Installation, Licensing and Updates
New LP360 Experimental Release
LP360

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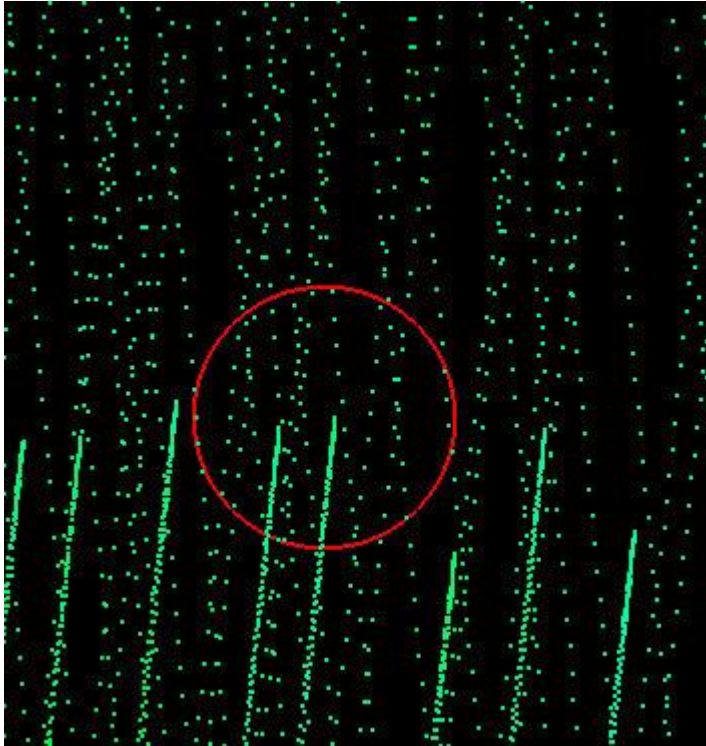
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September 2013
Revision 1.0

Both the most recent Block release of LP360 (2013.1) and the new EXP release are compatible with ArcGIS 10.2.

We have just posted a new Experimental (EXP) release of LP360. These experimental releases give customers an opportunity to take advantage of (and yes, test!) new features of LP360 prior to the official block releases. We generally plan on two block releases per year (as in 2013.1 and 2013.2) and EXP releases when we have a bundle of stable features. We may also do an EXP release to support a customer who has contracted with us to add a special feature that is needed prior to a block release.
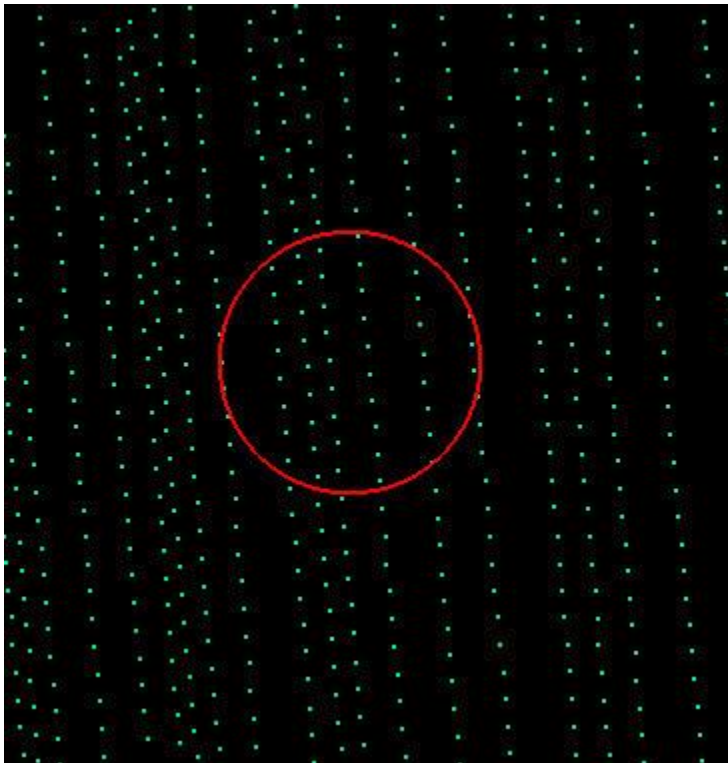
Our new EXP release (2013.2.24.0) has some exciting new features that most users will find quite valuable. In addition, this EXP release has a preview of our new Point Cloud Task (PCT) engine, a feature aimed at advanced users. All of the new features described in this article are available in all LP360 platforms (LP360 for ArcGIS®, LP360 for Windows® 32-bit and LP360 for Windows® 64-bit). The new features are available at various license levels (Basic, Standard, Advanced). I will indicate any feature that requires a licensing level above Basic.

