Alabama Geographic Information Program Office

Request for Information

Statewide Digital Orthophotography

October 17, 2013

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1.0 INTRODUCTION

The Alabama Geographic Information Program Office is submitting a Request for Information (RFI) regarding digital aerial orthophotography and mapping. The purpose of this RFI is to obtain the latest information on new orthophotography and mapping technologies and techniques, the costs of acquiring digital orthophotography and updating planimetrics, and the methods used for a statewide collection. This information will be used to determine the feasibility of establishing a program to manage the collection of this data on a statewide basis. This document does not in any way constitute a Request for Proposal (RFP) and it does not indicate a commitment by the participants to purchase the services cited for which the information is submitted. All participants should indicate any proprietary information in their RFI.

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2.0 BACKGROUND

Alabama has 67 counties with a total land area of 52,423 square miles which includes 1,673 square miles of surface water, and 53 miles of coastline on the Gulf of Mexico. Currently, each individual county manages the acquisition of imagery and planimetric updates at various intervals and resolutions. The GIS Advisory Committee on May 14, 2013 unanimously approved a statewide Imagery Business Plan from the Imagery/LiDAR Subcommittee. This plan contains detailed information as well as additional background information and can be found at the GIS website for the State of Alabama (gis.alabama.gov) and downloaded at http://gis.alabama.gov/Downloads.aspx.

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3.0 PROJECT SPECIFICATIONS

It is imperative that all submissions to this RFI adhere to the State of Alabama Department of Revenue (ADOR) Property Tax Division's, *Specifications for Property Ownership Maps GIS/Computer Assisted Property Tax Mapping and Aerial Photography ADV-25 (Effective June 2010)*. This complete document can be referenced on the Alabama Department of Revenue's webpage at http://www.revenue.alabama.gov/advalorem/sections/Mapspecs12.pdf. This document is used by permission as specifications to this RFI.

3.1 General Requirements (from Alabama Department of Revenue specifications document)

Due to Homeland Security issues and the number of military installations and other security sensitive locations within the State of Alabama, the Department of Revenue requires that all work conducted for a project is performed within the boundaries of the United States. Under no circumstances shall it be permitted to send any maps or any other data, whether digital or hard copy, associated with the performance of a contract to destinations outside of this country. The use of offshore labor or non US

citizens in performance of any aspect of a project or work performed in the United States by a company that in any way is owned or partly owned or managed by a non United States Citizen must be considered on a case-by-case basis and advance approval requested from the County and the Department of Revenue.

The Department of Revenue prefers to have all work performed by the contracting vendor; however, it will not be the sole criterion for selection. Where a vendor proposes a subcontracting arrangement, the submitted proposal must address how quality and workmanship will be maintained and should demonstrate the knowledge, expertise, capacity and oversight to insure a successful project. Advance approval must be requested from the contracting county and the Department of Revenue for any proposed subcontracted or outsourced project implementation, digital imagery, photography, and processing or photogrammetric work.

The Department of Revenue requires a set of pilot test maps to be checked for accuracy. County and State cadastral mapping personnel will inspect and evaluate the Pilot Test Maps. This phase of the contract work will include development of either rectified enlargements or digital planimetric Base Map Layers and corresponding digital Orthophotography as contracted by the County. The Pilot Test area will consist of 2 adjacent 1"=400' scale tiles and 2 adjacent 1"=100' scale tiles as a pilot area to test applicable production results and ensure delivery of all data in full compliance with Department of Revenue specifications. All Department of Revenue Data Specifications are compliant with Federal Geographic Data Committee Standards.

The Department of Revenue requires appropriate task training of County personnel for those “first time counties” receiving digital planimetric Map Base Layers and / or digital Orthophotography as set out in the delivery schedule. Formal introductory level product user training for County Cadastral Mapping employees will be conducted within 1 month from the Contractual Agreement date of delivery of the digital Base Map Layers and / or digital Orthophotography. The county and the contractor will mutually agree upon the training location and time frame.

The Department of Revenue requires that the contracted work done on all projects be completed by surveyors and photogrammetrists licensed in the State of Alabama.

3.2 AERIAL PHOTOGRAPHY - DIGITAL IMAGERY ACQUISITION

3.2.1 Project Area

The location, size and boundaries of the area to be photographed/imaged will be outlined on a county map at an approximate scale of 1 inch = 1 mile and further subdivided and designated in a way to show the scales of the final aerial photographs/images to be obtained. The areas to be photographed/imaged shall extend only to the boundary lines as indicated. This map shall be entitled the "County Area Map" and will be included with all proposals submitted. The flight plan proposed by the contractor shall be drawn on a similar county area map and submitted to the contracting authority for approval.

3.2.2 Atmospheric and Ground Conditions

Aerial photography/imagery will be accomplished during the period when deciduous trees are barren (leaf-off). Photography/imagery will be flown between the hours of 10:00 a.m. and 2:30 p.m. and when the sun angle is not less than 30 degrees above the horizon. Photography/imagery will not be

undertaken when the ground is obscured by snow, haze, fog, or dust; when streams are not within their normal banks; or when the clouds or cloud shadows will appear in any one photograph/image within the respective scale bounding limits or project county boundary. The photography/imagery shall not contain objectionable shadows caused by relief or low solar altitude.

3.2.3 Re-Flights

The contractor shall correct unacceptable aerial photography/imagery at no additional cost. Re-flight coverage will overlap the accepted photography/imagery by a sufficient amount to provide for continuous stereoscopic coverage.

Scale of Aerial Photograph Negatives

Aerial photography shall be obtained for each respective map scale as specified below.

Map Scale	Photo Scale	Above Ground Level
1" = 400'	1" = 2,000'	12,000'
1" = 200'	1" = 1,320'	7,920'
1" = 100'	1" = 660'	3,960'

Negatives deviating from the Photo Scales by more than 2% shall be cause for rejection.

3.2.4 Scale of Digital Images

The three major Digital Cameras (sensors) developed to supplement or replace the film-based cameras were designed by each respective manufacturer to have different focal lengths and CCD sensor planes with differing pixel sizes. As a result, a standard fixed image scale and/or AGL values to be mandated by the user for each desired map scale couldn't be included in this document. However, the contractor will include in the proposal the planned Image scale, Above Ground Level height, sensor pixel Ground Distance Resolution and the expected horizontal and vertical accuracy of the perspective image center at time of collection. The Ground Distance Resolution of the imaging sensor will not exceed the final Ground Distance Resolution of the final Orthophotography. Images deviating from the proposed scale by more than 2% shall be cause for rejection.

3.2.5 Project Area Overlap

Overlapping photographs/images in each flight line shall provide full stereoscopic coverage of the project area. The first flight line of aerial photography/imagery will be flown to overlap the project's boundary by approximately 15% to 25% of the image area. The final flight line will provide this amount of project boundary overlap or greater. Each flight line will have a minimum of 2 principal points outside of the project area at the beginning and end of each flight line.

