Merging LAS Data from Different Sources/Layers

For information on this CueTip™, contact:
Martin Flood
GeoCue Corporation
9668 Madison Blvd., Suite 101
Madison, AL 35758
mflood@geocue.com
01-519-590-8291

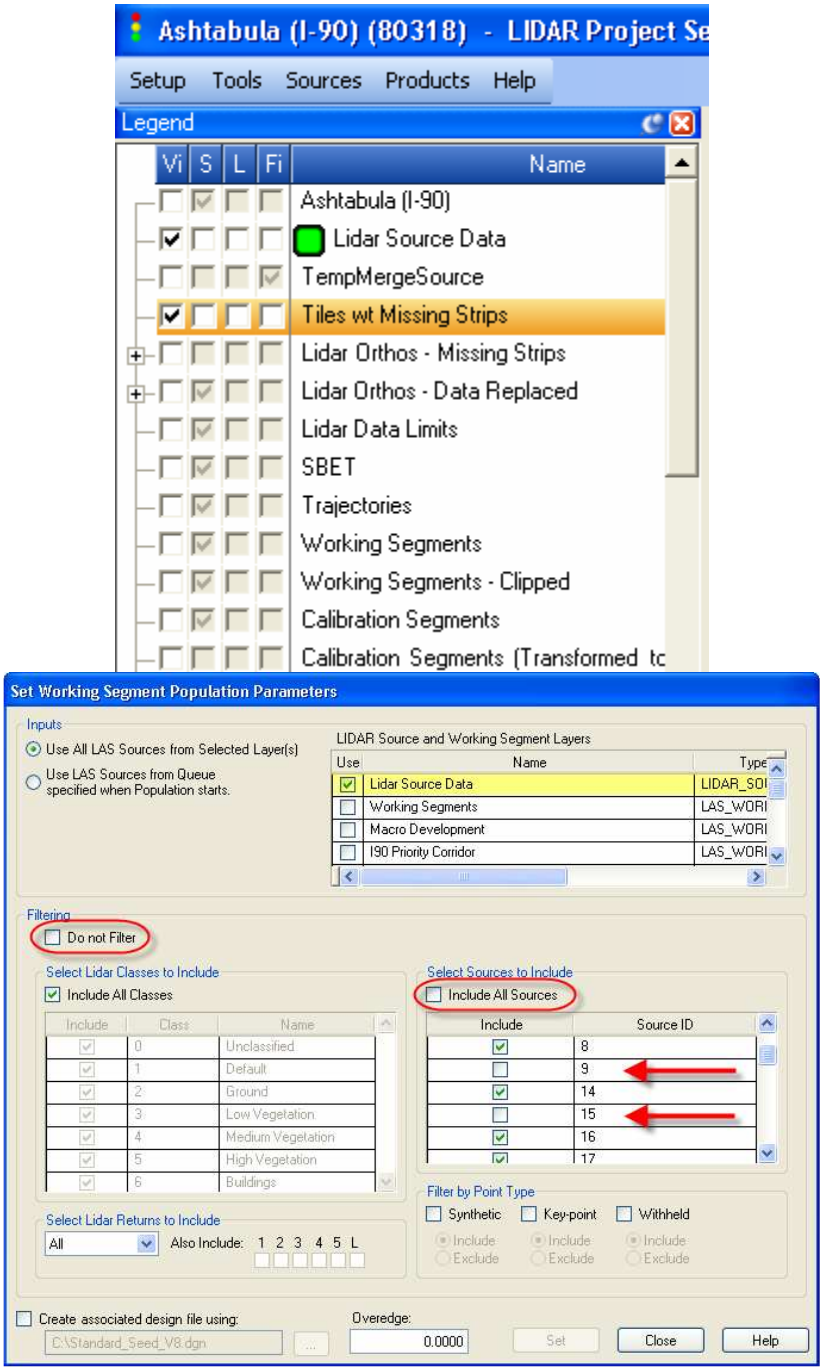
Purpose:

This note describes the procedure for using GeoCue's 'Merge' command to combine LAS data from different layers or different data sources without having to repopulate working segments from the original source data. This procedure preserves any existing work – e.g. ground classification or building extraction – that has already been done on the target layer. It is often used to …

