

City of Fayetteville Staff Review Form

2020-0114

Legistar File ID

3/3/2020

City Council Meeting Date - Agenda Item Only
N/A for Non-Agenda Item

Keith Macedo

2/10/2020

INFORMATION TECHNOLOGY (170)

Submitted By

Submitted Date

Division / Department

Action Recommendation:

Staff recommends authorizing the attached proposal, with Surdex Corporation, to provide GIS aerial photography through the Government Cooperative Purchasing Program, General Services Administration (GSA) Schedule 70.

Budget Impact:

4470.170.8170-5315.00

Sales Tax Capital

Account Number

Fund

02055.1

Geographic Information System (GIS)

Project Number

Project Title

Budgeted Item? Yes

Current Budget \$ 49,307.00

Funds Obligated \$ 12,595.00

Current Balance **\$ 36,712.00**

Does item have a cost? Yes

Item Cost \$ 28,000.00

Budget Adjustment Attached? NA

Budget Adjustment

Remaining Budget **\$ 8,712.00**

V20180321

Purchase Order Number: _____

Previous Ordinance or Resolution # _____

Change Order Number: _____

Approval Date: _____

Original Contract Number: _____

Comments:



MEETING OF MARCH 3, 2020

TO: Mayor and City Council

THRU: Susan Norton, Chief of Staff

FROM: Greg Resz, GIS Manager
Keith Macedo, Director of Information Technology

DATE: February 10, 2020

SUBJECT: Staff recommends authorizing the attached proposal, with Surdex Corporation, to provide GIS aerial photography through the Government Cooperative Purchasing Program, General Services Administration (GSA) Schedule 70.

RECOMMENDATION:

Staff recommends authorizing the attached proposal, with Surdex Corporation, to provide GIS aerial photography through the Government Cooperative Purchasing Program,

BACKGROUND:

The City's Geographic Information Systems (GIS) division provides mapping resources for the entire City, which includes aerial photography data. The City traditionally obtains new aerial photography on an annual basis to help monitor and map changes in the City. For the past three years the City has cooperatively purchased aerial photography services via the Benton County Assessor's contract. Assessors primarily are interested in property change closest to January 1 of each year and base their photography acquisitions date accordingly. City operations would prefer photography acquired in late winter to have a better sun angle to reduce shadows and to leverage the least amount of leaf canopy as possible.

DISCUSSION:

The GIS division put out the City specifications for an informal bid late last year. That process returned bids in excess of \$20,000.00 which necessitated the City to develop an RFP or look for existing cooperative purchasing agreements to leverage. City staff identified an existing cooperative purchasing agreement, through GSA schedule 70, Contract #47QTCA18D00J5, GSA Special Item Number (SIN) Earth Observation Solutions: 132-41, with Surdex Corporation, that complies with City procurement policy. The Surdex agreement meets or exceeds the City's specifications and Surdex references provided positive feedback. Staff recommends authorizing the attached proposal, in the amount of \$28,000, to purchase aerial photography for the entire City as well as the water service and planning areas.

BUDGET/STAFF IMPACT:

The cost for the attached proposal is \$28,000 and is budgeted within the Sales Tax Capital improvements fund, within the GIS CIP project (02055).

Attachments: Surdex Corporation proposal, City Aerial Photography Specification

PROPOSAL

CITY OF FAYETTEVILLE, AR 2020 Digital Orthophotography

Date: January 23, 2020



SUBMITTED TO

Greg Resz, GISP

GIS Manager
City of Fayetteville, Arkansas
113 W. Mountain St.
Fayetteville, AR 72701
Phone: (479) 444-3431

SUBMITTED BY

Tim Donze

Vice President, Business Development
Surdex Corporation
Office: (636) 368-4424
Mobile: (314) 422-7616
Email: TimD@surdex.com

PROPOSAL

City of Fayetteville, AR

2020 Digital Orthophotography



Surdex is proposing the City contract with us using our contract through the Government Cooperative Purchasing Program, GSA Schedule 70, Contract #47QTCA18D00J5, GSA Special Item Number (SIN) Earth Observation Solutions: 132-41. Surdex agrees to meet the specification provided in the City's "Request for Bid" for the 2020 Digital Orthophotography. This proposal is a brief understanding of the scope of work and includes a fee schedule for this project.

PROJECT AREA

The project area for this project are identified on the following page, Control Diagram (6") project area that is approximately 154 sq/mi. located in the City of Fayetteville (COF), Arkansas. The exact area of interest (AOI) diagram is shown on the Control Diagram on the following page. Prior to mobilization of acquisition assets and production, Surdex will require confirmation of the contractual project limits.

DIGITAL AERIAL PHOTOGRAPHY

Surdex aircraft will capture four band (red, green, blue, and near infrared), multispectral digital aerial ortho photography of your area of interest(s); the control diagrams are provided later in this document. Each aircraft is equipped with high-precision digital aerial mapping sensors. The acquisition plan will be designed to achieve photogrammetric accuracies based on the known requirements requested by the City of Fayetteville and generally accepted industry practice. Surdex's image sensors are equipped with forward motion compensation and gyro-mount sensor leveling features. To supplement the required photogrammetric ground control, all aircraft and sensors are equipped with Global Navigation Satellite System (GNSS) navigation and Inertial Navigation System (INS) technology. Surdex's direct digital sensors capture Panchromatic (PAN), Red, Green, Blue (RGB) and near Infrared (IR) bands simultaneously. Processing and delivery of supplemental image bands is available upon request for an additional charge.

