What's New in LP360 – 2020.1
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GeoCue Group Background

- Founded in 2003
  - Jim Meadlock, founder and 30+ year CEO of Intergraph
  - Lewis Graham, founding CEO of Z/I Imaging
- Located
  - HQ - Huntsville, Alabama USA
  - Satellite office – Toronto, Canada
- Ownership
  - Private
  - Jim, Lewis, employees, minority outside investors
- Our Focus – LIDAR and Imagery technology
  - Providing geospatial processing solutions close to the sensor
  - Providing data management solutions
  - Providing end-to-end drone mapping solutions

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What we do…

*ALS/MLS Solutions

- Terrasolid sales & support
- LP360 Point Cloud S/W
- Data Management
- Workflow consulting
- Training

30%

Drone Mapping

- True View Sensors
- Complete workflow S/W
- Cloud-hosted Data Management (Reckon)
- Direct Geopositioning H/W (Loki)
- DJI Enterprise sales
- H/W Integration
- Consulting services
- Mapping Services

50%

Enterprise Solutions

- Bespoke cloud-hosted (AWS) data processing systems
- Earth Sensor Portal – AWS LIDAR/Imagery Management
- LIDAR data modernization services

20%

*ALS/MLS – Traditional "manned" airborne and mobile laser scanning

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ALS/MLS Business Area

- GeoCue Group is the largest supplier of *Production* LIDAR tools, geospatial workflow management systems and LIDAR production consulting services in North America
- LP360 (standalone) has become the best Windows (standalone) desktop application for Point Cloud Exploitation (both LIDAR and Structure from Motion, SfM)
- LP360 for ArcGIS® is the world's most prevalent and highest performance LIDAR extension for ArcGIS®

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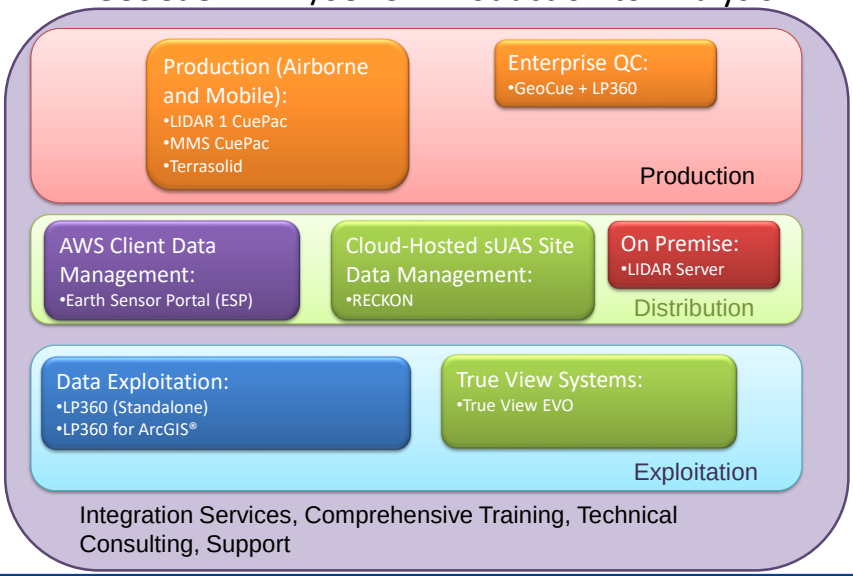
GeoCue LIDAR/sUAS – Production to Analysis



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Who uses LP360/Topolyst?

(This is a sample- we have hundreds of users around the globe)