3.2.6 Endlap

Consecutive photographs/images in each flight line shall have an endlap of approximately 60% to insure stereo coverage. Overlap area expressed as a percentage will be no more than plus or minus 5%. Endlap error will average no more than plus or minus 2% for optimal coverage.

3.2.7 Sidelap

Sidelap will not be less than thirty (30) percent between parallel flight lines. Any point on any flight line will not deviate from its flight plan location by more than 10% of the width of coverage of the photograph/image. Sidelap error will average less than 5% for optimal coverage.

3.2.8 Crab

Crab in excess of three (3) degrees may be cause for rejection of a flight line or any portion thereof in which the excess crab occurs.

3.2.9 Tilt

Tilt of the camera from verticality at the instant of each exposure shall not exceed 3 degrees nor shall it exceed 5 degrees between successive exposure stations. Average tilt over the entire project shall not exceed one (1) degree.

3.2.10 Drift

Changes in course between successive photographs/images will not exceed 3 degrees.

3.2.11 Aircraft

The aircraft to be used shall be configured and equipped for aerial photography/imagery purposes with all essential navigational and photographic/sensor instruments and will be operated by a well-trained and experienced crew. Performance of the aircraft shall be adequate to complete the proposed project in accordance with the technical specifications. All operations shall be in conformity with the applicable official regulations and ordinances.

3.3 AERIAL PHOTOGRAPHY (applicable to Film based Analog Cameras only)

3.3.1 Aerial Camera

The aerial camera shall be a high precision aerial cartographic mapping camera of equivalent or better quality than a Leica RC-30, equipped with a low distortion, high resolution lens. The calibrated focal length of the lens shall be 153 millimeters + 3 millimeters (6" focal length). The camera shall expose a 9" X 9" size negative and produce a minimum of eight fiducial marks in each negative. It shall be equipped with adequate means of flattening the film in the focal plan to + .005" at the instant of exposure. No glass will be permitted between the lens and the film. An appropriate anti-vignetting filter will be used. All of the aerial cartographic photographs of the same scale should be taken using the same camera. Differing mapping scales may use different cameras.

A USGS camera calibration report, no more than three years old, shall be submitted to the contracting officer for each aerial camera to be used to assure that the camera, lens, focal length, and its device for holding the film flat at the time of exposure are all photographically adequate and within acceptable accuracies. Maximum shutter speed and aperture setting shall be used to minimize image motion.

3.3.2 Aerial Film

Black and white aerial film shall be a fine grain high-speed photographic emulsion on a dimensionally stable base. The film must have been stored and handled in accordance with the manufacturer's instructions. Only one type of film shall be used for the entire project. Outdated film shall not be used.

Color aerial film will be high quality such as AGFA X100 or equal and must have been stored and handled in accordance with the manufacturer's recommendations. Only one type of film shall be used for the entire project. Outdated film will not be used.

3.3.3 Image Quality

Images on the aerial negatives shall be clear and sharp in detail and free from light streaks, static, marks, scratches, and other blemishes. Special care shall be exercised to insure proper development and thorough fixing and washing of all film, and to avoid rolling film on drums or in any way distorting it during processing or drying. Film shall be exposed and processed with a target density range of 1.0 + 0.2, as measured in the neat image areas of each roll of film. Minimum density, as measured with a densitometer with a scale range of 0 to 3.0 should not be less than 0.3 and the maximum density not greater than 1.5. All fiducial mark images shall be clear and sharp.

3.3.4 Film Labeling

<u>Automated:</u>

When available, all film labeling will be accomplished through automated means at the time of exposure. Data programmed into the camera system will be printed on the edge of the negative outside of the image area. Data will include Date of Photography, Scale, County Name, and Flight-Exposure numbers.

<u>Manual:</u>

Each exposure shall be clearly labeled at the edge of the negative just inside the image area and on the north edge for North-South flights. The labeling shall include the following information as a minimum:

DATE OF PHOTOGRAPHY
SCALE OF PHOTOGRAPHY
COUNTY NAME
FLIGHT-Strip & Exposure Number (12-24)

The "Scale of Photography" shall be given in inches, e.g., 1" = 24,000', etc. "Flight Strip" numbers are not to be repeated anywhere within the photographic coverage of the project, but will be numbered consecutively, starting with "Strip No. 1" and continued sequentially over all flight lines and scales. "Exposure Numbers" for any flight strip will be numbered consecutively from "Exposure No. 1", and continuing to the end of that flight line.

3.4 CONTACT PRINTS of AERIAL PHOTOGRAPHY
{(Optional) (not available with Digital Camera Imagery)}:

One (1) set of contact prints of the original aerial negatives may be prepared on double-weight, semi-matte paper or equivalent weight resin-coated paper. All prints will be clear and free from chemicals, stains, blemished, fog, streaks, or any defects that would render them unusable. One set of contact prints will be delivered to the contracting officer for a quality control inspection as soon as they can be made available and prior to any reproductions.

3.5 SCREENED HALFTONE REPRODUCTIONS
{(Optional) (not available with Digital Camera Imagery)}:

Halftones shall be screened on a matte finish, polyester film, and thickness being 4 mills. Sheet size shall be 30" x 30" to match existing tax map sheets. The enlargement factor will be that which matches each map sheet for each scale. Within the lower right hand corner, the corresponding tax map number will be in 1/2" high numbers in order to match the halftone with the map sheet. The county will provide the map sheets for the contractor to use while making the enlargements.

3.6 PAPER ENLARGEMENTS
{(Optional) (not available with Digital Camera Imagery)}:

Paper enlargements shall be of a high quality, black & white, semi-matte finish and on medium weight paper. Sheet size shall be 30" x 30" to match existing tax map sheets. The enlargement factor will be that which matches each tax map sheet for each scale. Within the lower right hand corner, the corresponding tax map number shall be in 1/2" numbers to match the corresponding map sheet. The edges of each paper enlargement shall be bound with tear proof tape.

Locator Index:

The contractor shall furnish a locator index to assist county personnel in identifying the photograph from which the enlargements are made. One (1) index for each scale shall include flight line and exposure number of each photograph used for easy referral to map sheets.

3.7 DIGITAL CAMERA (sensor) IMAGERY

<u>Digital Camera:</u>

The digital camera shall be a high precision aerial photogrammetric mapping camera of equivalent or better quality than a Z/I DMC, equipped with a low distortion, high resolution lens. The sensor will have a calibrated focal length that will vary between manufactures. The Z/I DMC focal length is 120 millimeters (4.8"); Vexcel Imaging ULTRACAM-D has 100 millimeters (4.0") while the Leica ADS40 has a 62 millimeters (2.5") focal length. The sensor will be capable of full forward motion compensation and producing high geometrical resolution images in panchromatic (B&W), color (RGB) and IR. All of the digital images of the same scale will be taken using the same camera. Differing scales may use different cameras.

The respective digital camera manufactures provide an extensive calibration report and parameters with

each respective camera to be used in the post processing raw imagery. Currently, USGS does not provide a camera calibration for digital cameras.