Acquisition Conditions: Surdex will acquire imagery leaf-off conditions when the sky is free of clouds, cloud shadows and atmospheric haze, generally between 10:00 a.m. and 2:00 p.m. and/or when the sun angle is greater than 35 degrees.

Manufactures calibration Reports: The manufactures calibration reports for our digital mapping cameras/sensor will be provided to the COF.

GROUND CONTROL SURVEYS

Surdex will use existing photo identifiable control points provided by COF to support geospatial data production for this project. Surdex assumes no responsibility for the accuracy of the control provided. Re-work required by Surdex due to insufficient or inaccurate control surveys provided by COF may be cause for increased fees. Re-work of mapping services will not be completed, nor additional fees charged without written agreement between Surdex and COF.

Should any additional survey points be needed, Surdex will perform ground surveys to support geospatial data production projects. This surveying will be performed to an accuracy and density required to support the mapping project. The proposed control diagram is on the following page.

PROPOSAL

City of Fayetteville, AR

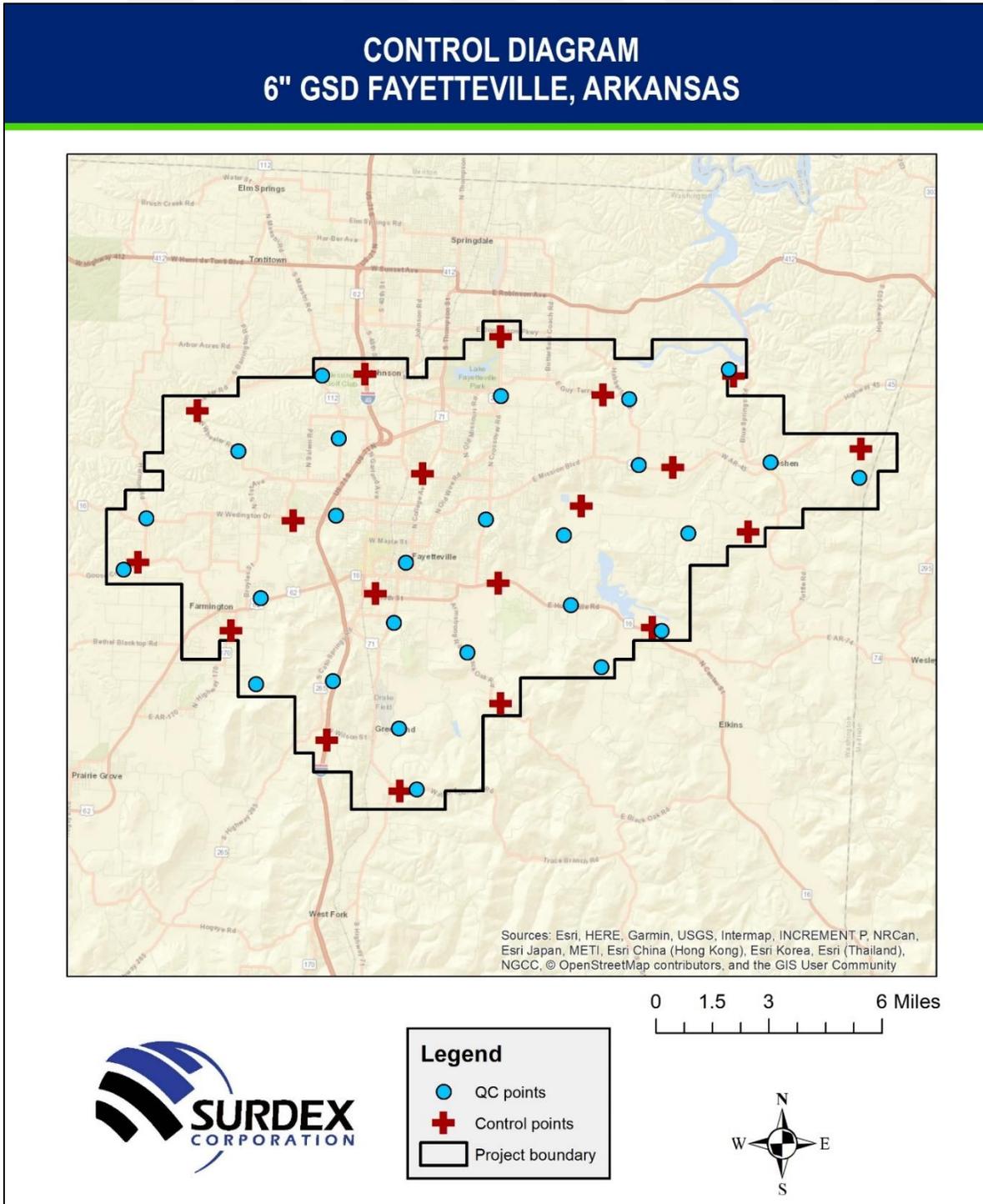
2020 Digital Orthophotography



TRIANGULATION

All aerial imagery collected for this project will be processed through an analytical triangulation solution that is controlled to ground survey points.

