
Attachment A

Scope of Services

Program Overview

The State of Indiana has a goal to develop and/or update certain geospatial data sets for use by state government agencies, other levels of government, academia, and the general public, and to provide these data sets for inclusion to the IndianaMap. The IndianaMap is a resource for geographic information technology users inside Indiana and beyond. Funds for the statewide orthophotography program will come from state agencies, local governments, and grants.

Project Understanding

The Indiana Statewide Imagery and LiDAR project will consist of the following:

- New Statewide 1"= 200' scale 4-band orthoimagery at a 1-foot pixel resolution
- New LiDAR data at a 1.5-meter average post spacing

Project Area

The project will be divided into three project areas. Area 1 will be the center tier and performed in 2011. Area 2 will be the eastern tier and performed in 2012. Area 3 will be the western tier and performed in 2013.

The new 4-band orthoimagery will encompass the entire land area of the State of Indiana, or +/- 36,418 square miles. The tile border will be 1,000 feet beyond the state boundary with the following exceptions. The tile border with the State of Illinois along the Wabash River, and the State of Kentucky along the Ohio River shall be buffered a minimum distance of 1,000 feet or to the opposite river bank, whichever distance is greater. The imagery shall fill all tiles. Border areas of the State proximate to Lake Michigan (Lake, Porter and LaPorte Counties) shall be buffered beyond the shoreline a minimum distance of 2,500 feet. In addition to these dimensions, data coverage shall extend to the geographic extents of the delivery tile grid.

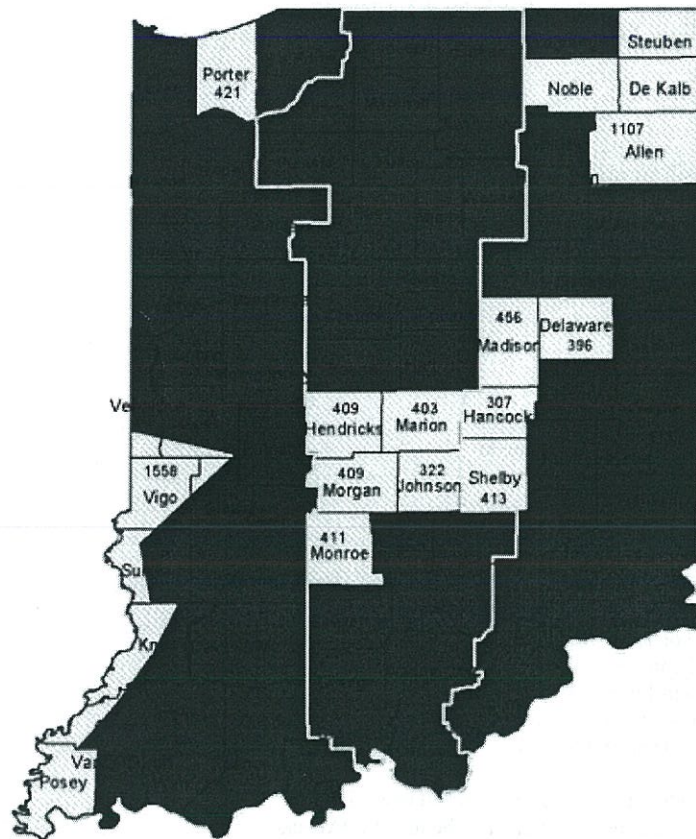
For the LiDAR effort, the project area will contain both existing LiDAR data and new LiDAR data to be collected by Woolpert beginning in 2011. The boundary limits for the new LiDAR data will be the same as the orthoimagery and cover +/- 29,218 sq. miles. However, unlike the orthoimagery, full tiles will not be delivered. The new LiDAR data will only be delivered to the 1000-foot buffer or to the opposite river bank whichever is greater.




The existing LiDAR is +/- 7,200 sq. miles and consist of the following counties:

- Complete Counties - Porter, Steuben, Noble, De Kalb, Allen, Madison, Delaware, Hendricks, Marion, Hancock, Morgan, Johnson, Shelby, and Monroe.
- Partial Counties – Vermillion, Parke, Vigo, Clay, Sullivan, Knox, Gibson, and Posey.