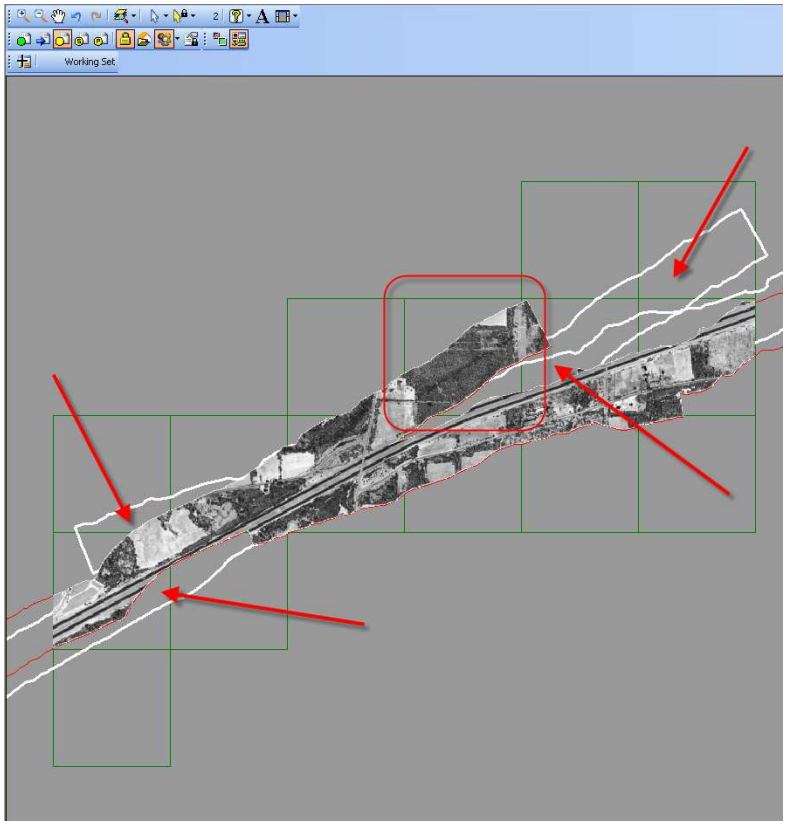
1. Merge data from a new flight line into an existing data set to fill gaps.

2. Extract data from an existing layer, excluding any data from flight lines that have been designated as 'Poor'.

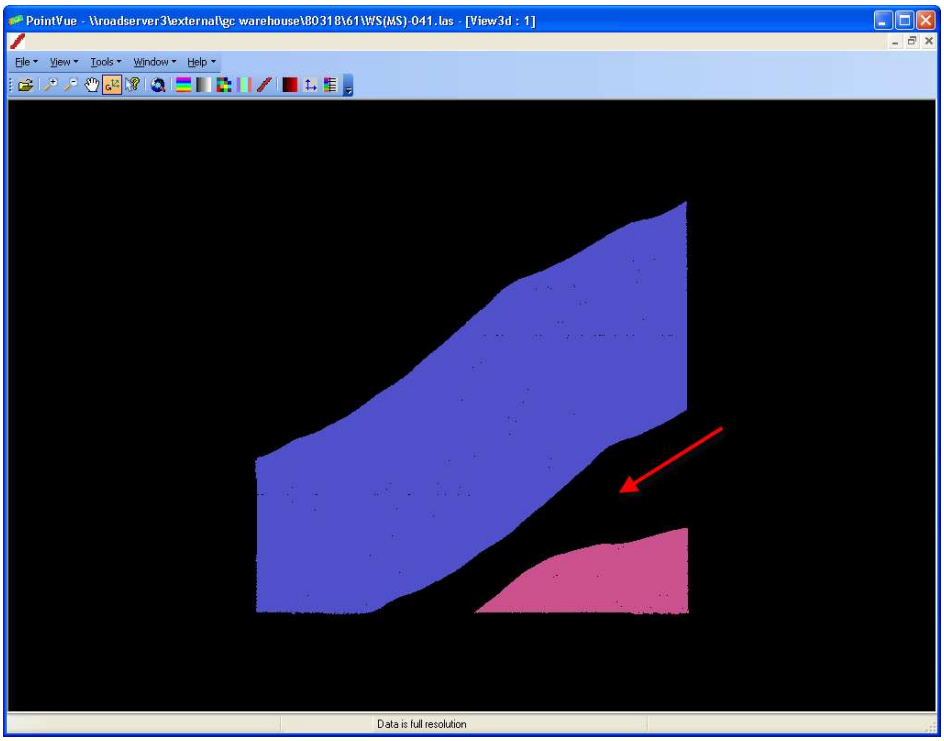
    A. For the purpose of this example, we are going to use the Ashtabula data set used during installation and training. To create a suitable example, we have created LAS working segments from the lidar source data, but deliberately 'missed' two flight lines when populating the working segments. This was accomplished by simply filtering those sources out of the population parameters we set for each segment, in this case omitting lines #9 and #15. We've placed these segments on a layer called "Tiles wt Missing Strips":