CONTROL DIAGRAM



PROPOSAL

City of Fayetteville, AR

2020 Digital Orthophotography



ORTHOIMAGERY MAPPING

Surdex will produce digital orthorectified aerial image tiles consistent with the shapefile area of interest (AOI) and tile layout provided by COF. The orthoimage tiles will be provided at a horizontal scale of 1"=100' at a ground resolution of 1.0' and 1"=50' at a ground resolution of 0.5'. Unless specifically requested in writing, Surdex reserves the right to utilize, if available, any existing elevation model deemed suitable for orthorectification to meet the contractual accuracy requirements as stated. If suitable elevation data is not available, Surdex will generate a new elevation model using manual and automated photogrammetric techniques. If requested, Surdex will deliver the elevation model used in the orthorectification process. To improve efficiency of client acceptance, Surdex may provide, at its discretion, seamline data for reference. Standard image format shall be tiff and tiff world (.tif/.tfw) and will be delivered on an external hard drive. Additional image formats are available. An additional charge may be required for additional formatting or processing.

PRODUCT ACCURACY

Unless otherwise requested, the products provided under this proposal will meet or exceed the American Society for Photogrammetry and Remote Sensing (ASPRS) Accuracy Standards for Digital Geospatial Data horizontal and/or vertical accuracies as listed below. Table accuracy values below are RMSE in feet.

PRODUCT ACCURACIES				
GSD	LIMITING RMSE _{x,y}	RMSE _r	CE95	ALLOWABLE SEAMLINE MISMATCH
6"	1.0'	1.41'	2.45'	2.0'

SCHEDULE

PRELIMINARY SCHEDULE	
TASK	DATE
Aerial Acquisition no later than	March 15, 2020
Final delivery of orthophotography	July 20, 2020

PROPOSAL

City of Fayetteville, AR

2020 Digital Orthophotography



FEE SCHEDULE

FEE SCHEDULE

Date: 01/23/2020

Surdex GSA Contract No. 47QTCA18D00J5

2020 Fayetteville 6" 4-Band Digital Orthophotography

SIN	SERVICE PROPOSED	PRICE OFFERED TO GSA	Unit	Qty	PRICE
132-41	Photogrammetrist Senior	\$109.92	/ hr.	4	\$440
132-41	Photogrammetrist Journey person	\$64.08	/ hr.	26	\$1,666
132-41	Quality Assurance Manager	\$98.27	/ hr.	12	\$1,179
132-41	Project Manager	\$94.18	/ hr.	16	\$1,507
132-41	Aerial Photography Pilot	\$67.55	/ hr.	10	\$676
132-41	Sensor Operator in flight	\$76.42	/ hr.	15	\$1,146
132-41	Sensor Operator on ground	\$47.09	/ hr.		\$0
132-41	Airborne GPS Ground Engineer	\$61.06	/ hr.	3	\$209
132-41	Stereo Technician	\$58.86	/ hr.		\$0
132-41	Orthophoto Technician	\$48.72	/ hr.	135	\$6,577
132-41	GIS Technician	\$48.44	/ hr.	8	\$388
132-41	Survey Licensed	\$114.44	/ hr.	12	\$1,373
132-41	Survey Technician	\$51.00	/ hr.	120	\$6,120
132-41	Geospatial Analyst Senior	\$109.61	/ hr.		\$0
132-41	Geospatial Analyst Journey	\$68.87	/ hr.		\$0
132-41	Imagery Scientist	\$76.07	/ hr.		\$0
132-41	Cartographer Senior	\$82.08	/ hr.		\$0
132-41	Cartographer Journey person	\$48.55	/ hr.		\$0
132-41	Database Manager	\$127.58	/ hr.		\$0
				361.4	
SUBTOTAL					\$21,281

SIN	ODC - Other Direct Charges				
132-41	Piston single	\$279.81	/ hr.		\$0
132-41	Piston twin	\$582.28	/ hr.		\$0
132-41	Turbo prop	\$800.12	/ hr.	6	\$4,801
132-41	LiDAR sensor	\$505.97	/ hr.		\$0
132-41	Digital Sensor	\$639.56	/ hr.	3	\$1,919
132-41	GPS	\$6.94	/ hr.		\$0
SUBTOTAL					\$6,719

TOTAL PROJECT PRICE **\$28,000**

Proposal is good for Sixty (60) days from date of proposal.

PROPOSAL

City of Fayetteville, AR

2020 Digital Orthophotography



DELIVERY ITEMS

The following delivery items are included in the fees above:

Digital Orthoimagery

- Survey Report
- Digital orthoimagery in .tif/tfw, .JPEG, Mr. SID tiles and/or MrSID mosaic formats
- Seamline shapefile
- FGDC-compliant metadata

SURDEX CORPORATION

CITY OF FAYETTEVILLE, AR



Signature

Signature

Date February 7, 2020

Date _____

HELP US PREVENT PAYMENT FRAUD – Surdex will adhere to the original payment processing method in our contract. Surdex will not contact you to change payment processing methods. Surdex requests all questions or concerns be directed to Surdex Corporation, Accounting.

