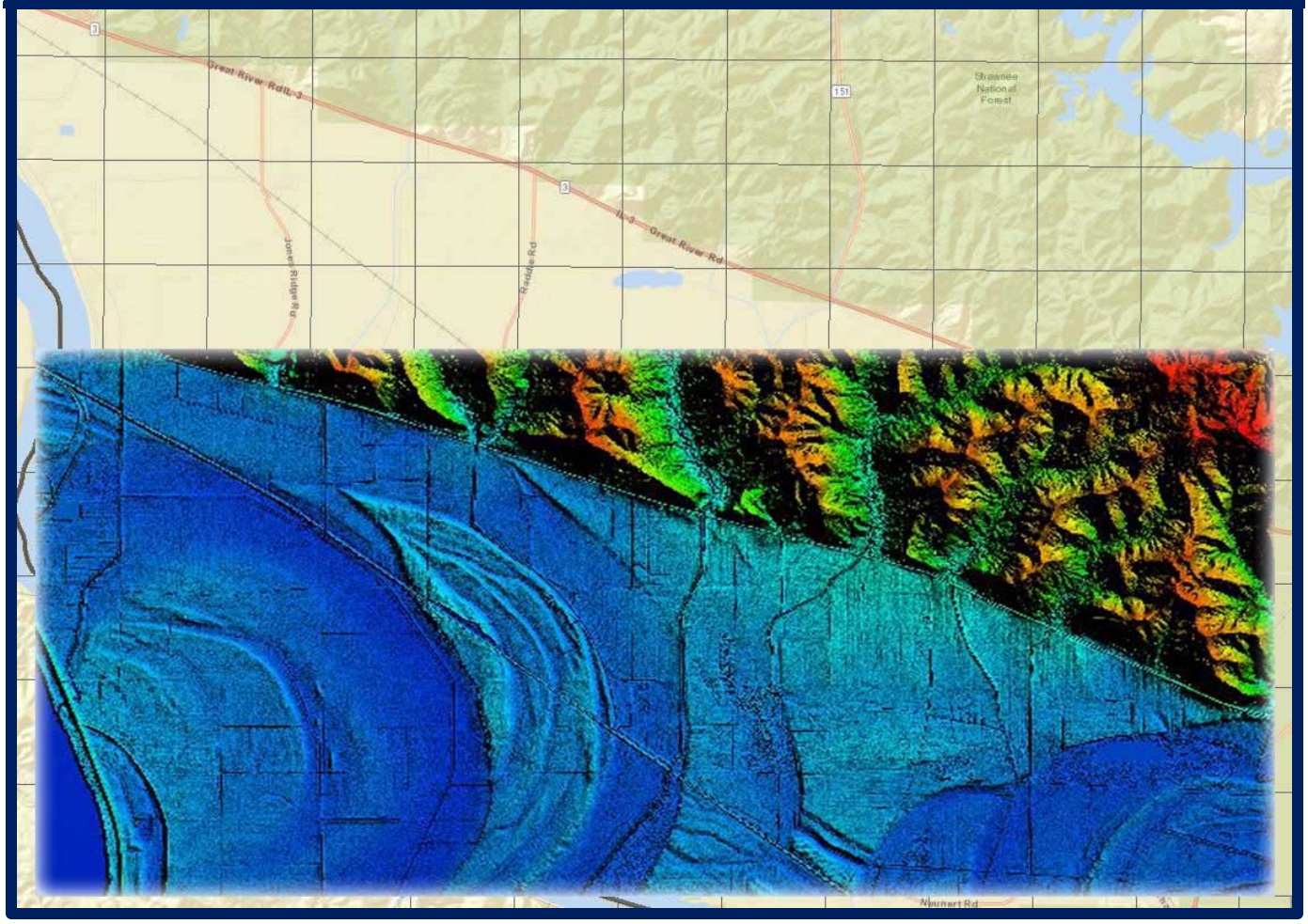
LiDAR ACCURACY REPORT

Project:	2014 ILHMP LiDAR Project
Report Area:	Jackson County, IL
Project No.:	U14113
Retainer Contract:	E0015873-R1
Date:	12-December-2014
Submitted by:	Tim Bohn, C.P., PMP Director of Project Management

