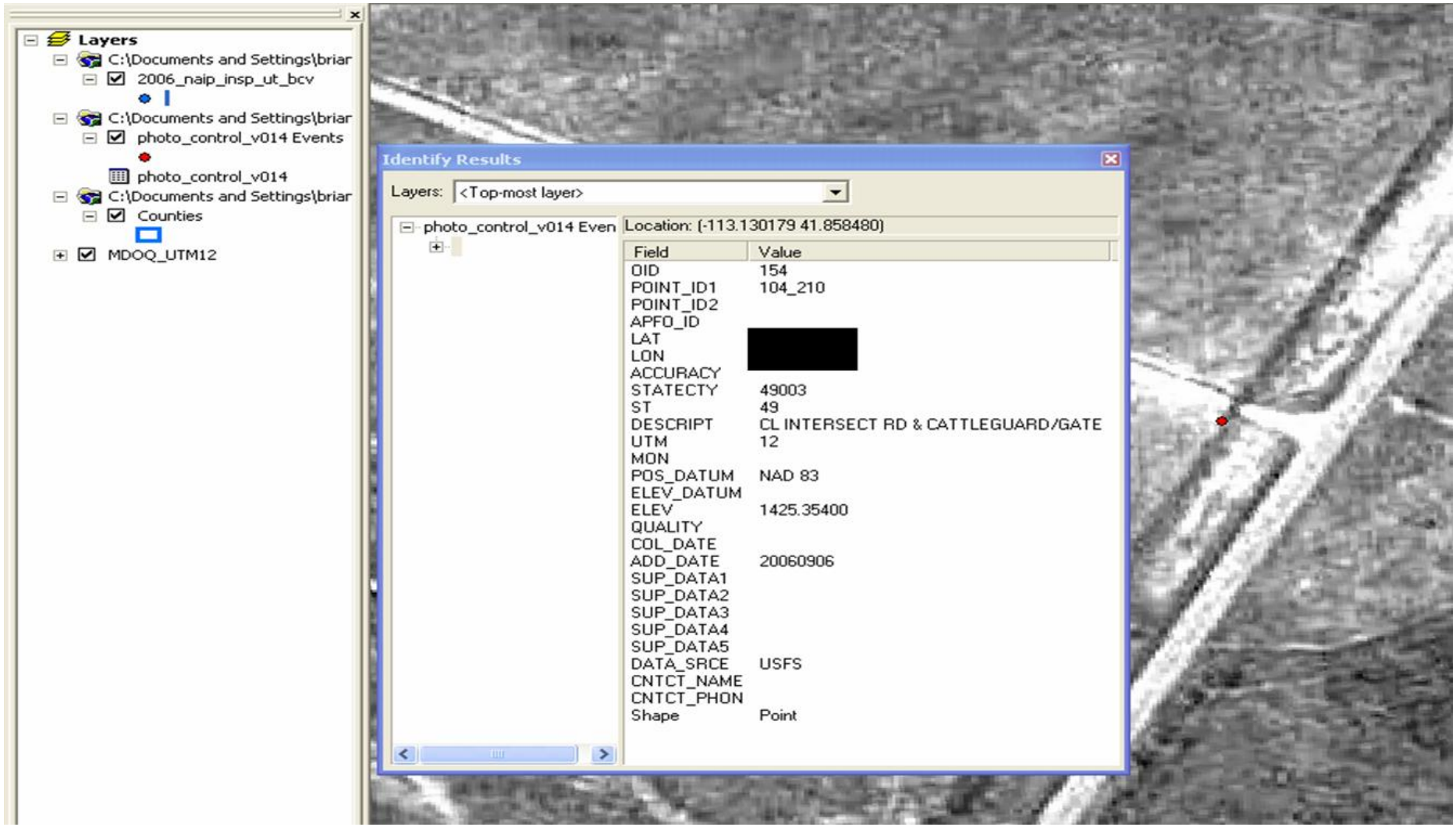
Create Inspection Point



Populate Inspection Point Using Attribute Transfer Tool



Move on to Next Point



Run Point Distance Tool

ArcGIS

- Append
- Buffer
- Clip
- Dissolve (Aggregation)
- Erase
- Identity
- Intersect
- Merge
- Multipart to Singlepart
- Near
- Point Distance
- Union

What is geoprocessing?