Indiana's Imagery Program



-  2011 Project Area
-  2010 FEMA LiDAR
-  Current LiDAR Coverage
(7296 - 1107 = 6189) Hydro-Flattening



Scope of Services

Woolpert will provide the following products and services:

Project Planning

Woolpert will meet with IOT representatives to formalize the scope of services into a project plan. During the planning phase, Woolpert will develop a project plan that covers the phases of the project, detailing how to achieve the desired results. Based closely on the negotiated Scope of Services in the contract, this plan will be a step-by-step guide for completing the project. This formal planning phase helps ensure that the final deliverables not only meet the technical specifications outlined in the Request for Proposal, but also the functional needs anticipated by IOT, who will depend on the imagery and related data developed during the project. The project plan will address the following:

- Develop a Comprehensive Technical Approach
- Develop a Communication Protocol
- Establish Data Design, Distribution, and Management
- Provide Quality Assurance and Quality Control

Project Promotion

The Woolpert management team will meet with the IOT to facilitate and promote local government participation. Together the Woolpert management and the IOT team will provide an outreach to all 92 county governments.

- Provide a direct mailing campaign to identified County Representatives
- Follow-up with E-mail canvassing
- Follow-up with telephone canvassing
- Invite County Representatives to attend a program seminar
- Present program seminars each year at various locations throughout the State to facilitate ease of travel for participants and their schedules
- The seminars will describe to the County Representatives the benefits and the return on investment concerning the IOT Program including product, services, and cost information
- The seminar will provide an opportunity for County Representatives to express their needs, goals, current programs, conditions, schedules, and ability to participate
- The seminar will include presentation material such as PowerPoint presentations, product samples, handouts, brochures, and provide innovative solutions through technology demonstrations
- Meet with each individual County Representative who requests follow-up at their location

Project Website

Woolpert will maintain a secure project website to help communicate various aspects of the project to authorized participants. Any project documentation distributed will be available on the project website, including:

-
- Progress reports
 - Meeting minutes
 - Final scope of services
 - Project schedule
 - Other contract documentation such as terms and conditions, and contract addendums
 - Identifying any issues, concerns, decisions, outstanding items and next steps. Written progress reports will be provided on a weekly basis during the life of the project.

One of the most important components of the project website will be reporting progress of the project. We've found this most effective when presented graphically with maps of the project area. For example, maps will be presented showing the following information:

- Flight schedule
- Status of completed flights
- Area delivery schedule
- Status of delivery areas – color coded according to the current status of each area, or portion of the area
- Completed and accepted delivery areas

The Project Website will be password protected allowing IOT to control the access to the information.

Quality Assurance/Quality Control Website

Woolpert will provide project status review and acceptance application, using Microsoft Silverlight technology, for the purpose of error identification and the verification of corrections. This customized redlining tool will provide a streamlined process for managing quality control of the orthoimagery in a secure environment. The redlining tool will provide a simple method of viewing near lossless full-scale imagery and noting any needed corrections – all via the Internet.

Woolpert will store all imagery in-house on our in-house HP IBrix storage appliance. All data will be served to the redlining application using ESRI's ArcGIS Server and utilizing cached map services. During the redlining process, the redlining tool will compile all of the information entered by IOT and its consultants, including comments, annotated areas, and the geospatial coordinates of any annotated areas into a dedicated SQL Server database instance.

IOT personnel and IOT consultants can log onto the secure Web site using a standard Web browser, such as Internet Explorer, Firefox or Google Chrome, and a password provided by Woolpert. Using Woolpert's redlining tool, IOT can view tiled imagery in real-time and perform quality control activities without having to transfer the preliminary data to their facilities. The tool allows the user to pan across the imagery, zoom in, zoom out, query and review attribute information, mark any problem areas with a point, line or polygon, and add comments to explain the requested changes.

LIDAR

Woolpert will create a flight plan to maximize the capability of our LiDAR systems and will obtain data at an average post spacing of 1.5 meters. The unprocessed LiDAR will consist of at least the first and last returns. The new LiDAR data will be obtained for the required project areas and consist of point number, X coordinate, Y coordinate and Z coordinate, along with an intensity

value. Woolpert will obtain and process the LiDAR data using the *"U.S. Geological Survey National Geospatial Program Base LiDAR Specification, Version 12"*, as a guideline.

The final DEM surface will be capable of supporting optional 2-foot contour generation with the addition of supplemental breaklines.

LiDAR data acquisition will occur under leaf-off conditions, with minimum or no snow on the ground, rivers are within their channels at or below normal levels, when the sky is sufficiently clear of clouds, smoke and atmospheric haze. The proposed window of acquisition is the spring of 2011, 2012, and 2013 during leaf-off conditions; however fall collection may also occur with IOT approval.