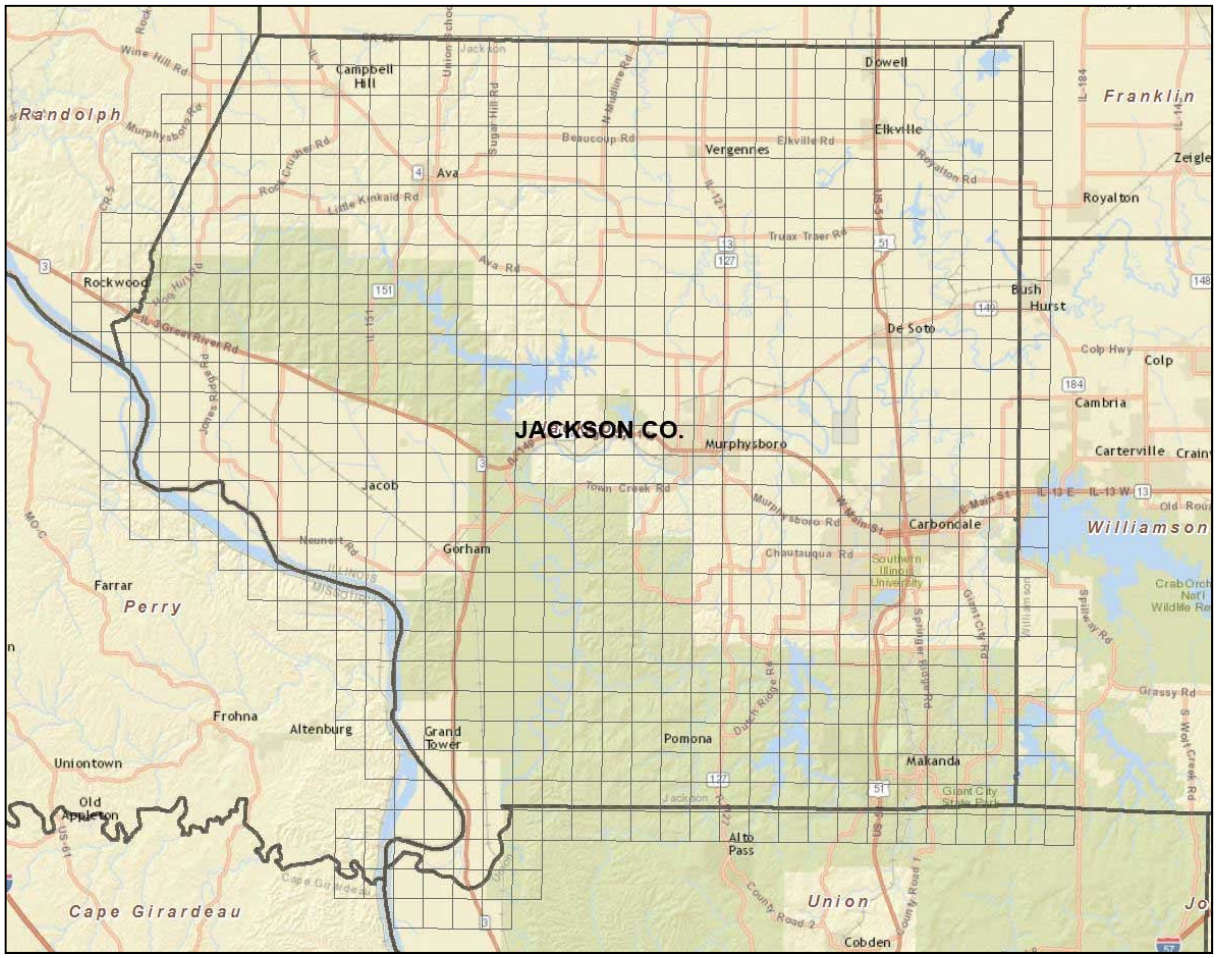


Project Overview

The University of Illinois contracted with Surdex Corporation in the spring of 2014 to collect high resolution LiDAR elevation data as part of a multiple county LiDAR Project. The purpose of the project was to acquire detailed surface elevation data for the Illinois Height Modernization Program (ILHMP) which is managed by the Illinois State Geological Survey (ISGS). When combined, the three IL county (Perry, Jackson and Franklin) project area totaled over 1,745 square miles of coverage. Processing of the LiDAR data and bare-earth model followed USGS Base LiDAR Specifications V1.0 standards. Surdex tested that the deliverables meet or exceed Quality Level 3 (QL3) accuracy as stated in the USGS National Requirements for Enhanced Elevation Data. Hard surface (bare earth) survey control points were collected by Surdex in order to calibrate the swath LAS data, the results are listed in the table on page 3. In addition, independent