The first group of features are aimed at all users of LP360.

- Full support for LAS 1.4. This is a very important addition since LAS 1.4 (point data record format 6 and above) supports 256 classes rather than the 32 supported in prior versions of LAS.
- Scan Angle Filter. This is a new tab (there aren't enough, right!!) on the Filter dialog. This is very useful for situations where you need to focus in on a portion of the LIDAR swath. We recently were assisting a customer who was ground classifying the data of Figure 1. Due to mission operational parameters, the point density at the edges of swaths was so high that points were literally on top of one another. The data in the red circle has about 5 times the density of that in the average area of the project. This sort of disparity in point density can cause many automated processing algorithms to behave badly. Using the Scan Angle Filter, we were able to trim the edges to achieve a more uniform density (Figure 2).

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Figure 1: Widely disparate point density

Figure 2: Data of Figure 1 clipped by Scan Angle

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- Load File dialog – We have added a completely new Load Files dialog. This dialog combines the functions of the multiple dialogs that used to pop up when loading LAS data. Additionally, the dialog provides a readout of all of the header information contained in the LAS file header. You can even export this list to Excel by pressing the Copy button and then pasting into Excel.
- Load by LAS compatibility – You may not know this, but LP360 can load LAS data that are of incompatible file types. In prior versions of LP360, we did not do a very good job of loading these data in a manner that would be truly useful (for example, we might include LAS files with 32 and 256 classes on the same data layer). In the new loading system, we sort the data by compatible groups and then load to compatible layers. We even let you add to an existing compatible layer via the standard Load Files dialog. Finally, you can drag and drop LAS files from a Windows Explorer window to the LP360 Load Files dialog. Overall, this new dialog provides a very useful enhancement to project organization.
- LP360 has been internationalized! This means that we moved all text (a huge job!) to a "resource table." The strings are Unicode, meaning they can support non-English diacritical marks and non-Latin alphabets. Localization is the process of actually translating the strings into a specific language. We are working with our good partner, Kokusai Kogyo Company (KKC) of Japan to localize to Japanese. We will add other localization as demand warrants.

The second group of features are aimed at Quality Checking (QC) of point cloud data. We have a very large group of customers who use LP360 for high-performance QC, and thus these features will be a very welcome addition. GeoCue worked closely with Dr. Al Karlin, Senior GIS Scientist at the Southwest Florida Water Management District (SWFWMD) on the quality check improvements in this release of LP360. "The vertical error between swaths is a critically important metric when considering hydrology in flat terrains," said Dr. Karlin. "LP360's tools to perform this analysis very quickly over large projects will allow us to immediately assess the relative vertical accuracy of data we receive from our vendors. This new capability really complements the already extensive QC workflows that can be achieved in LP360."

These new features are found on the Display Mode tool selector and in the Export Wizard (Select Surface and the new Surface Method called "Point Insertion"). The Display Mode settings are found on the Active Layer Properties setting dialog on the Symbology tab.

The first of these features is a method to visualize the vertical deviation of flight lines from one another in overlap regions. If you examined two overlapping flight lines at the same horizontal location over a hard, flat surface (roads work quite well), you would expect no deviation at all – after all, the same spot on the ground is being imaged in both passes.