Overview

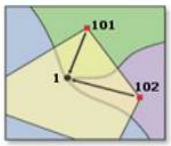
Point Distance *(ArcInfo only)*

Open Tool

NOTE: This tool only works with an ArcInfo license.

Point Distance computes the point-to-point distance between each point in a feature class or layer to all points in the same or different feature class or layer, within a specified search radius. This tool is another Analysis tool used in calculating proximity.

Learn more about the Point Distance tool

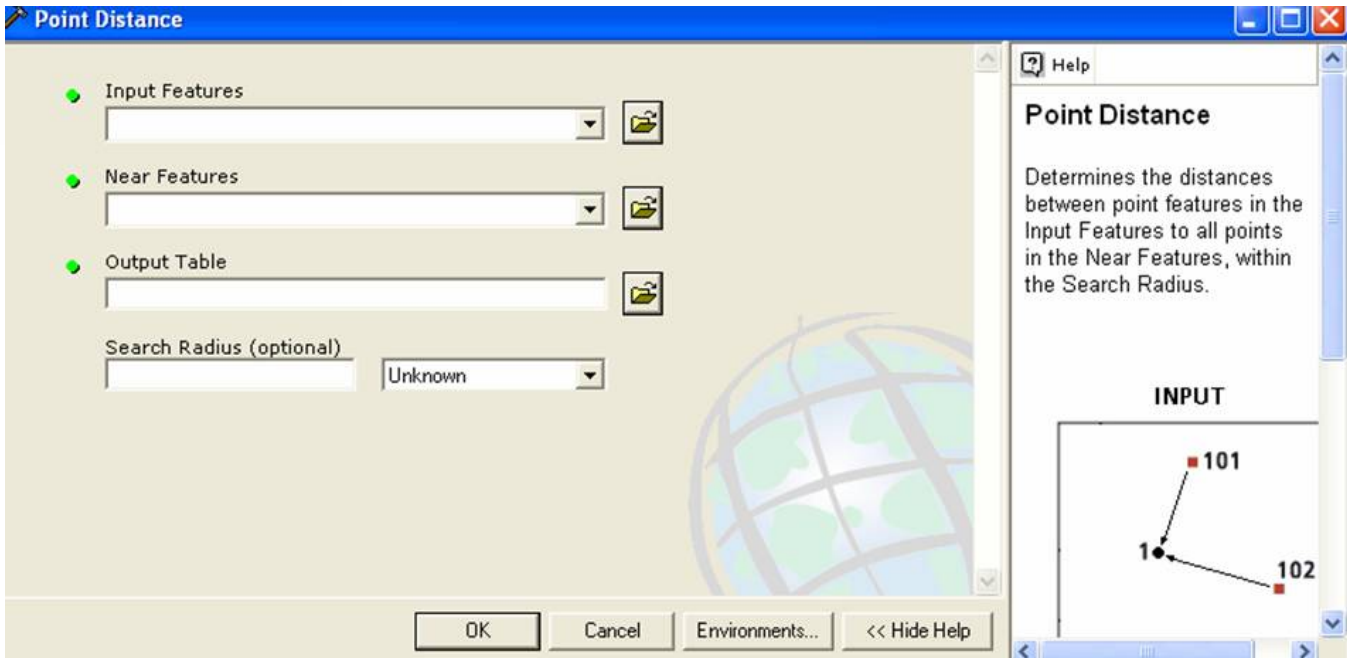


INPUT

input_FID	output_FID	Distance
101	1	65
102	1	83

OUTPUT TABLE

- POINTS IN FEATURE CLASS A
- POINTS IN FEATURE CLASS B



Inspection Example Summary

- Process should be further automated in subsequent years
  - All out of the box ArcGIS tools…
- Stats can be run by County, State, Data Source, any field…all due to quality DB
- Training component involved due to elevation/location of some points…