survey check points were collected on hard surface features, in brush, short and tall grass & under trees for each county area. In order to meet the Fundamental Vertical Accuracy (FVA) project specifications the overall vertical accuracy of these points should be 12.5cm (0.41 feet) RMSEz or less. The RMSEz was calculated as the square root of the average of the set of squared differences between the bare-earth and the survey points collected for the individual features (hard surface, brush, short grass, tall grass & trees). The final results for this delivery area are listed on the last page of this report.

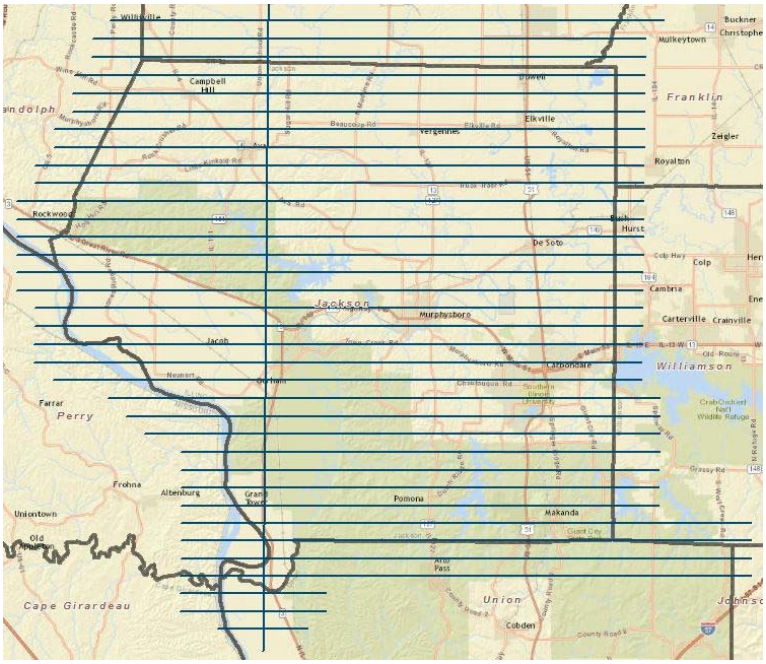
Delivery Area

This report covers the collection and processing of LiDAR elevation data over Jackson County IL. The project limits are presented in the graphics below. The project area consisted of 807 tiles sized 5,000' square, covering approximately 723 square miles of elevation data (county plus buffer for full tiles).



