

# M. J. HARDEN ASSOCIATES, INC.

PHOTOGRAMMETRIC ENGINEERS

1019 ADMIRAL BOULEVARD / 720 TROOST / KANSAS CITY, MO. 64106 / (816) 842-0141

May 7, 1987

Jonesboro Unlimited  
603 Southwest Drive, Suite A  
Jonesboro, Arkansas 72401

**ATTN:** Mr. Howard Vance

**RE:** Photogrammetric Engineering Services - Jonesboro Unlimited, AR

Gentlemen:

M. J. Harden Associates, Incorporated proposes to furnish photogrammetric services for the above referenced site, in response to your recent inquiry. Following is a description of the proposed services:

## PROJECT AREA DESCRIPTION

The project area includes approximately 3600<sup>±</sup> acres located in Craighead County and is specifically delineated on the map supplied with your inquiry.





## AERIAL PHOTOGRAPHY

New aerial photography has been flown of the area on April 23, 1987, with a single engine Cessna 206 equipped with a precision 6" focal length mapping camera certified by the U. S. Department of Interior-Geological Survey. The photo mission was flown at an altitude of 1800' above mean terrain, 60% forward overlap, yielding a negative scale of approximately 1"=300', suitable for base map compilation at a direct scale of 1"=100'. One set of 9" x 9" contact prints has been furnished for your files on May 4, 1987, via First Class Mail.

Photo Mission Fixed Fee: \$ 1,600.00

## CONTROL SURVEYS

Horizontal and vertical photographic ground control has been planned by M. J. Harden Associates, Inc. and will be established by Haywood, Kenward Associates, Incorporated.

AERIAL TOPOGRAPHIC SURVEYS  ORTHOPHOTOMAPPING  UTILITY INVENTORIES  
AERIAL PHOTOGRAPHY  GEODETIC CONTROL SURVEYS  VOLUMETRIC INVENTORIES

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Forty-six (46) photo identifiable positions have been indicated on one set of field prints and forwarded to Haywood, Kenward Associates on May 5, 1987, via Federal Express.

Standard Procedures will be used for the horizontal control to ensure angle closures not to exceed three (3) seconds per angle and linear error of not greater than 1:10,000. All level line closures shall not exceed 0.05 feet times the square root of the distance in miles.

**Control Surveys Not to Exceed Fee: \$ 20,100.00**

(The minimum fee for control functions shall be \$16,750; actual hourly rates shall be in accordance with the enclosed fee schedule).

#### **ANALYTICAL AEROTRIANGULATION**

Using the aerial photography and basic field control described above, a procedure called "analytical aerotriangulation" will be performed. Analytical aerotriangulation is a mathematical in-house method of obtaining additional control required for stereo-model orientation. This method accurately determines the horizontal position (x and y) and elevation (z) of supplemental photo identifiable control points to each individual stereo projection by means of digital calculations from the basic field control. A 1:1 bridging ratio shall be used in obtaining this supplemental control.

**Planning and Analytical Not to Exceed Fee: \$ 4,350.00**

#### **TOPOGRAPHIC MAPPING**

Base map stereo compilation will be performed with 1 foot contour intervals on a Wild B8S stereoplotter with Intergraph interface which is a direct on-line data entry to the VAX 11/780 computer. Digital terrain modeling (DTM) techniques shall be utilized. When a surface is digitized and stored as a DTM, a number of products may be obtained from the data. Primary uses include:

- 1) Contour mapping of entire area or chosen portions of the DTM surface.
- 2) Straight-line profiles across the model surface between any two defined points.
- 3) Extraction of Cross-Sections which are referenced to a straight base-line or arc.
- 4) Cut and fill volume determination when a second DTM surface is introduced.

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Cultural features to be shown will include all those visible on the photography which are generally shown on maps of this scale and contour interval.

Following edit procedures, this stored graphic data will be ink plotted at a scale of 1"=100' on a Cal Comp 965 automatic plotter. Final sheets will be provided in quarter section format (estimate 25 sheets).

**Topographic Mapping Not to Exceed Fee: \$56,135.00**

#### **TOPOGRAPHIC MAPPING ACCURACY**

The topographic mapping described above will meet or exceed National Map Accuracy Standards defined as follows:

The horizontal accuracy will be such that not more than 10% of the points tested shall be in error by more than 1/30 inch at map publication scale when compared to the nearest horizontal control station.

The vertical accuracy will be such that not more than 10% of the elevations tested shall be in error more than 1/2 the contour interval when compared to the nearest bench mark.

In areas where the ground is obscured on the photographs, such as areas of dense foliage or coniferous growth, dashed line contours will be shown indicating that these contours may not meet the previously defined National Map Accuracy Standards and no warranty is expressed or implied concerning such areas. Wherever possible, however, spot elevations will be shown to provide the most complete and accurate vertical information available from the photography used for this project.

Standard procedure dictates that photogrammetric maps be field-checked prior to use. Failure to notify us within 6 months of any errors and/or omissions shall be deemed an acceptance of the maps and any claims as a result of such defects are waived.

#### **SCHEDULE**

The aerial photography and photo control planning are complete. The ground control will take three to five weeks. The analytical and topographic mapping functions will take ten to twelve weeks from completion of the ground control. All other services will be provided on a mutually agreeable schedule after receipt of a signed copy of this proposal.

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**PAYMENT TERMS AND CONDITIONS**

Fees as stated shall remain in effect for ninety (90) days from the date of this proposal. If date of acceptance occurs after this time period, we reserve the right to revise our fee and resubmit this proposal.

All shipments other than First Class Mail shall be invoiced at cost.

We will submit monthly invoices for the percentage of the work completed. Terms of payment shall be net due thirty (30) days from the date of invoice and shall be subject to 2% service charge on balance each month thereafter.

We hope the foregoing is sufficiently adequate in detail for your evaluation. Thank you for the opportunity to provide for your photogrammetric engineering needs.

Sincerely,

**M. J. HARDEN ASSOCIATES, INC.**

*Don Cleveland*

Don Cleveland  
Project Officer

DTC:gj  
cc: MJH6650

For your convenience, this proposal can be utilized as a contract, a signed copy of which will serve as your authorization to proceed.

All terms and conditions of the above proposal agreed to this  
\_\_\_\_\_ day of \_\_\_\_\_, 1987.

Accepted For: **JONESBORO UNLIMITED**

By: \_\_\_\_\_

Title: \_\_\_\_\_