PROPOSAL

City of Fayetteville, AR

2020 Digital Orthophotography



TERMS AND CONDITIONS

The following terms and conditions are incorporated in and together with the proposal become a part of the contract between Client and Surdex Corporation ("Surdex"). Both parties agree as follows:

ACCESS

Client shall arrange for access to and make all provisions for Surdex to enter upon all public and private lands as required for Surdex to perform its services.

INVOICES / PAYMENT SCHEDULE

Client is solely responsible for payment of services; payment will in no way be conditional upon Client receipt of payment from another party. Payment schedule is to be:

- 60% due upon completion of acquisition, 40% due upon final delivery.

PAYMENT TERMS

Payment shall be due 30 days after the City's acceptance of an invoice.

If a project is inactive for more than 45 days due to unforeseen circumstances, both parties will make every good faith effort to negotiate mutually agreeable terms.

TAXES

If Client does not provide evidence of tax-exempt status prior to commencement of any services by Surdex, then Client shall be responsible for any and all taxes in connection with such services.

SURDEX'S INSURANCE REQUIREMENTS

Surdex shall maintain in force throughout the term of this Agreement insurance of the types and in the minimum amounts set forth below.

- 1) WORKERS COMPENSATION: Statutory Coverage, including Employer's Liability with minimum limits of \$1,000,000.
- 2) COMMERCIAL GENERAL LIABILITY: \$2,000,000 Combined Single Limit per occurrence for Bodily Injury, Personal Injury, and Property Damages, including Contractual Liability covering Surdex's indemnification obligations in this Agreement.
- 3) COMPREHENSIVE AUTOMOBILE LIABILITY: \$1,000,000 Combined Single Limit per accident including any auto, all owned autos, hired autos and non-owned autos.

4) PROFESSIONAL LIABILITY: \$2,000,000.

5) AIRCRAFT LIABILITY: \$10,000,000, if aircraft are employed.

6) VALUABLE PAPERS: \$150,000.

INDEMNITY

Surdex agrees to indemnify, defend and hold Client harmless from and against any and all claims, demands, suits, damages, and costs (including attorney' fees and cost of defense) due to bodily injury or property damages arising directly out of Surdex's negligence, but only to the extent that such indemnity is covered by Surdex's CGL or Professional Liability insurance.

As a material part of the consideration to Surdex, Surdex assumes all risk of damage to its property or injury to persons, including its agents, contractors and employees in performance of Services hereunder, and Surdex hereby waives all claims in respect thereof against Client, except for any claim arising out of Client's negligence or willful misconduct. As used in this Section, the term "Client" shall include Client's employees, agents and contractors, if applicable, and "Surdex" shall include Surdex's employees, agents and contractors, if applicable.

Client agrees to indemnify, defend and hold Surdex harmless from and against any and all claims, demands, suits, damages, and costs (including attorney' fees and cost of defense) due to bodily injury or property damages arising directly out of Client's negligence.

PROPOSAL

City of Fayetteville, AR

2020 Digital Orthophotography



TESTING

Client shall independently verify the accuracy of Surdex's services prior to using or relying on the same (or providing the same to others for any reason), and in an event no later than six (6) months after completion of the services (the "Claim Period").

If Client fails to take commercially reasonable efforts to verify the accuracy of Surdex's services as required herein, then Client shall be deemed to have waived all claims and rights of recovery against Surdex.

RIGHT TO CURE

If Client discovers errors in the deliverables within the Claim Period, Client shall promptly notify Surdex, and Surdex shall have the right to correct or repair for ninety (90) days after receipt of Client's notice (or such longer period if 90 days is insufficient) at Surdex's sole cost.

LIMITATION OF LIABILITY

To the fullest extent permitted by law, Surdex's total aggregate liability to the Client arising out of this Agreement, whether arising in contract, warranty, tort (including negligence), strict liability, or otherwise, is limited to the Total Price paid to Surdex for this contract.

The terms of the warranty for all deliverables shall conform to the terms of Surdex's GSA contract.

NOTWITHSTANDING ANYTHING TO THE CONTRARY, NEITHER CLIENT NOR SURDEX SHALL BE LIABLE TO THE OTHER FOR, AND EACH EXPRESSLY WAIVES THE RIGHT TO RECOVER, CONSEQUENTIAL, INDIRECT, PUNITIVE, SPECIAL OR EXEMPLARY LOSSES OR DAMAGES, WHETHER ARISING IN CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE, INCLUDING BUT NOT LIMITED TO LOSSES OF USE, PROFITS, BUSINESS, REPUTATION OR FINANCING.

OTHER

Any services being provided to Client by Surdex may be terminated by either party upon ten (10) business days' prior written notice, and in such event Surdex shall be paid by Client for all services performed up to and including the termination date, including reimbursable expenses.