Direct Sensor Orientation (Bore site):

The vendor should perform a bore site misalignment for the direct sensor orientation that must be accomplished together with a system calibration including the focal length and principal point of the used digital array or metric camera. For digital array systems, direct sensor orientation must be accomplished using a minimum of two different flying heights similar to those required for county imagery.

3.8 GEODETIC CONTROL (Alabama Height Modernization Program & Photogrammetric Control):

The Department of Revenue (DOR), Department of Transportation (DOT) and National Geodetic Survey (NGS), of The National Oceanic and Atmospheric Administration (NOAA) have entered a cooperative agreement to improve the Geodetic Control Network within Alabama through the NOAA developed Height Modernization Program. This effort is an evolving process for the State. The DOT has developed a 40 km Primary Base Station Network throughout the State and will provide direct management for the development of the Local Network Stations with the contractor and the DOR. The DOR will coordinate the development of the Local Network Stations as part of the GIS Base Map Layer and/or Digital Orthophotography contracts. The mapping consultants awarded the respective county contracts will incorporate Local Network Stations requirements in their production procedures.

The survey consultant will develop LNS permanent survey monuments within the County at locations in accordance with the NOAA Height Modernization Program (HMP) for Local Network Stations (LNS). All control will be coordinated with the County and the DOT, Locations Division prior to submission to NGS for final network plan approval. The consultant provided coordinate positions of all HMP/LNS survey control points will be developed from Global Positioning System (GPS) technology on NAD83 (horizontal) and NAVD88 (vertical). All AHMP developed control points shall comply with NOAA Technical Memorandum NOS NGS-58 for Local Network Stations – 2-centermeter standard.
Consultant developed GPS Data will be submitted to the National Geodetic Survey as outlined in the NOAA Technical Memorandum NOS NGS-58, Appendix L and Input Formats and Specifications of the NGS Data Base – The NGS Bluebook.

Supplemental horizontal and vertical ground control in addition to the Local Network Stations may be required to support isolated 1"=100' and/or 1"=200' scale mapping areas. As a minimum all supplemental control will be marked with temporary monuments such as rebar/cap or PK nails. All Height Modernization Program control and supplementary photogrammetry control will be paneled with contrasting materials of sufficient size to be seen on the respective scale photography/imagery. All supplemental control shall be surveyed using GPS technology to meet Federal Geodetic Data Committee STD-007.2-1998.

Sufficient documentation shall be provided to verify that the Height Modernization Program Local Network Stations survey and supplementary photogrammetry control meets specifications. The survey shall be sufficient to yield mapping products that meet National Map Accuracy Standards at the scale of 1"=100', 1"=200' and 1"= 400' when utilized by a trained Photogrammetrist using film-based

photography or digital imagery, analytical and/or softcopy technology in accordance with standard industry practice.

3.8.1 Coordinate System

The horizontal control shall be tied to the Alabama State Plane Coordinate System, North American Datum 1983 (NAD83), U. S. Survey Feet.

The vertical control shall be tied to the North American Vertical Datum 1988 (NAVD88), U.S. Survey Feet.

The County will be provided the Latitude, Longitude and Elevation (Ellipsoid height) as well as X, Y and Z coordinate values for all Height Modernization Program Local Network Stations and supplementary photogrammetric control stations.

3.8.2 Airborne GPS/Inertial Measurement Unit (IMU)

The Height Modernization Program Local Network Stations will provide sufficient horizontal and vertical control to support the airborne GPS/IMU and aero-triangulation solution. Flight plans shall indicate the locations of all control points to be collected. The use of IMU is optional. An A/T report will be available to provide statistical validation for the triangulation and/or IMU solution used in the production process.

3.9 GIS LAYERS

3.9.1 Digital Map Compilation

Digital map data (elevation/planimetric data) shall be compiled directly from the aerial photography or imagery using First Order Analytical or Digital stereo plotters. All photogrammetric digital map compilation shall meet or exceed the National Map Accuracy Standards for the map scales requested. A Certified Photogrammetrist must supervise the compilation process and the results will be delivered in a digital file format appropriate to the County's GIS software platform.

3.9.2 Digital Orthophotography

To attain photogrammetric accuracy standards, the scanned photography or digital imagery shall be rectified using the digital terrain model generated during the map compilation phase of the project. This shall be accomplished with software, which shall rectify the imagery on a pixel-by-pixel basis for relief and other distortions. This shall produce a scale-accurate digital photographic image. The tiled images shall have uniform density and tone and they shall be free of mismatched imagery. Orthophotography created from scanned photography should be free of scan lines, double exposures, out-of-focus images, and man-made artifacts introduced during scanning. Images shall be rectangular and maintain a minimum overlap with adjacent images in order to appear seamless when referenced together in each respective scale. The Department of Revenue reserves the right to require pilot test images to be checked for accuracy and quality. County and State cadastral mapping personnel will inspect and evaluate the Pilot Test imagery.

The following orthophotography tiles will be created:

Color or Black and White 1"=100' tiles with .5 foot pixels (minimum)
Color or Black and White 1"=200' tiles with 1 foot pixels (minimum)
Color or Black and White 1"=400' tiles with 2 foot pixels (minimum)

3.9.3 DTM/DEM

A countywide DTM/DEM shall be generated based upon terrain data extracted from the 1"= 660', 1"= 1,320' and 1"= 2,000' aerial photography. If digital imagery is used the applicable image scale and AGL will be based upon the vertical accuracy achievable by the respective sensor. Depending on the type of sensor a lower AGL may be required to support the vertical accuracy than required for horizontal only accuracy. The contractor will include in the proposal the planned Image scale, Above Ground Level height, sensor pixel Ground Distance Resolution and the expected horizontal and vertical accuracy of the perspective image center at time of collection of digital imagery to support county requirements for GIS Planimetric Mapping with Orthophotography or GIS Topographic Mapping with Orthophotography.

3.9.4 GIS Planimetric Mapping and Orthophotography DEM

An “automated elevation extraction software program” supplemented with terrain modeling breaklines where necessary, may be used for development of DEM surface for production of orthophotography. The developed surface will be reviewed and modified as necessary prior to use in the orthophoto rectification process. It must be understood that contours generated from this surface will not meet NMAS for the respective map scale.

3.9.5 Topographic GIS Mapping and Orthophotography DEM

The DTM shall consist of breaklines and elevation points that accurately define the character of the terrain with point spacing appropriate to the output scale and contour accuracy requirements. Breaklines will be collected at significant terrain breaks, hydrographic features and along manmade features such as road centerlines, edges of pavement, and shall contain disturbed area polygons. The DTM/DEM shall, as a minimum, be capable of supporting the generation of 2-foot contours covering 1" = 100', 4-foot contours covering 1" = 200' map scale areas and 8-foot contours in the 1" = 400' map scale areas. A county may require contours of a closer elevation detail at their discretion (for example: 1 foot or 2 foot contours in 1" = 200' map scale areas, etc). Spot elevations, when required, shall be compiled at the highest point of significant closed contours, at the lowest point of significant closed depressions, significant saddles and inactive quarries, road intersections, rail intersections, each end of decks of bridges at the road centerline, and at points visible through dense vegetation in obscured areas. Elevations shall also be included for the surface of lakes and large ponds.