- AECOM
- Alabama Power
- Alaska Dept. Of Fish & Game
- Alberta-Pacific Forest Industries
- Atlantic Group
- Atkins North America, Inc.
- Ayres Associates
- BNSF Railway
- Central Texas Council of Governments
- California DWR
- Caltrans
- CSX Corporation
- Defense Intelligence Agency
- Dewberry
- Fugro (multiple subsidiaries)
- Gouvernement du Quebec
- GRW
- Harris Corporation
- Iowa DNR
- Lower Colorado River Authority
- Manitoba Hydro
- McKim & Creed
- MeadWestvaco
- Ministere des Transports du Quebec
- MN DOT
- NC DOT
- Naval Research Laboratory
- NOAA/National Geodetic Survey
- Ontario Ministry of Natural Resources
- Packaging Corp. of America
- Penn State – LIDAR Training Specialty
- Quantum Spatial
- SAIC
- San Diego Zoo
- Sanborn
- Surdex
- Surveying and Mapping, Inc.
- Southwest Florida Water Management District
- Tennessee Valley Authority
- The Nature Conservancy
- TN DOT
- Tuck Mapping Solutions
- US Army Corps of Engineers (multiple Offices)
- USDA (Primary QC Acceptance tool)
- US Fish & Wildlife
- US Forest Service
- USGS (Primary QC Acceptance tool)
- Wilson & Company
- Woolpert

- Israel Ministry of Defense
- Eastdawn Corporation (China)
- Kokusai Kogyo Co., Ltd. (Production)
- PASCO (Production)
- Geosciences Australia
- Land Department, NSW
- Sydney Catchment Authority
- Spatial Information Infrastructure (Australia)
- El Salvador - Ministry of the Environment and Natural Resources (MARN)
- Pemerintah Kota DKI Jakarta
- Gobierno de Castilla La Mancha (Spain)
- Direction Regionale des Affaires Culturel (France)
- KiwiRail Holdings Ltd.
- Statoil Petroleum AS (Norway)
- City of Cape Town

100+ Universities

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Knowledge

- Knowledge base:
  - support.geocue.com
- Please join the GeoCue LinkedIn group

GeoCue Group, Inc.

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LP360 Versions

- LP360 (standalone 64-bit Windows)
  - Viewer (free)
  - Basic
  - sUAS (Advanced but limited to 4 km^2)
  - Standard
  - Advanced

- LP360 for ArcGIS® (requires Basic version of ArcMap)
  - Viewer (free if you own at least one copy of LP360 on current maintenance)
  - Basic
  - Standard
  - Advanced

- True View EVO
  - EVO Explorer
  - EVO Lite
  - EVO
  - EVO Unlimited

Your LP360 license will allow you to run either LP360 for ArcGIS or LP360 – both are delivered!

A custom version of LP360 specifically crafted for True View and Guest sensors

LP360 2020.1 is compatible with ArcGIS® 10.1 through ArcGIS 10.8

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Localizable

- Currently localized to:
  - English
  - Chinese
  - Japanese
  - Spanish
  - Polish

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New Features – LP360, LP360 for ArcGIS

- Live View:
  - Blend Classification mode - blend one or more classifications into a display mode set other than classification. Example, view LAS by RGB for all points not classified as ground
  - Manual Update mode added
  - Display by User field – great for diagnosing multibeam scanners
  - Edge of flight line Boolean filter
  - Color Band and Stretch added to Color Tab
  - Single row "radio button" select/deselect added to improve QC processing (e.g. rotate through flight lines)
- New Point Cloud Tasks (PCT):
  - Proximity Classifier PCT to classify points based on the attributes of a proximal point
  - Affine Transform LAS PCT (New home of shift/scale/rotate options formerly found on the Reproject LAS PCT)
  - Reproject LAS PCT used to transform a LAS to a new horizontal and/or vertical spatial reference system (SRS)
  - LAS Data Smoothing PCT
- New Cloud Optimized GeoTIFF output raster format
- Standard Deviation of the Mean (SDOM) and Standard Deviation (Sz) added to the Control Report dialog
- Control Report honors type for reporting
- Quick grid option added to profile properties to help quickly set Graticules properties
- Multi-threading is now used to speed up the processing of the Height Filter, Model Key Point, Low/Isolated Points, and Building (Planar) PCTs
- Modified Ground Adaptive TIN PCT to handle dense point clouds
- Added a wait and retry for license option to command line executables
- Numerous bug fixes and stability improvements