Inspection Example Summary

- Training component involved due to elevation/location of some points…

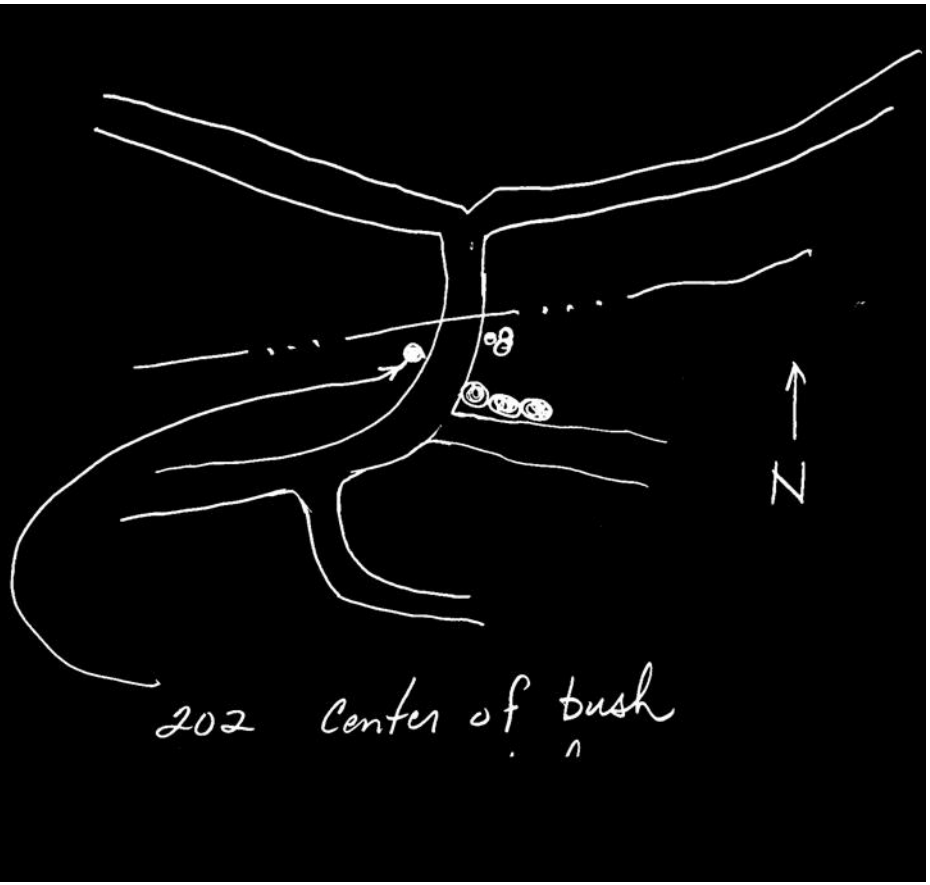
Where is the base of the tower?