FORCE MAJEURE

Neither Client nor Surdex shall be liable to the other for damages or delay in performance caused by acts of God, weather, strikes, labor disputes, accidents or any other event beyond the control of the other or its employee's and agents.

ARBITRATION

Disputes regarding this agreement should, in everyone's interest of expedience and cost, resolve issues in

arbitration, in accordance with the rules of the American Arbitration Association. Should either party not agree to such arbitration, they are entitled to seek judgement in a court of law.

OWNERSHIP OF WORK PAPERS

Surdex agrees that all materials, reports, drawings, studies, specifications, estimates, maps, computer data tapes, computations and other materials prepared by or for Client under the terms of this Agreement shall upon proper payment by Client to Surdex become the property of the Client. However, any processes, procedures, programs, software, or similar practices of Surdex, whether developed prior to or during the project, shall remain the property of Surdex until sold or licensed to Client for its use or use by others for separate compensation. Client shall not alter the same in any manner and shall waive any claim against Surdex and shall, to the fullest extent permitted by law, indemnify, defend, and hold Surdex harmless from any claim or liability for injury or loss arising from unauthorized alteration of Surdex's work product.

CONFIDENTIALITY

Surdex shall keep confidential all information obtained from and designated as confidential by Client and shall not divulge any confidential information concerning the Project to any person or entity (other than Surdex's subcontractors, employees or other persons or entities to the extent necessary to complete the services) unless written approval is granted by the Client or as ordered by a court of competent jurisdiction.

GOVERNING LAW

This Agreement shall be governed by and construed in accordance with the laws of the State of Arkansas. Should a conflict of terms arise from agreed to provisions, the terms of this agreement shall prevail.

EXECUTION

Upon signing of this document, this Agreement shall be binding upon and inure to the benefit of the parties hereto, their successors and assigns.



CITY OF
FAYETTEVILLE
ARKANSAS

113 W Mountain St

Fayetteville, AR 72701

REQUEST FOR BID

CITY OF FAYETTEVILLE, AR
2020 DIGITAL ORTHOPHOTOGRAPHY

DETAILED SCOPE OF WORK

1. General Information

1.1. Overview

The purpose of this Request for Bid is to receive price proposals from well known, industry qualified, Contractors that can meet or exceed the specifications laid out by this detailed scope of work to provide professional services related to the production of 4 band high resolution, natural color digital orthophotography, including, but not limited to, digital camera capture of aerial photography, project control, ground control, photogrammetry, and aerial triangulation.

Map 1 shows the 6" acquisition area (154 sq/mi) for 2020. Map 2 shows the proposed 3" acquisition area (106 sq/mi) for 2020. The shapefile for this area can be downloaded at <https://www.fayetteville-ar.gov/514/Data-Downloads> and is called AerialGrid6 and AerialGrid3.

COF would also like a quote for both 3" and 6" resolution, four band (red, green, blue and near infrared), multispectral digital orthophotography.

1.2. Background Information

The City of Fayetteville (COF), AR flies a yearly leaf off aerial photo mission and in some years will fly a second leaf on mission. COF may request some add on products in the future.

2. Digital Orthophotography

COF seeks to acquire six inch (6") or better ground sample distance (GSD), four band (red, green, blue and near infrared), multispectral digital orthophotography from imagery that must be acquired prior to March 15, 2020. The March 15 deadline is to ensure the photography is acquired when the majority of the vegetation does not have leaves. This is also referred to as "leaf-off" aerial imagery, where the least amount of vegetation is present to improve the visibility of features that can be covered by vegetation during the growing months. under leaf-off conditions.

2.1. Capture of aerial photography shall be accomplished using a precision digital aerial mapping camera with "area CCD array" camera architecture.

Technical Specifications

2.1.1. General

Orthophotography will be delivered in the coordinate system shown below.

Ground Resolution:	0.5 US Survey Foot (6 inch) or better
Image Type:	4 Band CIR Imagery
File Format:	Geotiff
Compressed File Formats:	SID compressed format for entire project area at compression ratio determined in consultation with COF; all compression formats shall be fully compatible with ESRI©.

Coordinate System:	Arkansas State Plane, North Zone
Horizontal Datum:	NAD 1983(2007)
Map Units:	U.S. Survey Feet

Tile Size:	Full tiles required. Based on the previous acquisition grid structure. An index grid established for the project will be provided.
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2.1.2. Data Capture Method

The aerial camera used for this project shall be a large format digital mapping camera/sensor designed for stereo vertical aerial photography with electronic forward motion compensation (FMC). The sensor shall provide direct digital capture of 4-band (RGBir) imagery with 12-bit or greater radiometric resolution for each image band. A manufacturer's calibration report shall be submitted with the response to these specifications for each camera system to be used on this project. The absence of a calibration report may be cause for disqualification of the Vendor. Imagery shall be acquired at a nominal ground pixel resolution sufficient for developing 6" (six inch) pixel or better orthophotography (or 3" pixel or better if this option is selected). The Contractor may resample from a smaller pixel resolution to achieve the specified pixel resolution, but in no case shall the Contractor resample from a larger pixel resolution to achieve the specified pixel resolution.