The LiDAR data will be post processed and a QA/QC will be performed. The data will be reviewed to ensure that it is consistent with the project requirements in terms of coverage, post spacing, and absence of artifacts. The point cloud will undergo classification to determine bare-earth and non-ground points utilizing various proprietary algorithms and COTS software. The following classification scheme will be used:

- 1 = processed but unclassified
- 2 = Bare Earth Ground
- 7 = Noise (Low or High, manually identified, if needed)
- 9 = Water
- 10 = Ignored Ground (breakline-proximity=nominal point spacing)
- 13 = Bridges (Bridges under 100 feet in length and foot bridges are not included)

Woolpert will not be using land use category test areas. Woolpert will use 20 test points per LiDAR acquisition block. These points will be carefully planned and equally distributed over the project area. They will be located in open terrain, where there is a high probability that the sensor will have detected the ground surface, without influence from the surrounding vegetation. The checkpoints will be located on flat or uniformly sloping terrain and will be at least five (5) meters away from any breakline where there is a change in slope.

The bare-earth LiDAR points will undergo additional QA/QC cleaning to verify that most artifacts have been removed. Using the bare-earth points determined during the classification, Woolpert will develop a Digital Elevation Model (DEM). The DEM will be produced to prevent clustering effects and ensure uniform densities throughout the data set. The DEM will be delivered in tile format as 5-foot pixels using ERDAS Imagine .IMG format and will be spaced so that 90% of the cells in a 3-meter x 3-meter grid placed over the data will contain at least one LiDAR point (Note USGS V13 Specification).

The LiDAR will be delivered using the 5,000' by 5,000' orthoimagery tile grid.

After the completion of the LiDAR processing, Woolpert will develop a comprehensive LiDAR Report. The LiDAR Report will contain at a minimum the following documents:

- Ground control report with dates of collection, issues encountered and coordinates.
- Information regarding the collection of the data such as mission planning, acquisition altitude, overlap, speed, equipment, etc.
- Information regarding the LiDAR collection device, including calibration test methods and results

-
- Final LIDAR point cloud results
 - Average point spacing (point density) of acquired LiDAR
 - Horizontal & vertical RMS error
 - Check point results

The data collected under this Task Order shall meet the National Standard for Spatial Database Accuracy (NSSDA) accuracy standards.

The Fundamental Vertical Accuracy (FVA) of the TIN: 30 cm at a 95% confidence level, derived according to NSSDA, i.e., based on RMSE of 15 cm in the “open terrain” land cover category (Note USGS V12 Specification).

Consolidated Vertical Accuracy (CVA): 36.3 cm at a 95% confidence level, derived according to ASPRS Guidelines, Vertical Accuracy Reporting for LiDAR Data, i.e., based on the 95th percentile error in all land cover categories combined (Note USGS V12 Specification).

Automated and manual filtering for LiDAR products shall use the following minimum performance for artifact/feature removal from the bare earth model: The bare earth surface model shall have a minimum of 95% of surface canopy artifacts, including buildings, vegetation, bridges or overpass structures removed.

Hydro Flattening

Woolpert will perform hydro flattening on the new and existing LiDAR data sets.

Woolpert has provided LiDAR services for the following counties and will restore these datasets from our historical back-ups in order to perform water flattening:

- Steuben, Noble, De Kalb, Allen, Madison, Delaware, Hancock

IOT will provide the existing county LiDAR data sets to Woolpert for water flattening:

- Porter, Hendricks, Marion, Morgan, Johnson, Shelby, and Monroe.

Woolpert will review the existing LiDAR data sets provided by IOT. If it is determined during our review process that the LiDAR does not meet the required standard and cannot be hydro flattened, Woolpert and the IOT will determine the next appropriate action, which may affect the cost and schedule of the project.

In order to achieve hydrologic flattening of the LiDAR data, Woolpert will perform the following:

- Breaklines will be used to perform the hydrologic flattening of water bodies, and the gradient hydrologic flattening of double line streams. Lakes, reservoirs and ponds, at with a nominal minimum size of two (2) acres or greater (~350' feet in diameter for a round pond), will be compiled as closed polygons. The closed water bodies will be collected at a constant elevation.