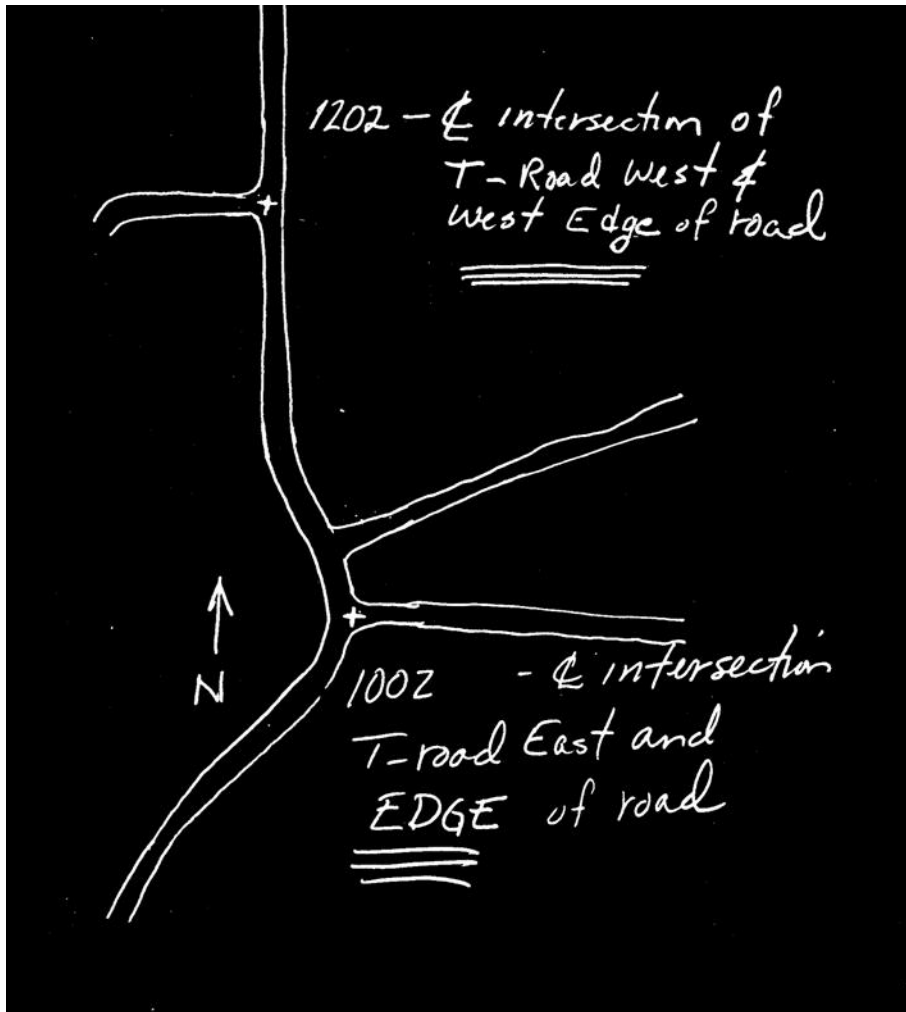
Where is the base of the tower?

SUP_DATA SAMPLES

- Without supplemental data for the control points, one is left only with a short description…usually not sufficient