2.1.3. Capture Conditions

Leaf-off conditions and no haze, clouds, fog, dust, smoke, air pollution, snow, or other ground obscuring conditions shall be present. Capture shall occur within two (2) hours before and two hours after maximum sun angle, and when the sun angle is not less than 35 degrees above the horizon. Images shall not contain objectionable shadows caused by relief or low solar altitude.

Acquisition window shall be during the spring 2020 acquisition season prior to the 2020 leaf-on season. The season is estimated to run no later than March 15, 2020.

2.1.4 Flight Design

The flying height above mean terrain shall be appropriate for achieving the required pixel resolution and for achieving DEM accuracy sufficient to support rectification in areas where new DTM data is required. The flight mission shall be designed such that forward lap is 60% and side lap 40% in order to ensure total project area coverage. Crab shall not be in excess of three (3) degrees; and, tilt of the camera from verticality at the instant of exposure shall not exceed three (3) degrees. Imagery shall be acquired at a density in the urban area such that all transportation networks (including active transportation) are clearly visible and that buildings show no signs of excessive tilt or lean.

The flight mission schedule must include sufficient time for captured data to be inspected and for any necessary re-flights to be completed within the capture window and prior to March 15, 2020 (see section 2.2.3 above). Re-flights shall be centered on the plotted flight lines and must be taken with the same camera system. The Contractor at no additional fee must correct aerial imagery that does not meet defined specifications.

2.1.5 Horizontal Positional Accuracy

Horizontal accuracy shall test at 2.45 feet or better at 95% confidence level (RMSE, of 1.4142 feet); National Standard for Spatial Data Accuracy (NSSDA) (reference FGDC- STD007 .3-1998). Accuracy testing and reporting must conform to the NSSDA requirements. Accuracy testing parameters (well-defined points, the independent source of higher accuracy acquired separately from data used in the AT solution or other production procedures, and check point distribution) shall be determined by the Contractor in consultation and with concurrence of COF's Project Manager. Complete NSSDA accuracy testing results of all well-defined points shall be provided to COF at the time of data delivery. COF may choose to use a third party to validate the accuracy of the dataset.

2.1.6 Aerial Triangulation (AT)

Aerial triangulation will be performed using industry-standard procedures and software packages to support the horizontal accuracy requirements of the orthophotography.

2.1.7 Image Quality

Orthophotography shall be clear and sharp in detail with no noticeable blemishes and be radiometrically and geometrically corrected to enable adjacent files to be displayed simultaneously without obvious differences in tone, contrast, or position of ground features between single images, across the block, or across the database.

The most nadir part of every image will be used in mosaicking. Seam lines will be created to ensure that joins do not cut hard detail and will not cross through above ground structures. Visible seams within a tile or between tiles, which exhibit a noticeable "edge" or "displacement" effect, will be grounds for rejection of tiled or mosaiced data.

- The imagery shall not contain defects such as out-of-focus imagery, blurs, whorls, color blemishes, or any other kind of digital blemish or data corruption.
- Feature warp or misalignment, smearing, double image, or image stretching indicating bad elevation data shall not be present and will be grounds for rejection of tiled or mosaiced data.
- Distortion resulting from elevated surfaces such as bridges and interchanges or other abrupt changes in elevation shall be corrected or removed.
- Occlusion and smearing in areas of extremely high relief shall be fixed or minimized to the extent possible using overlapping orthophotos.
- Color and contrast adjustments are allowed in post process production provided that information is not lost in the shadows or highlights as a result of the process.

2.1.8 Image Tiling

See Section 2.2.1 of this Scope. Tile grids be supplied by the COF and extended by the Contractor in any new imagery areas.

2.1.9 Image Mosaics

SID compressed format image mosaics shall be produced in such a manner so that there are no part of the tiles area has areas of "No Data" (e.g. white/black blocks) obscuring any portion of the adjacent imagery. If 3" imagery is selected, then mosaics will also be produced in 3" resolution. The following mosaics shall be produced:

- SID compressed format image mosaic at six-inch (6") GSD resolution or better shall be produced for all of the project area.

2.1.10 Project Control

Project control shall include ground control points acquired under the supervision of a registered surveyor at sufficient density and accuracy to support production of digital orthophotography according to the technical specifications outlined in this Appendix. In addition, Airborne Global Positioning System (AGPS) control and Inertial Measurement Unit (IMU) technology shall be used as part of the digital capture system.

To the maximum extent possible and practicable, bidders are encouraged to utilize existing ground control points or to establish points that are within public properties (i.e. within road rights-of-way). In the event ground control or targets are needed on private property, the Contractor shall notify and obtain written permission of the property owner or proper agency prior to placing these ground control targets.

Control will be collected in Arkansas State Plane, North, U.S. Survey Feet, horizontal datum NAD83 (2007), and vertical datum NAVD88.

The Contractor shall provide the location and identification of all ground control and photo control points established and used during the flyover in ArcGIS shapefile or file geodatabase format.