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New Features – LP360 Only

- Support for camera imagery added to Feature Analyst (currently implemented for True View sensors)
- Export QC Features and Vertices tools added to Feature Analyst
- New file types supported for Feature Import. Now supports SHP, DGN (v7 and v8), DXF, KML/KMZ, and DWG.
- New file types supported for Feature Export. Now supports SHP, DGN (v7 and v8), DXF, KML.
- New export RGB attribute option to create Red-Green-Blue raster images from colorized LAS points. Available in Point Insertion and TIN surface options.
- Display Map Grid option to overlay a simple grid on the Map View.
- TOC right-click menu "Open in Explorer" command to open the location of the layer's files in Windows Explorer
- Top of Seawall Collection Tool on the Feature Edit toolbar for collecting the top of seawalls
- Export LAS/LAZ/PRJ right-click menu in the table of contents commands
- Close Project command
- Control Report contains sensor and calibration information for a True View project
- TOC right-click Delete Files now allows deletion of all file types

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Focus of 2020.1 Update

- Improved sUAS tools
  - Improved processing of very dense point cloud data
- Data Smoothing Filter
- Improved visualization tools
- New Feature QC Export tools
- Focus on performance
  - Continued Multithreading Point Cloud Tasks
  - Rewrote some algorithms to improve dense cloud processing

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Demo - Class Modulated Visualization

Live View:

Allows superimposition of selected classes over any other display mode

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DEBIASING POINT CLOUD DATA

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The Components of RMSE

$$RMSE_Z = \sqrt{\frac{\sum_{i=1}^{N}(r_z)^2}{N}}$$

where

r_z is the vertical (z) residual

N is the number of test (check) points

$$RMSE^2 = MSE = \bar{r}^2 + s_r^2$$

where *MSE* is the Mean Square Error and:

$\bar{r}^2$ = the mean of the residuals, squared

s_r^2 = the square of the sample standard deviation (the sample variance) of the residuals

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When we can debias vertical ("Z Bump")

Standard Deviation of the Mean (SDOM) tells us how reliable is the mean:

$$\text{SDOM} = \frac{s_r}{\sqrt{N}}$$

where s_r is the standard deviation of the residuals and N is the number of check points

I argue that if $|\bar{r}|$ - SDOM > 0 then debiasing is legitimate.

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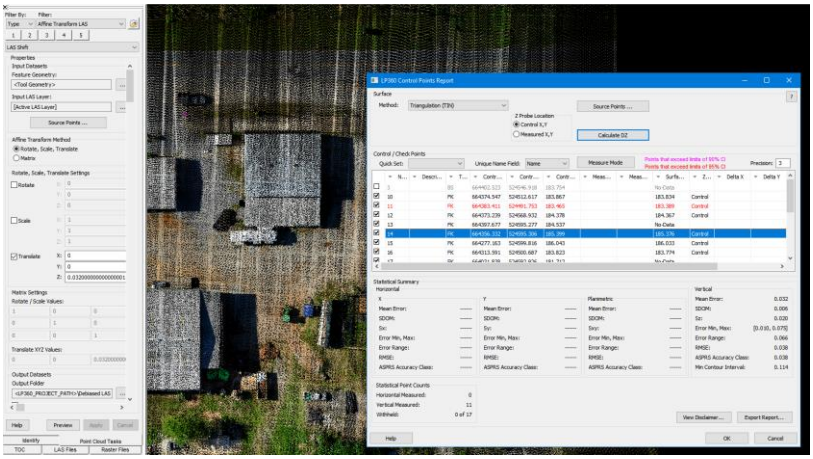
Demo - Debiasing ("Z Bump")