-
- Breaklines for rivers, creeks, and streams, with a nominal minimum width of 100-feet, will be compiled in the direction of flow, with both sides of the stream maintaining an equal gradient elevation. The hydrologic flattening of the LiDAR data will be performed using the *“U.S. Geological Survey National Geospatial Program Base LiDAR Specification, Version 12”*, as a guideline.
 - Any breakline/hydro feature vector data created during the hydro-flattening process will be delivered in ESRI format

Digital Orthoimagery

Ground Control

Woolpert will perform the necessary survey services to support the orthoimagery aerial triangulation and image processing. This includes airborne GPS support, reconnaissance of existing control, and any new photo ground control. If new control points are necessary, survey will establish control as second-order horizontal and third-order vertical. For new control points, Woolpert surveyors will capture photo identifiable points (PID) as often as possible. PID points are more environmentally friendly and avoid unnecessary public intrusion and interference in the community. PID points will be picked on clear, well defined locations that are identifiable from the appropriate photo scale. The PID points will be semi-permanent such as an “X” etched in concrete, PK Nail, or 18" rebar with cap. If a PID point is not available, Woolpert will place an aerial target at the point location. Along with ground control, Woolpert will obtain 20 test points per aerial acquisition block for a total of 240. Woolpert will incorporate the State of Indiana CORS stations as part of our airborne GPS solution.

Imagery for the project will be referenced to the appropriate Indiana State Plane Coordinate System East (2967) or West (2968) Zones as appropriate expressed in U.S. Survey Feet. Tiles which border the East/West State Plane divide shall have overlapping tiles delivered in both projections.

- Horizontal Datum: North American Datum of 1983, National Re-adjustment of 2007 (NAD83/2007)
- Vertical Datum: North American Vertical Datum of 1988 (NAVD 88) with the latest ellipsoid and geoid adjustments.

Aerial Imagery Acquisition

During the spring of 2011, 2012, and 2013 Woolpert will acquire new 4-band (R, G, B, and NIR) aerial imagery covering the entire project area using Leica ADS digital camera systems. The aerial imagery will be captured to produce orthoimagery at 1" = 200' scale with a 12-inch pixel resolution.

All imagery will be collected during the late-Winter / early-Spring flying season (approximately mid-February to late-April) during leaf-off conditions for deciduous vegetation in Indiana. The sun angle shall be 30-degrees or greater, and streams should be within their normal banks, unless otherwise negotiated. Woolpert will submit the flight logs to IOT as part of our acquisition documentation as confirmation of the actual flight date and time. During flight planning and acquisition, a significant effort is made to limit clouds, snow, fog, haze, smoke, or other ground

obscuring conditions in the imagery. In no case will the maximum cloud cover exceed 5% per image. Within the immediate areas of power plants or factories, some steam or smoke and/or shadows may be visible on imagery.

Woolpert will provide a flight line diagram for each project area divided into acquisition blocks. Woolpert will make every attempt to capture the appropriate project area each spring, however weather and ground conditions may influence our ability to accomplish the task in its entirety. Woolpert will provide daily weather reports during the acquisition phase of the project. Together Woolpert and IOT will determine the appropriate action if the aerial acquisition task cannot be completed within the window of opportunity due to uncontrollable events such as weather or ground conditions.

Woolpert will run the raw Leica ADS imagery data through an initial process immediately after acquisition has been completed to ensure that all program specifications have been met. This allows any necessary re-flights to be accomplished as soon as possible after the date of the original acquisition.

As part of our project plan, Woolpert will allocate resources and schedule based upon reflights of 10% of the total flight lines. Our experience has been about 10% in the Spring and 5% other times of the year.

As part of our project plan Woolpert and IOT will develop acceptance/rejection criteria. The criteria will include but not limited to coverage, cloud cover, endlap & sidelap, quality, resolution, low sun angle, tone or contrast, or artifacts, leaf cover, etc.

If the agreed upon criteria are not met, IOT will reserve the right to reject any or all photography or imagery. Woolpert will then redo, supplement, or modify the data at no extra cost to IOT unless Woolpert and IOT had previously agreed in writing that a given condition is allowed.

Woolpert will meet with IOT prior to the aerial acquisition missions to review acquisition resources for approval prior to flight. After approval, failure to complete the acquisition task due to insufficient resources being committed, subject to Section 18 of the contract, may be deemed a material breach of contract.