2.1.11 DEM/DTM

A DTM/DEM shall be developed at a density level necessary to accurately represent the shape of the ground and support the orthophoto production and accuracy specifications as outlined in this Scope. Terrain/elevation data used in the development of the DTM/DEM shall be captured by photogrammetric techniques or derived from 2015 LiDAR data or a combination of both as applicable.

2.1.12 Metadata

Complete, Federal Geographic Data Committee (FGDC) compliant (reference FGDC- STD001-1998) metadata shall be provided for each component of the project, including digital orthophotography and DEM/DTM data. In addition, file-based FGDC compliant metadata shall be provided for the US Survey Foot digital orthophotography. All metadata shall be delivered at the same time and on the same media as the dataset delivery.

2.2. Project Deliverables

2.2.1. Data

Uncompressed-geotiff orthorectified imagery, compressed Mr. SID files, and corresponding metadata for the entire project on a portable hard drive. COF will use the final deliverables with ESRI software packages, and all data requested must be useable in this suite of software with no further manipulation. All data and reports will be considered property of COF upon final delivery.

Deliverables shall include:

1. One set of US Survey Foot tiled orthophotography and accompanying deliverables
 - a) A set of bundled 4-band geotiffs
 - b) A full area mosaic SID format
 - c) Tile index with file names and alternate names in ESRI shapefile format

- d) COF will supply the tile index
- e) Complete FGDC compliant metadata for each ortho file and by project
- 2. A digital flight index showing actual photo centers and dates and time of capture in ESRI shapefile format
- 3. A project control list in ASCII comma delimited text format and an ESRI shapefile with point identification and x, y, and z values for all ground control positions used or acquired for the project
- 4. AT Report describing all aspects of the AT process including graphical maps and tabular information for ground control, pass and tie points quality, and adjustment statistical results
- 5. Table of NSSDA accuracy testing results for all well-defined points
- 6. One (1) set of any new, tiled, DEM areas produced for this project and used in the orthorectification process including each of the following formats:
 - a) ArcGIS ASCII grid format
 - b) ArcGIS shapefile format for point and line files
 - c) Complete FGDC compliant metadata
- 7. Digital Sensor Product Characterization Report for the camera/sensor(s) used in this mission.