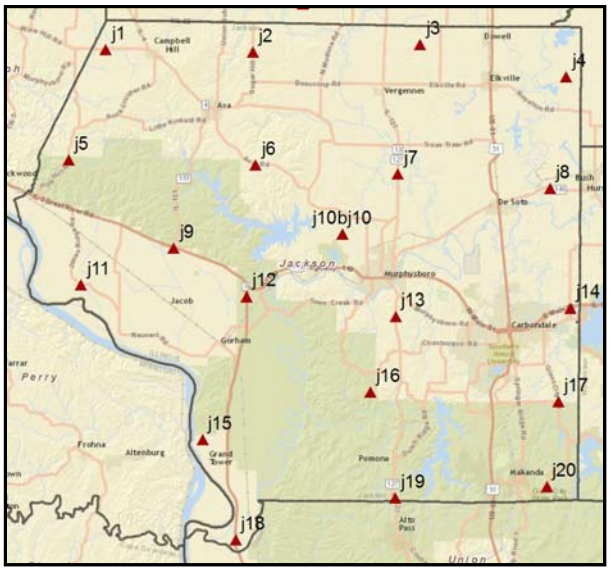
LiDAR Data Collection

The LiDAR elevation data for this project was collected April 17-20, 2014 with a Leica ALS70HP Aerial LiDAR sensor system mounted in a twin engine Cessna 335. For efficiency purposes, this project design called for one combined flight plan for both Jackson and Perry Counties, with acquisition of LiDAR data with lines flown approximately 10,200' above mean sea level in an east-west alignment, with a perpendicular cross flight used for calibration purposes. The collection scenario called for the acquisition of a minimum contract point spacing of 1.0 meters on the ground.



Jackson-Perry Co. Swath LiDAR Control

The field survey control for this two county area consisted of 42 hard surface (bare-earth) control points used for calibrating the unclassified LiDAR swath data. The graphic below presents these control points over Jackson county however the results shown come from the combined analysis of both counties. A complete copy of the results has been provided in the Accuracy folder, this chart shows the results.