3.9.6 LiDAR DEM
(Optional)

A LiDAR option is available for surface generation and contour development and will be considered on a case-by-case basis. If LiDAR is a county requirement, specifications are available upon request.

3.9.7 Base Mapping Layers

(Planimetric feature selection including optional)

The following is a list of basic DOR required planimetric features to be provided in the Base Mapping Layers. The DOR has provided the Counties with the opportunity to request additional optional planimetric features at an additional cost to the respective county. The DOR maintains a feature collection and portrayal specifications, to be provided to the selected contractors, in order to maintain consistency in planimetric features collected for all counties necessary to support a Statewide GIS.

1. Building Roof Outline
2. Paved Road (Edges of Pavement)
3. Un-Paved Roads (Edges of Traveled way - graded dirt surface or edge of tire tracks).
4. Centerlines - Paved Roads
5. Centerlines – Un-Paved Roads
6. Hydrography to include coastlines, rivers, streams, lakes, swamps, major ditches and ponds.
7. Bridges (Road & Railroad) and Overpasses
8. Geodetic Control (Alabama Height Modernization Control / Photogrammetry Control / Etc.)
9. Railroads, Spurs, Yards (active)
10. Airports (Runways & taxiways) & Helipads
11. Fences (property line, cross country, utility only) – optional transportation right-of-way
12. Dam's
13. Major utility lines (cross-country electric transmission, above-ground gas pipelines, etc.)
14. Towers (cellular, microwave, radio)
15. Additional planimetric features may be added based on client requirements.

3.9.8 Contour Information

(Optional)

Contours at 2-foot intervals will be indexed at 10-foot intervals and shall be uniquely attributed to allow for display of heavier line weight. Indexes will be labeled at approximately 1500-foot intervals. The map area contours generated at 4-foot intervals shall have index contours at 20-foot intervals and labeled at approximately 3000-foot intervals. The map area contours generated at 8foot intervals shall have index contours at 40-foot intervals and labeled at approximately 6000-foot intervals.

The following contour information shall be included as applicable:

Indexes
Hidden Indexes
Depression Indexes
Hidden Depression Indexes
Index Contour Labels
Intermediate Contours
Hidden Intermediate Contours
Depression Intermediate Contours
Hidden Depression Intermediate Contours

Contour information shall be delivered in the appropriate topologically structured format (free of

crossing contours, pseudo-nodes, gaps, overshoots, etc.).

3.10 ACCURACY STANDARDS

3.10.1 Base Mapping

All surface level features on the final base mapping levels shall meet horizontal National Map Accuracy Standards (NMAS) for each respective mapping scale. All remaining inputs and processes (i.e. flight AGL, aerotriangulation control and methodology, scanner calibration, and sensor calibration) used in digital mapping production shall be sufficiently accurate to ensure that the final product meets NMAS.

3.10.2 Digital Orthophotography

All surface level features on the final digital Orthophotography shall meet horizontal National Map Accuracy Standards (NMAS) for each respective map scale. All remaining inputs and processes (i.e. flight AGL, aerotriangulation control and methodology, scanner calibration, and sensor calibration) used in digital orthophoto production shall be sufficiently accurate to ensure that the final product meets NMAS.

3.10.3 Topographic DEM's

All surface (points & breaklines) data on the final digital elevation model developed for generation of contour information shall meet both horizontal and vertical National Map Accuracy Standards (NMAS) for each respective map scale. All remaining inputs and processes (i.e. flight AGL, aerotriangulation control and methodology, scanner calibration, and sensor calibration) used in DTM/DEM production shall be sufficiently accurate to ensure that the final product meets NMAS.

3.10.4 Contours

All contours generated shall meet both horizontal and vertical National Map Accuracy Standards (NMAS) for each respective map scale. All remaining inputs and processes (i.e. flight AGL, aerotriangulation control and methodology, scanner calibration, and sensor calibration) used in contour production shall be sufficiently accurate to ensure that the final product meets NMAS.

PLANIMETRIC MAPPING GUIDELINES 4

4.0 PLANIMETRIC MAPPING GUIDELINES

4.1 PLANIMETRIC COLLECTION REQUIREMENTS

The following guidelines will be used to collect Base Mapping Layer planimetric information through photogrammetric means where visible on the imagery.

4.1.1 Area

a. Differing mapping scale areas are defined by the County Cadastral Tax Maps. Many of the 100-Scale and 200-Scale maps are not full sheet maps. In theses cases all partial 100-Scale and 200-Scale sheets will be expanded to equal the respective quarter section or section. This action will hold true unless the respective map sheet is bounded by the County boundary.

b. Data will be collected 100 ft beyond the County boundary. See hydrography – Double line Rivers.

4.1.2 Buildings

The building (roof outline) shall have at least one side with a minimum length, as outlined below for each respective scale, in order to be collected. Buildings will be compiled as closed polygons.

a. 100 Scale: 20'
    i. Do not collect window awnings as part of the structure.
    ii. Collect covered porches/decks and carports if they are part of the roof outline.
b. 200 Scale: 20'
    i. Do not collect window awnings as part of the structure
    ii. Collect covered porches/decks and carports if they are part of the roof outline.
c. 400 Scale: 20'
    i. Collect all qualified buildings and generalize roofline by not showing minor changes in rooflines i.e. dormers, window awnings, etc.

4.1.3 Paved Roads

Edges of Pavement will be captured where applicable for all paved roads. No distinction will be made between public and private.

a. 100 Scale:
    i. Inter-state/state highways: Edge of pavement does not include the shoulder. Collect on outside edge of “Fog Line”. Collect acceleration and deceleration lanes as part of the edge of pavement. Collect entrance and exit ramps as part of the edge of pavement. Collect edge of pavement for through ways of rest stops (not parking area).
    ii. Multi-lane Roads - Divided: Collect edge of pavements for both interior (at base/edge of median) and exterior edges. If curbs exist in urban areas collect a base of curb. Do not include shoulders.
    iii. Multi-lane Roads – Not Divided: Collect edge of pavements for exterior edges. If curbs exist in urban areas collect a base of curb. Do not include shoulders. Do not show interior turn lanes.
    iv. County Roads: Majority of the county roads does not have shoulders. Collect actual “edge of pavement”.
    v. Urban areas streets: collect “edge of pavement” at the base of curb when present.
    vi. Collect Edge of pavement across top of bridges and overpasses. Do not break line across these features.
    vii. Collect roads in apartment complexes and industrial areas.