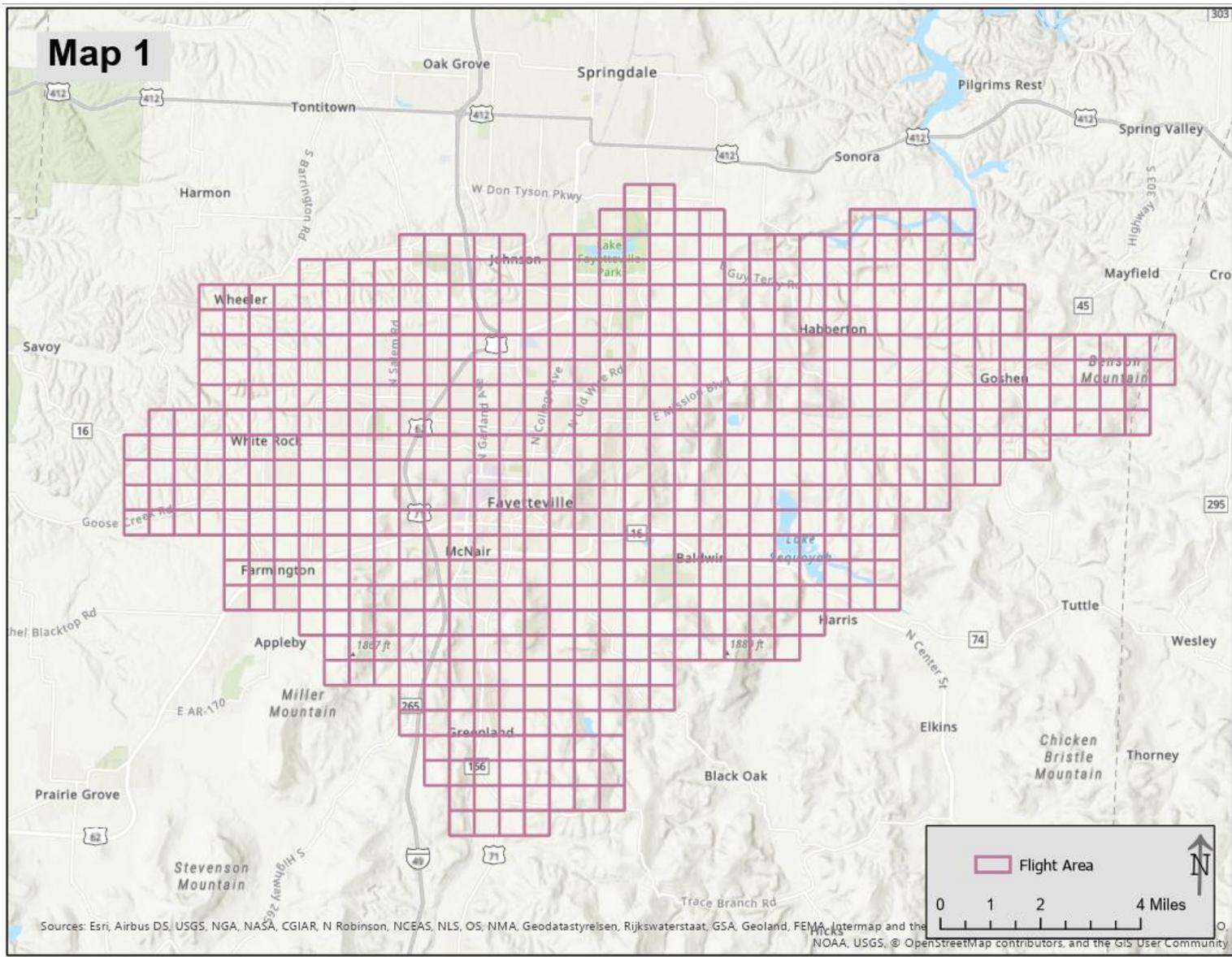
2.2.2. Media

Digital data deliverables shall be provided on industry standard portable hard drive with the highest speed transfer rates available.

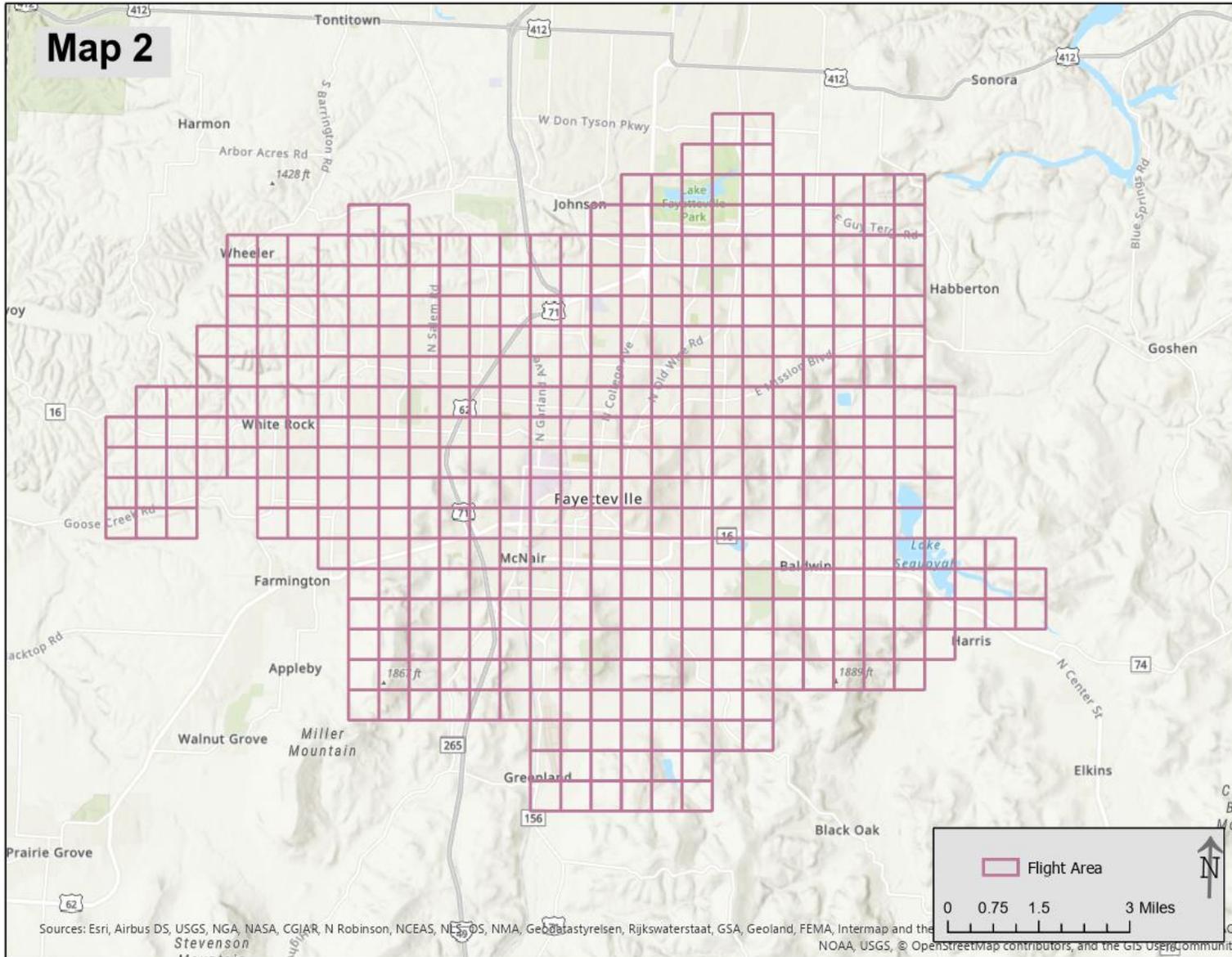
2.2.3. Delivery Date

Final delivery for all deliverables listed in 2.2.1 shall be July 20, 2020.

Map 1



Map 2



Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, USGS, NMA, GeoBastatysreisen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the
Stevenson
NOAA, USGS, © OpenStreetmap contributors, and the GIS User Community