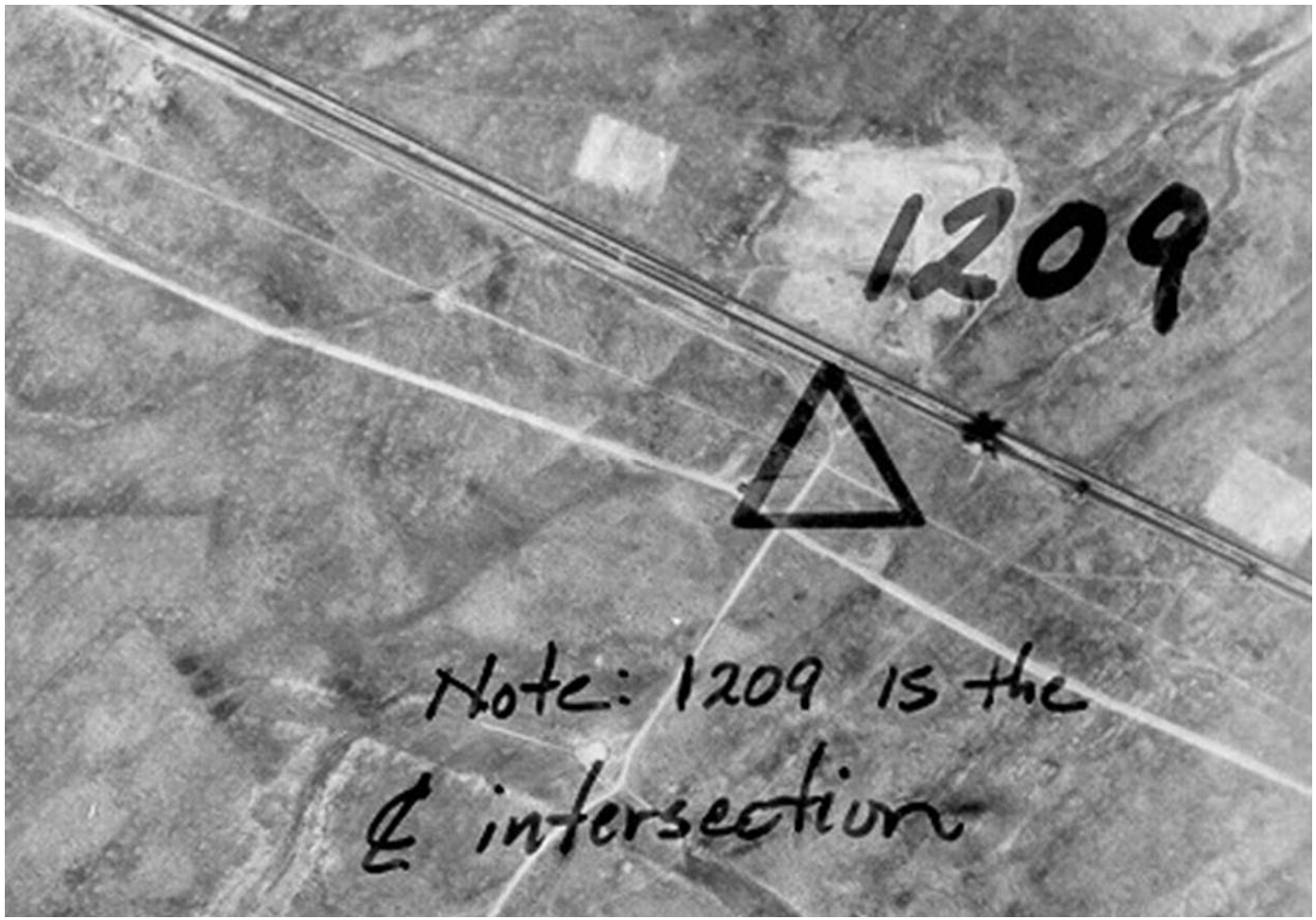
SUP_DATA SAMPLES





SUP_DATA SAMPLES

SUP_DATA SAMPLES



SUP_DATA SAMPLES

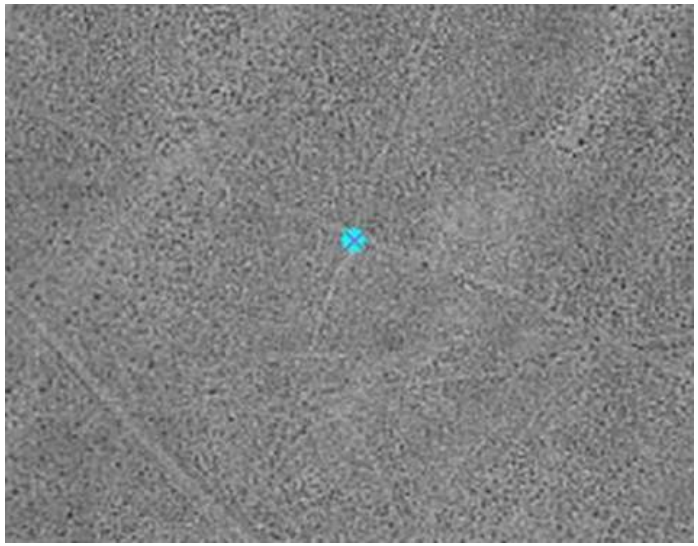
The NGS Data Sheet

See file dsdata.txt for more information about the datasheet.

DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.42
1 National Geodetic Survey, Retrieval Date = NOVEMBER 20, 2006

```
DESIGNATION -  OGDEN DEL MONTE FOOD PROD TANK
PID         -  [redacted]
STATE/COUNTY-
USGS QUAD   -

                    *CURRENT SURVEY CONTROL

* NAD 83(1994)-  [redacted]                          ADJUSTED
* NAVD 88     -

LAPLACE CORR-          8.66  (seconds)              DEFLEC99
GEOID HEIGHT-        -16.79  (meters)               GEOID03

HORZ ORDER  -  THIRD

.The horizontal coordinates were established by classical geodetic methods
.and adjusted by the National Geodetic Survey in November 1997..
.The Laplace correction was computed from DEFLEC99 derived deflections.

.The geoid height was determined by GEOID03.

;                        North          East      Units Scale Factor Converg.
;SPC UT N      -  [redacted]                        MT  0.99995697   -0 19 53.5
;UTM  12       -  [redacted]                        MT  0.99968695   -0 39 39.1

                    SUPERSEDED SURVEY CONTROL

 NAD 83(1994)-  [redacted]
 NAD 83(1986)-  [redacted]
 NAD 27      -  [redacted]

.Superseded values are not recommended for survey control.
.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
.See file dsdata.txt to determine how the superseded data were derived.

_U.S. NATIONAL GRID SPATIAL ADDRESS:  [redacted]
_MARKER: 51 = TANK

 HISTORY     - Date     Condition        Report By
 HISTORY     - 1963     FIRST OBSERVED   CGS
 HISTORY     - 1965     GOOD             CGS
 HISTORY     - 1973     GOOD             NGS

                    STATION DESCRIPTION

'DESCRIBED BY COAST AND GEODETIC SURVEY 1963 (JCC)
'THE STATION IS THE CENTER OF THE TOP OF A 174 FOOT HIGH WATER
'TANK.  IT IS ABOUT 1 MILE EAST OF U.S. HIGHWAY 84 AND NEAR THE
'EAST END OF THE TOWN OF OGDEN.

                    STATION RECOVERY (1965)

'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1965 (JJC)
'THE INTERSECTION STATION WAS RECOVERED.  THE TANK IS PAINTED GREEN
'ON ITS TOP AND BOTTOM WITH THE CENTER PORTION OF THE TANK PAINTED
'BLACK.

                    STATION RECOVERY (1973)

'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1973 (DLS)
'STATION RECOVERED AS DESCRIBED IN GOOD CONDITION.
'
'AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN
'IN TOWN.

*** retrieval complete.
Elapsed Time = 00:00:00
```

Control Point Examples



DEM Requirements

- Achievable horizontal accuracy affected by the accuracy of the DEM
  - Do we continue to use “best available” language *or* provide the DEM?
    - If we state +/- 6 meters horizontal accuracy, are the “best available” DEMs good enough to support the accuracy requirement?
  - Ultimatum
    - We provide the DEM and hope the vendor can meet the requirements, or
    - We provide the DEM and verify that the vendor can meet requirements, or
    - Continue to use “best available” language and hold fast to the horizontal accuracy requirement…
      - What if “best available” wasn’t good enough

DEM Requirements

- If the DEM becomes Government Furnished Material
  - What sources will we select and will they be consistent?
  - Will they support the horizontal accuracy requirement?
  - What infrastructure will be required to support delivery of these materials?
  - How will DEM changes be handled?
  - How will disputes regarding horizontal accuracy be resolved if vendor not responsible for DEM?

DEM – The Bigger Picture

- Based on USDA customer needs/requirements
- Acquisition requires funding
  - NAIP avenues
  - Partnership avenues with other agencies that have DEM requirements? DHS/FEMA
- DEM updates to the Government from Vendor
  - Added contract cost to the Government?
- NDEP and “Elevation for the Nation”
  - What are other Government agency requirements?
    - Level of accuracy
    - 1 meter resolution ortho imagery is the “low hanging fruit”
      - As compared to flood modeling, survey, etc. needs

DEM – The Bigger Picture

- How do we get better DEMs into our ortho imagery products consistently on a National Scale?
- Once we have a DEM dataset that meets customer needs, how do we keep it up to date on a National Scale?
  - Refresh cycle
  - Identify
    - Urban growth interface
    - Major landform changes
    - Errors
- Who is the steward?