Shifting a point cloud in Z

- When is it OK?
- How to determine amount
- How to shift

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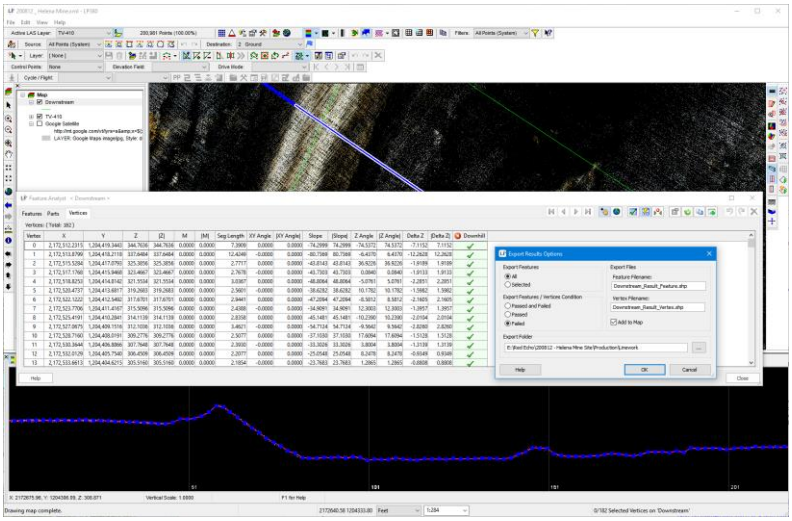
Demo - Feature QC Output



Feature Analyst QC Export

- Allows tagging of "failed" features at the vertex level
- Designed for USGS to allow transmission of defects to contractors

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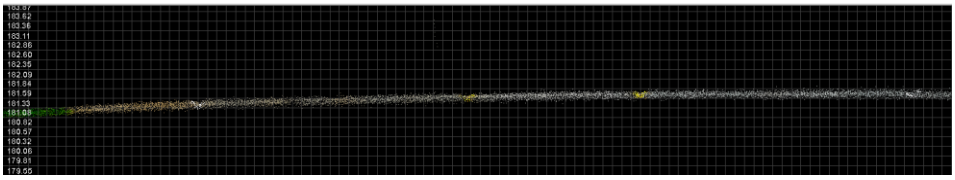
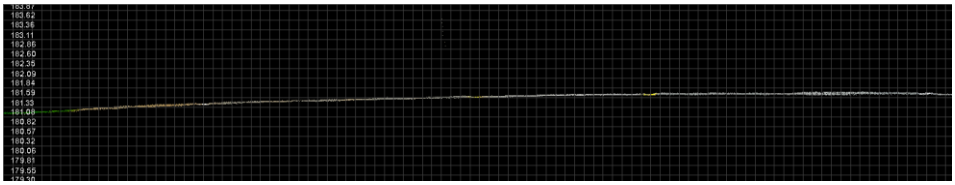
Demo - Data Smoothing



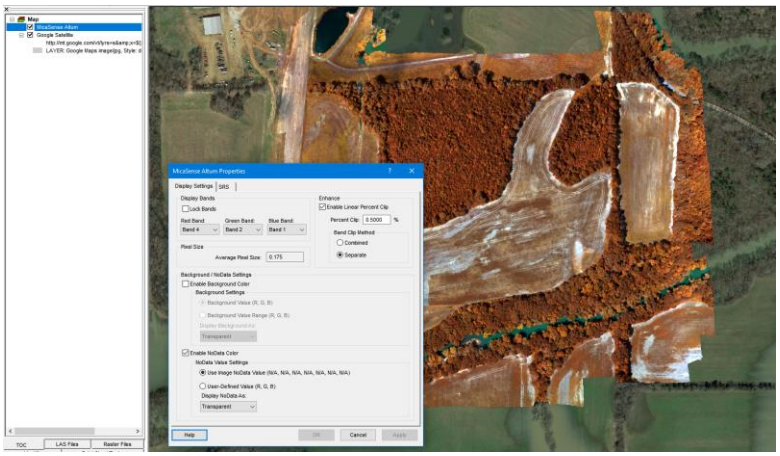
Raw drone LIDAR data



After smoothing

Reduce noise in point clouds without shifting the mean or destroying features

Demo – Improved Multiband Imagery Support



Multiband Support:

- Map N bands to R-G-B display
- Lock bands for single channel viewing
- Independent stretch for non-RGB images

Summary

- LP360 for ArcGIS® remains a *requirement* for serious point cloud work in ArcGIS®
  - We have not started a port to ArcGIS Pro as ESRI has not yet released a "deep integration" API
- LP360 (standalone) provides an immediate Return On Investment for anyone:
  - Doing large area QC
    - QC now includes vector QC!!
  - Collecting breaklines and other features from Point Cloud Data
  - Is an essential tool for anyone doing high accuracy sUAS site mapping/volumes

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