Note in Figure 3 the dZ display in the Map View. I have set a color scheme based on four error bands with each band having a width of 0.1 meters (10 cm). Thus, areas of the image showing green have less than 10 cm deviation between swaths. Areas showing red have more than 30 cm of vertical deviation. Now, of course this is only valid on flat, horizontal surfaces with no overhead interference (again, road surfaces work great). The profile view is laid out on a north-south road (white rectangle in the Map View in Figure 3. Notice the transition from yellow-green in the south (lower) section of the rectangle to red in the upper section. Examining the profile view using the "drape by LIDAR Source" (you knew that tool existed, right?!), you can clearly see the change in vertical correspondence between the flight lines.
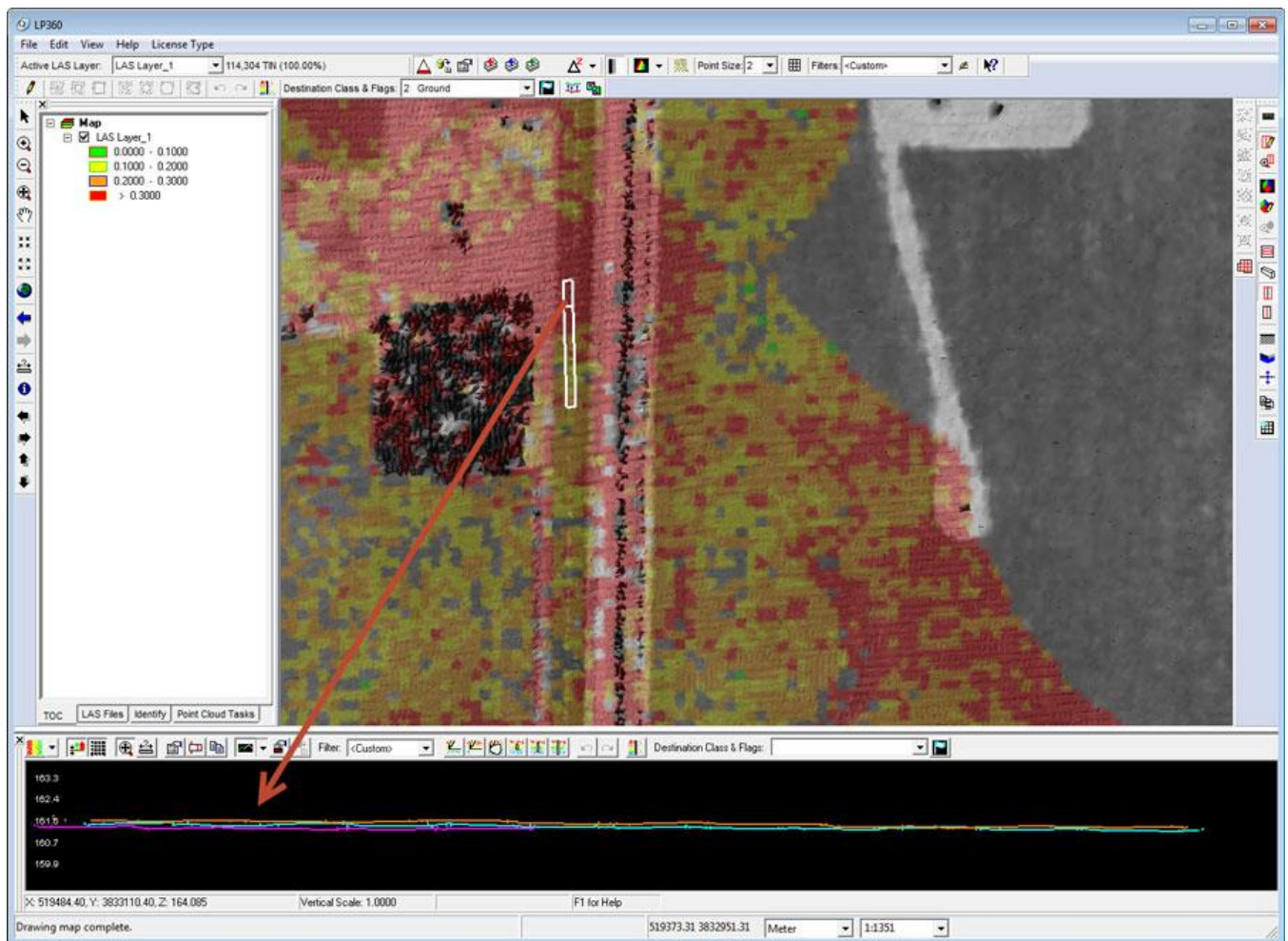
Figure 3: Dynamic dZ showing fluctuation in swath fit for overlapping flight lines