viii. Collect Edge of pavement below bridges and overpasses.
ix. All Edge of pavements will be collected concurrently with an associated breakline except bridges when crossing over and overpasses.
x. Edge of pavements will connect cleanly at all intersections, acceleration and deceleration lanes and at adjacent model ties. There will be a smooth transition from low to higher scales.
xi. A paved surface leading to two (2) or more residences is considered a paved road. Collect from the main road to the apparent driveway entrance and close off.
xii. xii. Collect all edge of pavement to 100 ft past the scale/project boundary.

b. 200 Scale:
   i. Inter-state/state highways: Edge of pavement does not include the shoulder. Collect on outside edge of "Fog Line". Collect acceleration and deceleration lanes as part of the edge of pavement. Collect edge of pavement for through ways of rest stops (not parking area).
   ii. Multi-lane Roads - Divided: Collect edge of pavements for both interior (at base/edge of median) and exterior edges. If curbs exist in urban areas collect a base of curb. Do not include shoulders.
   iii. Multi-lane Roads – Not Divided: Collect edge of pavements for exterior edges. If curbs exist in urban areas collect a base of curb. Do not include shoulders. Do not show interior turn lanes.
   iv. County Roads: Majority of the county roads does not have shoulders. Collect actual "edge of pavement".
   v. Collect Edge of pavement across top of bridges and overpasses. Do not breakline across these features.
   vi. Collect Edge of pavement below bridges and overpasses.
   vii. All Edge of pavements will be collected concurrently with an associated breakline except when crossing over bridges and overpasses
   viii. Edge of pavements will connect cleanly at all intersections, acceleration and deceleration lanes and at adjacent model ties. There will be a smooth transition from low to higher scales.
   ix. A paved surface leading to two (2) or more residences is considered as a paved road. Collect from main road to the apparent driveway entrance and close off.
   x. Collect all edge of pavement to 100 ft past the scale/project boundary

c. 400 Scale:
   i. Inter-state/state highways: Edge of pavement does not include the shoulder. Collect on outside edge of "Fog Line". Collect acceleration and deceleration lanes as part of the edge of pavement. Collect edge of pavement for through ways of rest stops (not parking area).
   ii. Multi-lane Roads: Collect edge of pavements for both interior (at base/edge of median) and exterior edges. Do not include shoulders.
   iii. County Roads: Majority of the county roads does not have shoulders. Collect actual "edge of pavement". If possible – collect centerline and copy parallel for each edge of pavement.

iv. Edge of pavements will connect cleanly at all intersections, acceleration and deceleration lanes and at adjacent model ties. There will be a smooth transition from low to higher scales.
v. A paved surface leading to two (2) or more residences are considered as a paved road. Collect from main road to the apparent driveway entrance and close off.
vi. Collect all edge of pavement to 100 ft past the project boundary.

4.1.4 Un-Paved Roads

Edge of Traveled Way (graded dirt surface or edge of tire tracks) will be captured as unpaved roads.

All scales:

a. An unpaved surface leading to two (2) or more residences are considered as an un-paved road. Collect from main road to the apparent driveway entrance and close off.
b. Do not include logging roads, temporary construction roads or off road vehicle trails, etc.
c. Trails do not need an associated breakline unless the roadbed goes through a significant cut or fill.
d. Trails will connect cleanly at all intersections and at adjacent model ties. There will be a smooth transition from low to higher scales.

4.1.5 Paved Road Centerlines

Centerlines shall be captured for all paved traveled ways throughout the County as follows (all scales):

a. General Instructions:
   i. Centerlines will be carried across and under bridges and overpasses.
   ii. Minimum vertices will be used during collection intersection to intersection and with sufficient number of vertices to maintain curves in the traveled way.
   iii. Centerlines for small “Y” type intersections will be extended through the “Y” median and extended to the crossing road forming a “T” intersection. This only applies to centerlines.
   iv. Centerlines at intersections will be snapped with vertices at the true center of intersection.
   v. Associated breaklines are not required with centerlines on this project.

b. Interstate Highways:
   i. One centerline will be collected at the center of each set of same direction traffic flow lanes (i.e. Northbound) and one centerline for the opposite direction (i.e. Southbound) will be collected at the center of each set same direction traffic flow lanes.
   ii. Centerlines will be collected for exit and entrance ramps and connected to the main paved road centerline.
   iii. Centerlines will be collected at rest-stop areas and connected to exit/entrance ramps.
   iv. Do not collect centerlines for acceleration or deceleration lanes.
   v. Centerlines will be collected for emergency vehicle crossovers.

c. Multi-lane Divided with median:
   i. One centerline will be collected at the center of each set of same direction traffic flow lanes (i.e. Northbound) and one centerline for the opposite direction (i.e. Southbound) will be collected at the center of each set same direction traffic flow lanes.
   ii. A centerline will be developed for lane crossovers i.e. center between breaks in median.
d. Multi-lane Not-Divided:
   i. One centerline will be collected for the multi-lane road dividing opposite directions of traffic flow. If there is a "center turn lane" the centerline will traverse the center of the turn lane.
   vi. If the multi-lane becomes divided, with median, for less than 500' continue the centerline through the median. If the multi-lane becomes divided for a city block or more use the rules for *Multi-lane Divided with median.*
e. Two-lane Road:
   i. One centerline will be collected for the two-lane road dividing opposite directions of traffic flow.
   ii. If a passing lane exists the centerline will continue to be placed at the center dividing opposite directions of traffic flow.
   iii. If the two-lane becomes divided, with median, for less than 500' continue the centerline through the median. If the two-lane becomes divided for more than 500' use the rules for *Multi-lane Divided with median.*

4.1.6 Unpaved Road Centerlines

a. General (all scales):
   i. Centerlines will be carried across and under bridges.
   ii. Minimum vertices will be used during collection intersection to intersection and with sufficient number of vertices to maintain curves in the traveled way.
   iii. Centerlines for small "Y" type intersections will be extended through the "Y" median and extended to the crossing road forming a "T" intersection. This only applies to centerlines.
   iv. Centerlines at intersections will be snapped with vertices at the true center of intersection.
   v. Associated breaklines are not required with centerlines on this project.
b. Centerlines shall be captured for all collected unpaved traveled ways throughout the County.