Aerial Triangulation/Image Processing

Woolpert will perform aerial triangulation of the aerial imagery using industry standard triangulation software. We will use the multi-sensor triangulation software module, which incorporates automatic pass point selection, numbering, and measurement in one batch process. Pass point selection uses autocorrelation algorithms to select multiple pass points in an image strip. Any pass point exceeding tolerances will be filtered out, and the positional accuracy of the pass points will meet IOT's accuracy requirements.

DEM

After hydro flattening, Woolpert will produce a new DEM using the new and existing LiDAR data. The new bare-earth digital elevation model (DEM) will be suitable for ortho-rectification only. The DEM will be delivered in tile format as 5-foot pixels using ERDAS Imagine .IMG format.

Pilot Project

Woolpert will perform a pilot project consisting of 4 image tiles. This provides an opportunity to test the production methods required for this project and it ensures that the final delivery will meet IOT's expectations. We generally recommend completing aerial imagery, ground control, and aerial triangulation for the entire project, and then performing the remainder of the production steps for the Pilot Area. This gives you a chance to:

- Approve the production process
- Approve the database design
- Test QC methods
- Perform field accuracy checks, if desired
- Modify scope of service

As part of the pilot project, Woolpert will provide IOT a minimum of three different image data sets. Woolpert's image specialist will prepare each data set with various color balance, tone, density, contrast, and brightness qualities. Woolpert will meet with IOT to determine the appropriate image sample to be used as a guideline for the pilot project. During the review of the pilot project further refinement of the image settings may take place before implementing full production.

Digital Orthoimagery

Woolpert will produce new countywide 8-bit, 4-band stacked color digital orthoimagery at 1"=200' scale and with a 12-inch pixel resolution. The orthoimage tiling format will follow a modular layout, with each 1"=200' scale image covering 5,000' x 5,000' defined in State Plane coordinates and named from the lower left corner. Orthophoto tiles will be clipped to eliminate overlap between adjacent tiles. The approximate file size for each tile will be 100 MB. Woolpert will use an interactive mosaicking process for tone balancing and image mosaicking. Full tiles will be used within the project interior and full tiles will be used along the exterior perimeter covering the state boundary and the buffer zone.

The digital orthophotography will be in GeoTIFF format. Woolpert will also provide orthoimagery tiles in Enhanced Compression Wavelet (ECW) format, compressed at 20:1, delivered in 5,000' x 5,000' foot grid tiles. Along with the digital orthoimagery a tile index will be provided with survey control point locations, flight lines, mosaic lines, and the final imagery exposure stations. Tile index vector files will be polygons, with attribute fields coded with the X-Y georeferenced coordinates of the lower left corner of the tile, and the filename. The tile index vector data will be delivered in ESRI compatible format.

Deleted: upper

Schedule

Woolpert will provide a detailed project plan with measurable milestones. The plan will include a schedule with incremental deliveries. Product data sets will be delivered based upon acquisition blocks. Woolpert understands the final delivery date is September 30th each year for the base product and October 30th for review. The final delivery date for buy-ups will not exceed December 30th each year. Using the on-line review tool, data review can be performed in parallel with production, shortening the review time. The delivery schedule will include a 30 day review process.

The following schedule would apply each year for the duration of the project.

Project Plan.....	January/February
Ground Control	February/March
Aerial Photography	March/April
LiDAR	March/April
Ground Control Report.....	May
Aerial Photography Report	May
Aerial Triangulation	May/June
Aerial Triangulation Report.....	June
Pilot Project	July
Pilot Project Review.....	July
LiDAR Ortho DEM Data.....	July
LiDAR DEM, LAS, and Hydro Flattening.....	October
LiDAR Report.....	October
Digital Orthophotography	July, August, September
Digital Orthophotography Client Review	August, September, October
Final Delivery and Project Wrap-up	October
Optional buy-up products	December

Deliverables

Metadata

Woolpert will provide metadata compiled at the product set level and conforming to the current Federal Geographic Data Committee (FGDC) standard (FGDC-STD-001-1998) for each of the product sets. The metadata will be USGS parser compliant.

Media and File Format Requirements

Woolpert will provide all final product dataset deliverables to IOT on an external hard drive. Other information such as the project plan, progress reports, survey and aerial photography reports, etc. will be delivered on DVD. Each individual complete county or other buy-up delivery area product set will be delivered separately on a separate portable hard drive (non-raid).

Permanent Storage

Woolpert will archive all raw source, intermediate, and final data for a minimum of 5 years, after which Woolpert and IOT will determine the next appropriate action.