This interactive tool is useful for localized inspection. For a total project view, it is most useful to employ the new dZ image creator we have added to the Export Wizard. Figure 4 is an image that I generated for an entire county of LIDAR data (it only took 6 minutes or so to generate). This raster was then imported (we now have an "add to map" option in the Export Wizard to save you the steps of manually adding the data to the Map View) into the project and used as a back-drop raster for the LIDAR data. Note that I immediately see a void where an entire flight line was missed (blue box), as well as an obvious relative vertical accuracy problem (flight line over which I have placed the red QC annotation). I drew a profile through this area and displayed by Point Source ID. You can clearly see the vertical deviation between the flight lines.
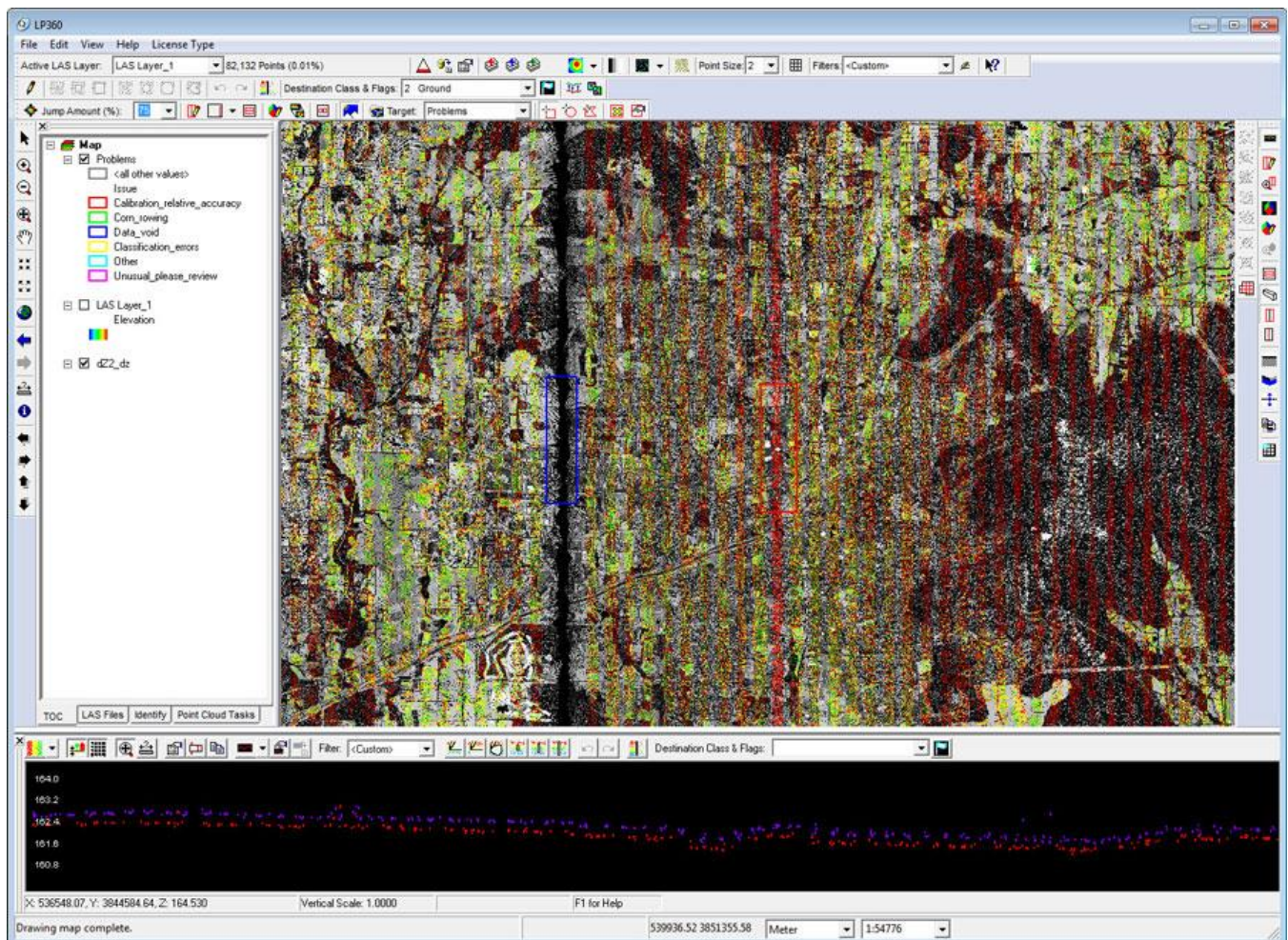
Figure 4: County-wide dZ inspection image