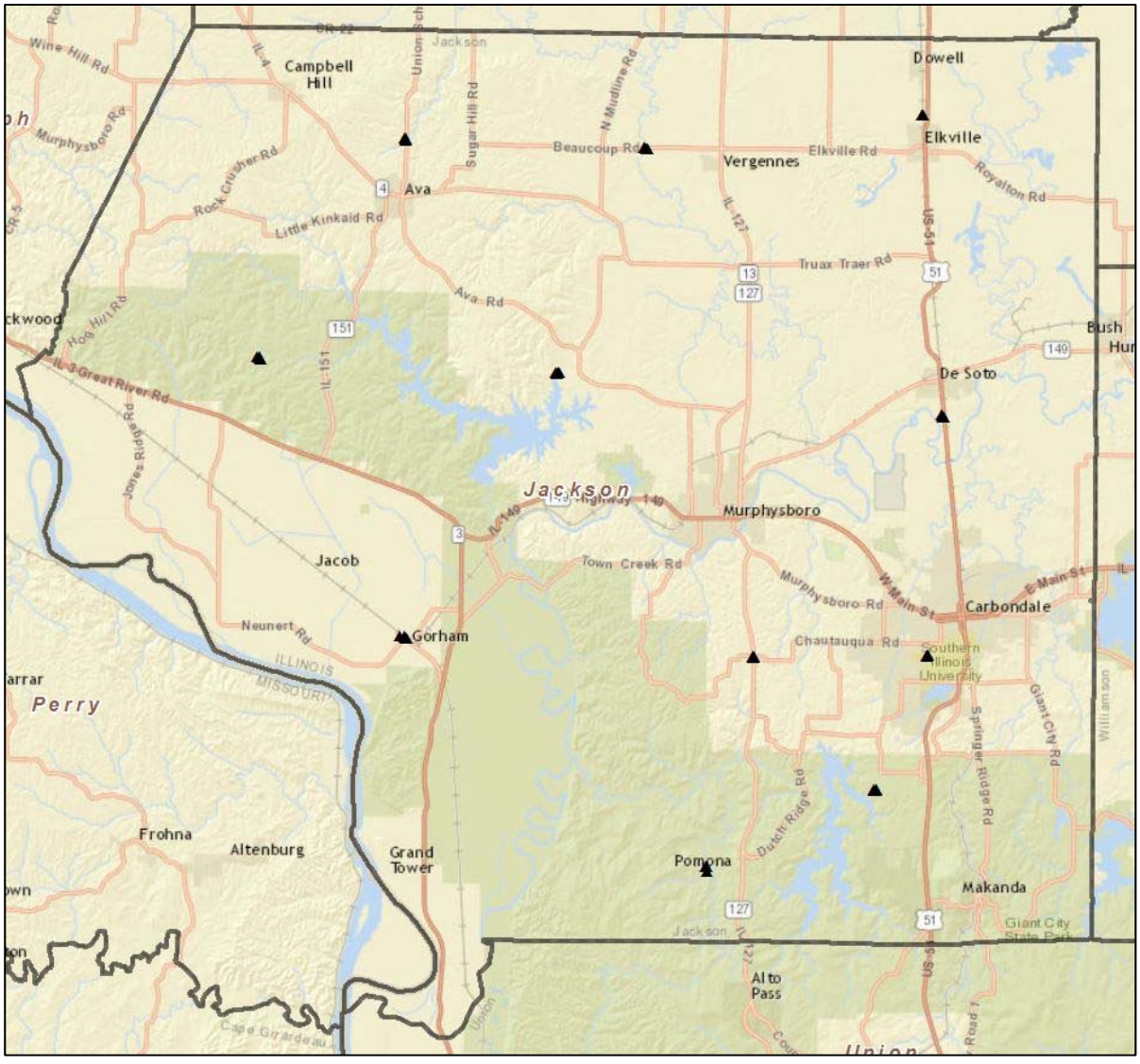


Count	42
Average	0.708
Minimum	0.217
Maximum	1.075
Sum Squares	22.131
Root mean square	0.726
Std deviation	0.162

All Units in US Feet

Jackson Co. LiDAR QC Check

An additional set of survey check points were collected over the combined Jackson/Perry Flight plan for an independent QC of the LiDAR as validated against the DEM deliverable tiles. The points were collected over the following feature types: 21 hard surface points, 21 short grass points, 20 tall grass points, 20 tree & 20 brush points for a total of 102 QC check points in the two counties. For the purpose of this report, the graphic below presents the distribution of QC check points just over Jackson County.



These points consisted of various types of ground cover including hard surface, brush, short grass, tall grass and trees. Examples of actual points surveyed in Jackson County are included below.

Brush – Jackson point 1099

Trees – Jackson Point 1094

Short Grass – Jackson point 1013

Tall Grass – Jackson point 1093

Hard Surface – Jackson point 1066

The required LiDAR elevation data values were derived within ArcGIS off 4' gsd raster grids. For each QC point location a LiDAR elevation value was derived and exported and the surface value subtracted from the survey elevation. These derived values were imported into Excel and comparisons were performed to generate statistics by ground cover type and for the overall dataset. Values reported are in US Feet due to the fact that all data was processed in IL Stateplane, NAD83, West Zone however metric equivalents are stated in some cases.

As indicated above the LiDAR DEM meets hard surface Fundamental Vertical Accuracy (FVA) project specifications of RMSEz less than or equal to 12.5 cm (0.41 feet), with an RMSEz of 6.7 cm (0.220 feet overall RMSE).

DEM QC Accuracy Results

The table below presents the results of the QC accuracy analysis for the Jackson and Perry County., IL data set derived bare-earth DEM tile data. All values are in US Feet.

Statistic	Overall	Hard Surface	Brush	Short Grass	Trees	Tall Grass
Count	102	21	20	21	20	20
RMSEz (FVA)	0.287	0.220	0.318	0.181	0.413	0.254