Deliverables

Woolpert will deliver the following:

- One hard copy of the Project Plan and one electronic copy of the report in PDF file Format.
- One hard copy of the Survey Report and one electronic copy of the report in the PDF file format.

-
- One hard copy of the Aerial Image Acquisition Report including the flight plan/control diagram and one electronic copy of the report in PDF file format.
 - One hard copy of the LiDAR Acquisition Report including the flight plan/control diagram and one electronic copy of the report in PDF file format.
 - One hard copy of the Triangulation Report and one electronic copy of the report in PDF file format.
 - One hard copy of the LiDAR Report and one electronic copy of the report in PDF file format.
 - One set of 1"=200' scale 4-band stacked digital orthoimagery at 1.0-foot pixel resolution for each tile in GeoTIFF format with TIFF world files (without pyramids) along with mosaick lines for the entire project area.
 - One set of 1"=200' scale 4-band stacked digital orthoimagery at 1.0-foot pixel resolution for each tile in ECW format for the entire project area.
 - One set of Filtered raw LiDAR data (point clouds) in LAS format
 - One set of LiDAR bare earth data, first, last return data, intensity in LAS v12 format
 - One set of Hydro Breaklines in ESRI format
 - Provide one set of Hydro Flattened DEM data delivered in ERDAS Imagine .IMG format
 - FGDC Complaint Metadata
 - Monthly Written Progress Reports and Monthly Invoicing in PDF file format.
 - Daily Update to the Project Website

Deliverable Acceptance

The client has forty five (45) business days to review each deliverable and submit review comments. Woolpert will review each comment and together with the client determine the appropriate action. If it is determined that Woolpert needs to re-submit a deliverable or portion of a deliverable, that deliverable or portion will be completed and resubmitted within thirty (30) business days after the appropriate action has been determined. Any deliverable not submitted by the Client for review within sixty (60) business days will be deemed as accepted, therefore Woolpert will not be obligated to change, correct, or resubmit that deliverable.

Ownership

Consistent with paragraph 32 of the Contract, Woolpert shall have no ownership or property interest in the deliverables.

Attachment B Compensation

Total Base Product Lump Sum Fee..... \$4,616,252.00 USD

For performing the services described in "Attachment A" Woolpert will be paid as follows:

The project will be a lump sum project. Woolpert will invoice the IOT each month according to percentage complete. Woolpert will provide via e-mail a progress report and invoice to the appropriate IOT representative with each month's activity. Each invoice is to be paid within 35-days after received.

2011 – Center Tier

Project Planning

1-Foot Orthoimagery – 12,133 sq. mi.

USGS LiDAR – 10,179 sq. mi.

Existing and New Hydro-Flattening – 12,133 sq. mi.

Total 2011 \$1,523,165

2012 – East Tier

Project Planning

1-Foot Orthoimagery – 11,796 sq. mi.

USGS LiDAR – 9,120 sq. mi.

Existing and New Hydro-Flattening – 11,796 sq. mi.

Total 2012 \$1,437,672

2013 West Tier

Project Planning

1-Foot Orthoimagery – 13,233 sq. mi.

USGS LiDAR – 11,229 sq. mi.

Existing and New Hydro-Flattening – 13,233 sq. mi.

Total 2013 \$1,655,415

Note: The project area for each tier may change due to potential optional buy-up services. The cost will be adjusted by addendum based upon optional services.

Optional Buy-Up Cost

6-inch Imagery

In Cycle with Tier Additional \$91.00 per sq. mi. *

Out of Cycle with Tier..... Additional \$101.00 per sq. mi. *

* based upon countywide coverage

3-inch Imagery

In Cycle with Tier \$400.00 per sq. mi. *

Out of Cycle with Tier..... \$410.00 per sq. mi. *

* based upon countywide coverage

LiDAR at 1-meter average post spacing (Countywide)

In Cycle with Tier Additional \$35.00 per sq. mi. *
Out of Cycle with Tier..... Additional \$45.00 per sq. mi. *

* based upon a countywide coverage

LiDAR at 1-meter average post spacing (20 sq. mile contiguous coverage)

In Cycle with TierAdditional \$1,240.00 per sq. mi. *
Out of Cycle with Tier.....Additional \$1,250.00 per sq. mi. *