We have had the dZ image generation capability within our GeoCue production software for years. Now we bring this very powerful analysis tool to the exploitation desktop. This tool is a new "must have" for folks doing LIDAR acceptance QC. It is imperative to find these geometric accuracy errors right at the start of QC, since it is not practical to try to fix these in the exploitation phase of a workflow. They nearly always require the attention of the LIDAR acquisition/primarily processing contractor. Of course, the relative error inspection is followed by absolute error analysis using the existing LP360 Control Point reporting tools.

The second major QC tool we have added is a "Display by Point Density" viewing mode and the associated Export Wizard tool to generate a map colorized by point density. As with dZ, the display mode is useful for close-in inspection, whereas the exported image mode is useful for synoptic analysis and external reporting (just include the image in a Word or PowerPoint document). Figure 5 depicts a density map of the LIDAR tile with uncropped scan angle. The threshold for good ("green") has been set to 60 points/m2 with the cell (grid) size set to 10 m. Notice the poor distribution of point density in this data tile.
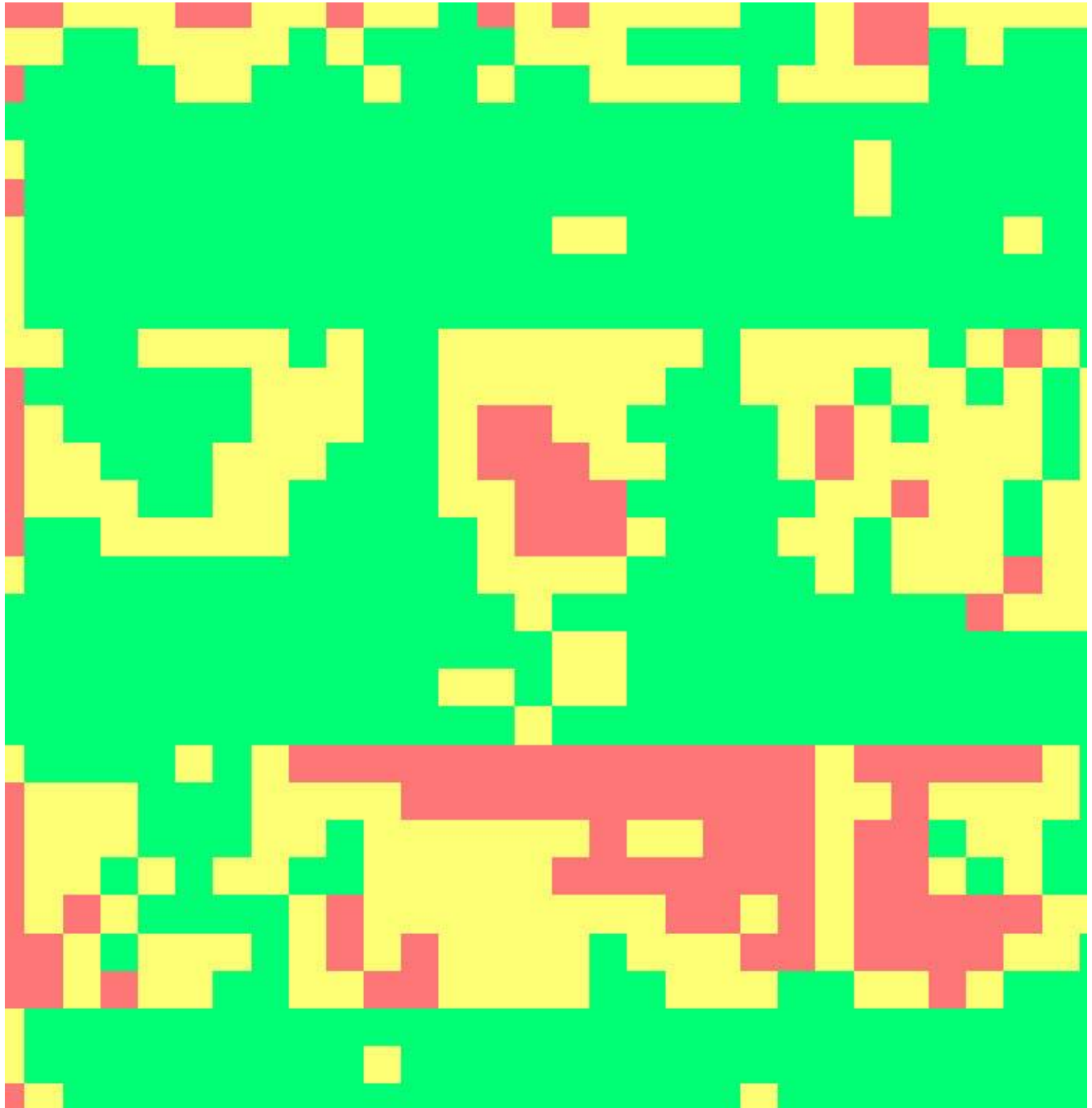
Figure 5: A density image with green at 60 points/m2