4.1.7 Hydrography

a. General:
   i. Hydrography must maintain connectivity throughout the County.
   ii. Hydrography features will continue under bridges and through culverts.
   iii. Breaklines will be collected concurrently with all hydrography features with the exception of features represented with hidden lines.
   iv. Use the USGS 30 x 60 Series Map (1:100000) as a collection guide for distinction river/stream.

v. Do not distinguish between Man-made and natural shorelines unless client makes a special requirement.

b. Rivers Double line:
   i. Rivers are considered as flowing bodies of water greater than:
      (1) 10 ft wide for 100 Scale
      (2) 20 ft wide for 200 Scale
      (3) 40 ft wide at 400 Scale
   ii. River shoreline will be collected at edge of water line for both sides of the river.
   iii. Discretion will be used to minimize frequent switching between single and double line representations where the river width is either more or less than specified width over relative short distances.
   iv. When rivers are portrayed as the county boundary or mapping limits the far bank will be collected.

c. Rivers Single line:
   i. Rivers are considered as flowing bodies of water but "less than"
      (1) 10 ft wide for 100 Scale
      (2) 20 ft wide for 200 Scale
      (3) 40 ft wide at 400 Scale
   ii. Discretion will be used to minimize frequent switching between single and double line representations where the river width is either more or less than specified width over relative short distances.

d. Streams (all scales):
   i. Collect all significant (wet or dry) streams within the mapping area. Use the 100K map as a guide – if it's on the map collect.
   ii. Snap stream cleanly to other hydrography features (i.e. lake spillway, ponds, rivers etc.
e. Lakes: Lakes are basically of two types: one being a closed bodies of water greater than 5 acres and two a large standing body of water created by building a dam at given points along rivers creating a recreational areas and/or for the purpose of water reservoirs.
   i. Collect all Lakes at the interpreted mean water level
   ii. Lake (shorelines), where created on rivers, will take precedence over river shorelines. Carefully determine the confluence of the river and lake to determine change in feature codes.
f. Ponds: A closed body of water less than 5 acres.
   i. Collect all ponds in 100 and 200 scale areas.
   ii. Collect ponds in the 400 scale area that are identifiable
g. Ditches (Major). Collect all major ditches, 100 ft in length or longer used to drain and or irrigate fields, pastures, swamps etc.
h. Swamp (wetlands): collect all swamps that are identifiable.
i. Coastlines: Collect all coast lines at the mean water level

4.1.8 Bridges/Overpasses

a. Collect extent of bridge deck for all highway and road bridges.
b. Collect extent of overpass deck for all highway and road overpasses.

c. Collect extent of bridge deck for all Railroad bridges.
d. Do not collect bridges for driveways.

4.1.9 Railroads

(active) Collect only active railroads:

a. General:
    i. Collect all railroads that cross railroad bridges or that may go under road bridges.
    ii. Associated breaklines should be collected concurrent with the centerlines with the exception of bridge crossings.
b. Single Track: Collect a single centerline between the pair of rails.
c. Multiple Track: Collect a single centerline between each pair of rails.
d. Spurs/Sidings: Collect a single centerline between each pair of rails of the spur and sidings. Minimum length of siding and spur will be 50 ft.
e. Rail yards: Collect a single centerline between each pair of rails in the rail yard.

4.1.10 Airports

a. Collect all paved runways and taxiways.
b. Collect all unpaved runways visible on the imagery.
c. Collect all paved helipads visible on the imagery.

4.1.11 Fences

(property line, cross country) (Note: right-of-way is optional feature)

a. General:
    i. Maintain connectivity where possible i.e. within a tree line
    ii. Do not collect connector fences i.e. property line fence to a house.
    iii. Do not collect internal fences i.e. pig pens, breeder lots etc.
    iv. Do not cross driveways
b. Collect transportation right-of-way fences (optional)
c. Collect all cross-country fences
d. Collect all fences defining property divisions
e. Collect fences around public utilities i.e. cell towers, pumping stations, power stations.

4.1.12 Dam's

a. Collect concrete dams and spillway
b. Collect major man-made earthen dams

4.1.13 Major Utility Lines

a. Cross Country Power Lines:
    i. Collect base of steel tower legs/poles for significant cross-country power transmission lines. A specific feature point symbol will be placed at the base of each leg/pole.
    ii. Do not collect electrical power poles, telephone poles, streetlight etc. along transportation routes, driveways, within parking lots, athletic fields, etc.

iii. Do not collect transmission lines.

b. Pipelines
    i. Collect all “visible” (above ground) pipelines.
    ii. Do not collect pipelines based on vegetation clearings and or scars
    iii. Do not collect breaklines for pipeline features.

4.1.14 Towers

(cell, microwave, radio)

a. Collect “stand-alone” towers as a point feature and attribute with type if possible.
b. Do not collect whip antennas, Ham Radio Towers, etc.

4.1.15 Additional Planimetric Features

a. Features may be added upon mutual agreement between the County and the Contractor.
b. The County and Contractor will agree upon content and depiction within the final product.

4.2 DIGITAL ELEVATION MODEL COLLECTION REQUIREMENTS

(Supporting Orthophotography Only Projects)

Auto correlation programs can be used to develop a DEM surface model to be used with the ortho rectification process. However, a stereo operator must quality review the generated surface models to remove any anomalies in the generated process and to add breaklines as necessary to support generation of quality orthophotography. DEM data will be collected at a minimum of 100 ft beyond the extent of the deliverable orthophotography tile.

4.3 DIGITAL ELEVATION MODEL COLLECTION REQUIREMENTS

(Supporting Topographic Contour Generation Projects)

A combination of stereo compiled mass-points (point elevations) and breaklines will be collected in order to define the shape of the surface. Breaklines will be collected for all features impacting a change in the surface. DEM data will be collected at a minimum of 100 ft beyond the extent of the deliverable orthophotography tile and contour limits.

4.3.1 Mass Points

Mass points will be collected to supplement Breaklines with an optimum density to support 2' (two foot), 5' (five foot) and 10' (ten foot) contour intervals for 1"=100', 1"=200' and 1"=400' topographic mapping respectively. The stereo operator has the authority to place mass points where necessary to properly reflect the true terrain. Mass points will not be placed on buildings, storage material piles/areas or in bodies of water. Ground obscured areas will be outlined at the last visible surface elevation. Every effort should be made to place mass points within the ground obscured area where the surface is visible. The mass points along, with the breaklines, will be used in the development of DTM, TIN and DEM.

4.3.2 Hard Breakline Data

Hard Breakline Data will be placed at the following locations if they impact the surface and

depiction of the contours:

a. Edge of Pavements – Transportation, parking lots and driveways where they impact the surface – Edge of pavement and breaklines at edge of pavement **will coincide** horizontally ensuring contours break at the edge of pavement
b. Retaining walls – top at ground level & bottom at ground level
c. Hydrographic Features (breaklines and their associate hydrographic features **will coincide**)
d. Shorelines
e. Streams
f. Drains/ditches
g. Cliffs – Top and base (top & toe)

4.3.3 Soft Breakline Data

Soft Breakline Data will be placed at the following locations if they impact the surface and depiction of the contours:

a. Transportation Road crowns
b. Railroad – C/L, bridges, raised right of ways, and cuts and fills
c. Top of riverbanks - (breaklines and their associate hydrographic features **will coincide**)
d. Swamps/marshes
e. Inundated (flooded) area
f. Ground obscured polygon
g. Levees - Top edges and base (top & toe)
h. Main Ridge Line
i. Small topographic changes impacting surface
j. Cuts and fills (top & toe)

4.4 DIGITAL ORTHOPHOTOGRAPHY REQUIREMENTS

4.4.1 Surface Data

The digital image, regardless of source, must be rectified to the respective DEM generated from the source photography/digital imagery for this project or from a validated DEM from previous mapping. A USGS DEM will not be used unless previously authorized by the Department of Revenue and the County.