* based upon a minimum of 20 sq. mile contiguous coverage

2-foot Hydro-Conditioned Contours

In Cycle with Tier\$350.00 per sq. mi. *

* based upon countywide coverage

1-foot Hydro-Conditioned Contours

In Cycle with Tier\$800.00 per sq. mi. *

* based upon countywide coverage and would require 1-meter LiDAR and 6-inch Imagery not included in this cost

The following optional services will be priced based upon each individual project scenario:

- Surveying Services
- GIS Services
- Remote Sensing Services
- Photogrammetric Services
- Planimetric Mapping
- Impervious Surface Mapping
- Land Use and Land Cover
- Automated Feature Extraction
- Oblique Aerial Imagery
- Line of Site Analysis
- Utility Inventory
- 3-D Modeling
- Mobile Mapping Services

NOTE: Consistent with paragraph 32 of the Contract, the Contractor will provide the State with a copy of all buy-up or optional data produced in connection with the Indiana Statewide Imagery program.

Attachment C

Buy-UP and Additional Products

Optional LiDAR

As an **option**, additional project partners including counties, cities/towns, and others may buy-up to collect LiDAR data at an average 1-meter post spacing. Woolpert will produce the optional 1-meter LiDAR data using the above mentioned methodologies.

Optional Digital Orthoimagery

As an **option**, additional project partners including counties, cities/towns, and others may buy-up to 6-inch or 3-inch pixel resolutions. Woolpert will produce the optional 6-inch orthoimagery using the above mentioned methodologies. For a 3-inch option the orthoimagery will be produced using the above mentioned methodology, except a film based solution may be used in lieu of a digital camera solution. The 6-inch imagery will be delivered using 2,500' x 2,500' tiles and the 3-inch imagery will be delivered using 1,250' X 1,250' tiles.

Accuracy will be reported and tested as per the Federal Geographic Data Committee (FGDC) Geospatial Positioning Accuracy Standards, Part 3: National Standard for Spatial Data Accuracy [NSSDA] (1998). NSSDA requires a minimum of twenty test points to perform a statistical analysis.

Woolpert understands IOT or its designate may be testing the orthoimagery to verify the imagery meets the NSSDA requirements. Woolpert will also be performing verification of the data by using our 20 test points per acquisition block. The following horizontal accuracy will be used.

- 12-inch pixel +/- 5 feet or better
- 6-inch pixel +/- 2.5 feet or better
- 3-inch pixel +/- 1.25 feet or better

Standard Optional Buy-up Products

Standard buy-up options include the following:

1. 6-inch resolution 4-band stack 2,500' x 2,500' tiles
2. 3-inch resolution 4-band stack 1,250' x 1,250' tiles
3. 1.0 meter LiDAR USGS v12
4. 2-foot contours including additional supplemental breaklines (1.5 meter LiDAR)
5. 1-foot contours including additional supplemental breaklines (1.0 meter LiDAR)

Woolpert has provided a cost associated with the standard options in "Attachment C".

Contours

Using the LiDAR data and orthoimagery, Woolpert will compile DTM breaklines. Some features that may be represented by DTM breaklines include: natural slope breaks, ditches, and tops and bottoms of embankments; and constructed slope breaks such as roads and graded areas. Woolpert

will generate Hydro-Conditioned (USGS V12) 2-foot contours using the LiDAR derived mass points and DTM breaklines. The 2-foot contours will have an accuracy of ± 1.2 feet @ 95% confidence level (FEMA Guideline). Contours will be continuous and not be labeled, however every fifth contour (10-foot intervals) will be shown as an index contour and represented with a heavier line weight. All contours delivered in ESRI format will contain an elevation attribute that will hold the photogrammetrically obtained elevation.

For the 1-foot contour option, Woolpert will use the above mentioned methodology; however the 1-foot contours will have an accuracy of ± 0.75 feet @ 95% confidence level. 6-inch orthoimagery and 1-meter LiDAR data would be required for the 1-foot option.

The contour data will be delivered in ESRI ArcGIS compatible format in the appropriate Indiana State Plane East or West Zone.

Enhanced Optional Buy-up Products

The following services can be provided:

- Surveying Services
- GIS Services
- Remote Sensing Services
- Photogrammetric Services
- Planimetric Mapping
- Impervious Surface Mapping
- Land Use and Land Cover
- Automated Feature Extraction
- Oblique Aerial Imagery
- Line of Site Analysis
- Utility Inventory
- 3-D Modeling
- Mobile Mapping Services