Again, this is a very valuable QC tool. Note that you have full access to the points filter for both dZ and density (ρ) so you can run scenarios such as Ground, Last Return and so forth.

The final set of features in the new Experimental Release are aimed at advanced analysis. We are in the process of completely rewriting the Point Cloud Task (PCT) system within LP360. The main reason for this rewrite is that in the previous versions of LP360, Point Cloud Tasks that needed to pass a feature file

from the output of one task to be used as the input of a second task (a feature passing Macro, if you will) could not be realized. We have been adding a volumetric computation PCT, primarily aimed at a very useful mode for point clouds derived by dense image matching from micro-Unmanned Aerial Vehicles. We wanted this to flow, in a single Macro PCT (this is a stockpile volume example but others are supported) as:

1. Digitize the base of the stockpile directly from an LP360 digitizing tool. This allows you to skip the "Create Feature Class" workflow of ArcGIS®.
2. Have LP360 automatically collect the Z (elevation) value for the base. We leveraged the standard LP360 Conflation tool, so this has the same computational option as those used in breakline tools and the toolbar version of Conflate (although we have added the ability for you to just set a constant Z).
3. Have the Volumetrics task automatically input the feature created in the prior step, compute the volume between the point cloud points and the 3D base and output results.
4. The output results (any of the base polygon, the volumetric analysis polygon and a Cut & Fill raster image) are created and, optionally, automatically added to the Map View.

I am pleased to say that the EXP version contains a beta implementation of the above. I find it quite slick. Once I have created the Volumetrics Macro and set the parameters, I can simply digitize polygon after polygon (using the new digitize tools on the PCT toolbar) and have my results pop into the Map View. I can also "chain digitize and conflate" points, lines and polygons. We often use LIDAR data for "poor man's" control in some of our photogrammetry experiments. We can now simply set up a PCT Conflate task and digitize points using the new Points tool on the PCT toolbar. Voila! 3D points pop into LP360 as they are digitized. Very powerful stuff!!! Most of the new PCT tools will be licensed at the Standard level. Several of the Volumetrics tasks will require an Advanced license (licensing will not be enforced until the next EXP release so Basic users have some time to play).

A separate tutorial will be created for the new Point Cloud Tasks (and PCT engine) we have added to LP360. I think you are going to find the overall operation of Point Cloud Tasks much improved in this EXP release.

I think you will agree that your maintenance dollars are being wisely used to add incredible new features to the LP360 family!