4.4.2 Image Source

The orthophotography can be developed from either scanned aerial photography or imagery from a digital camera. In either case the input pixel resolution will be less then the final output orthophotography pixel size (ground distance resolution).

4.4.3 Tile Size

The final Orthophotography Tile Size should be based on a “Minimum Bounded Rectangle” centered over the respective quarter section (100-Scale), section (200-scale) and 4 (Quad) Sections (400-Scale).

a. Due to the nature of the PLSS not being consistent in size and square shape, a "standard"minimum bounded orthophotography tile should be developed from the largest "average" quarter section, section or Quad Sections. Each tile should overlap each adjacent orthophotography tile by a minimum of 50 ft for 100-Scale, 100 ft for 200-Scale and 200 ft for 400-Scale to insure a seamless file appearance when two or more files are referenced together. Care should be taken where differing scales over lap.
b. Tiles that cover the respective County or County/State boundary will be designed to be smaller than the minimum bounded rectangle established for the normal tile. However, smaller minimum bounded rectangle must provide for the minimum over lap.
c. Differing size minimum bounded rectangle tile size for abnormally large or small tiles covering unusual areas i.e. along major rivers, Freeman Line, St. Stephens Meridian should be discussed with the County.

4.5 COMPRESSED FILES

Compressed files (example: *Mr. Sid*) may be generated.

4.6 FILE NAMING CONVENTIONS

File naming conventions will be provided by the GIS Program Office.

SCOPE OF WORK 5

5.0 PROJECT SCOPE

This scope of work shall be to acquire statewide natural color orthorimagery and planimetrics to be delivered in a digital format such as GeoTIFF. All acquisitions must adhere to the State of Alabama Department of Revenue (ADOR) Property Tax Division's, *Specifications for Property Ownership Maps GIS/Computer Assisted Property Tax Mapping and Aerial Photography ADV-25 (Effective June 2010)*. Sections 3 and 4 for this document contain these specifications. This project will require a comprehensive range of photogrammetric mapping services as described in the specifications including but not limited to:

- Digital color orthophotography statewide (leaf-off)
    - Must be acquired with digital cameras
    - Acquired within a 3 year cycle or less statewide
    - The GIS Program Office will coordinate with vendors for flight lines for geographical areas
    - Survey control (ground and airborne) is required. The GIS Program Office in conjunction with ADOR will facilitate the acquisition of existing ground controls from the counties.
    - Fully analytical aerial triangulation is required
    - Digital Terrain Model (DTM)/Digital Elevation Model (DEM) developed to support orthophoto production. The GIS Program Office in conjunction with ADOR will facilitate the acquisition of existing DEM/DTM as much as possible. See Appendix A for map showing publicly available LIDAR data.

- Planimetrics statewide(Section 4)
    - Existing planimetrics will be updated. See Appendix B for map showing dates of last county planimetric updates.
- Optional – LIDAR coverage for all counties that do not have existing LIDAR acquired prior to 2010 – See Appendix A. LIDAR will be collected as per the USGS LIDAR Guidelines and Base Specifications, Version 13 at the Quality Level 2 accuracy

SUBMISSION OF RESPONSES 6

6.0 SUBMISSION OF RESPONSES

To reiterate, this is a request for information intended to educate so that informed decisions can be made for imagery collection statewide. This RFI does not indicate acceptance or approval of any response to this request. The responses should include:

1. Title Page
2. Transmittal Letter
3. Detailed Response:
    a. Information about the firm
        i. Include years in operation
        ii. Type of business
        iii. Experience with similar projects
        iv. Qualifications (personnel and equipment)
        v. References
    b. Project Specifications:
        i. Rural area collection at a scale of 1”=200’ (1 foot resolution) minimum
        ii. Urban area collection at a scale of 1”=100’ (6 inch resolution) minimum
            1. Urban areas are defined by the US Census Bureau’s 2013 Metropolitan Statistical Areas (MSA) See Appendix C
        iii. Include project description and design
        iv. Describe the technology and techniques used
        v. Project staffing and management
            1. List all proposed sub-contractors
    c. Project Schedule
        i. Provide a general time estimate to complete each step
            1. This should begin with the initial acquisition, processing, and final delivery.
            2. All ortho imagery will be complete and delivered within 6 months of the date of acquisition.
    d. Project Design
        i. Provide a plan that demonstrates imagery acquisition statewide
            1. This can be over 1 to 3 year period but must be statewide
    e. Detailed Budget (itemized) of cost estimates
        i. Duration/expiration for the cost estimates
        ii. Cost estimate for imagery acquisition. Include additional information showing costs for DEM generation where it cannot be provided.

iii. Cost estimate for planimetric update. The GIS Program Office in conjunction with ADOR will facilitate the acquisition of the most current county plainmetrics data.

f. Optional – Provide a plan and estimate to collect LIDAR for all counties that do not have existing LIDAR acquired prior to 2010.

6.1 Response Deadline

Please send one (1) hard copy and one (1) digital copy of the completed proposal by 5:00 PM CST, December 2, 2013, in a sealed envelope marked "Confidential" to:

By Mail:
ADECA-GIS Management
Attn: Phillip Henderson
P. O. Box 5690
Montgomery, AL 36103-5690

By Courier:
ADECA-GIS Management
Attn: Phillip Henderson
Mailroom 404
401 Adams Ave. Suite 460
Montgomery, AL 36104

6.2 Contact Information/Questions

All questions about this request will be in writing emailed to the Point of Contact. Answers to all questions will be posted on the gis.alabama.gov website.

Please direct any questions, comments, and replies to:

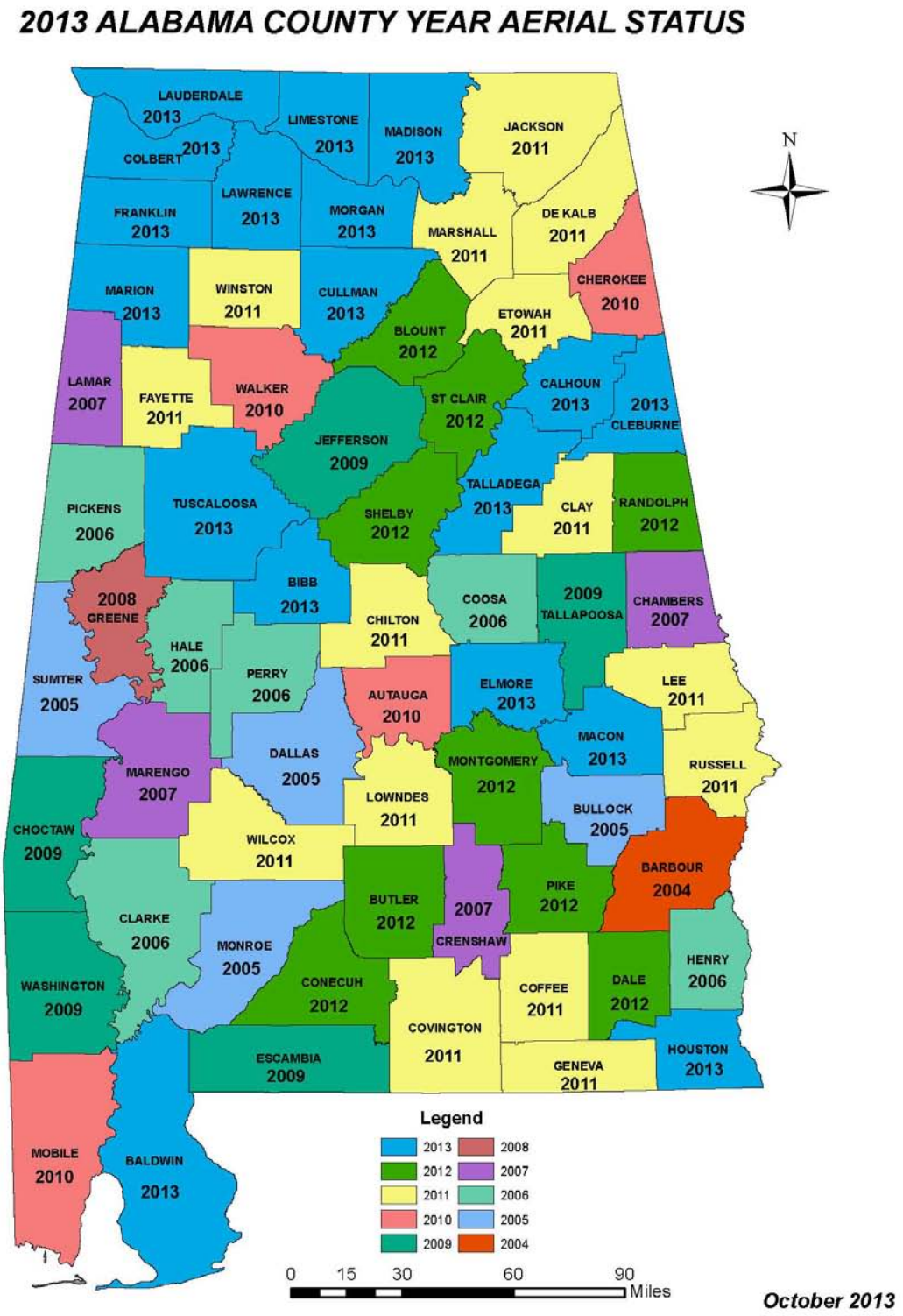
Phillip Henderson, GISP, PG
Director
Alabama Geographic Information Program Office
401 Adams Ave. Suite 460
Montgomery, AL 36104
Phone: *(334) 353-1038*
Phillip.Henderson@adeca.alabama.gov
www.gis.alabama.gov

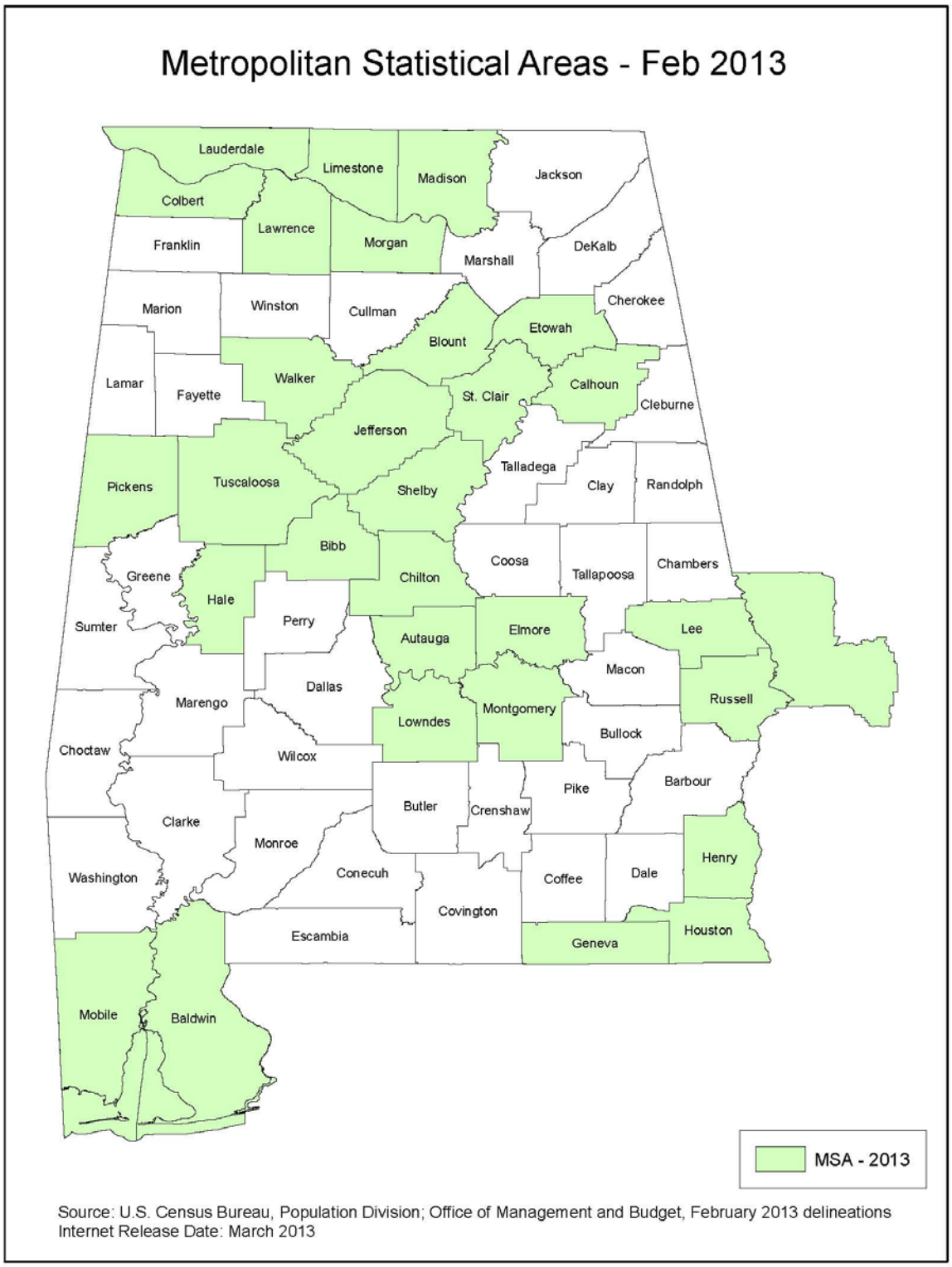
Appendix A 7

2013 Map of Alabama County LIDAR Status

Appendix B 8

Map of Alabama County Imagery and Planimetrics Updates



Appendix C 9

US Census Bureau's 2013 Metropolitan Statistical Areas