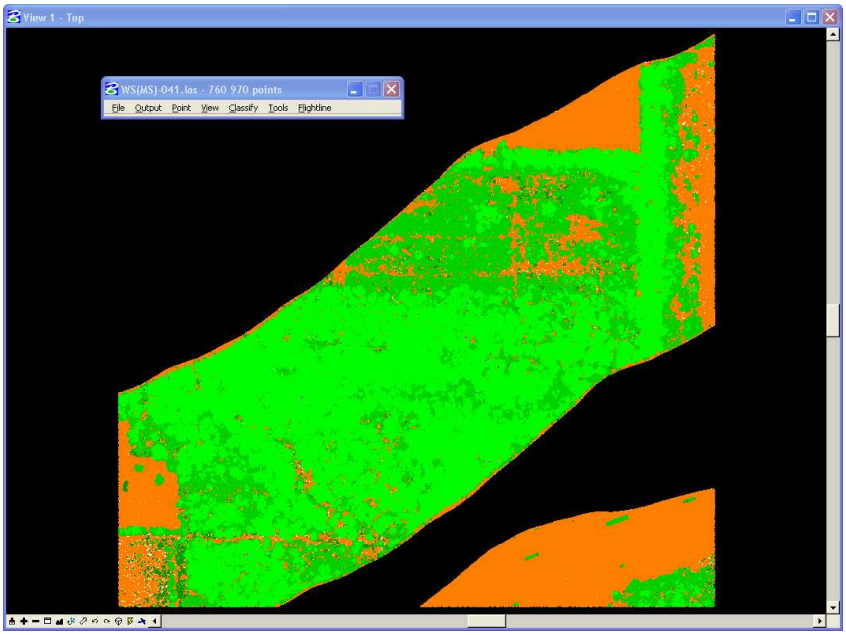
B. We populated the working segments on this layer and generated intensity ortho images to verify that we were indeed 'missing' data from two strips:



C. This missing data is perhaps most noticeable by examining the circled working segment in PointVue, viewed by flight line:

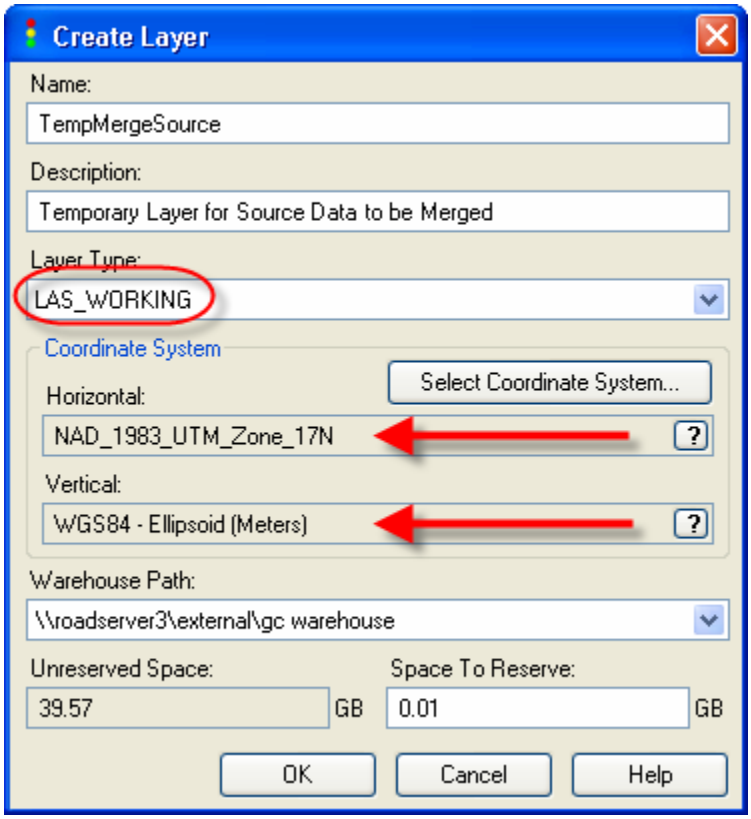


D. If this gap were noticed immediately, simply repopulating from the source data would resolve the problem. However, the missing data or gap may not always be noticed right away or the gap itself may result from the user deliberately omitting a bad flight line that is then later re-flown. Or it may be an actual gap in the data coverage. In all cases it is useful to be able to merge new source data into the existing working segment without having to repopulate the entire segment. This is especially useful if the segment has already had further work done on it, for example ground classification. To help demonstrate this later, we went ahead and classified the points in this particular block;

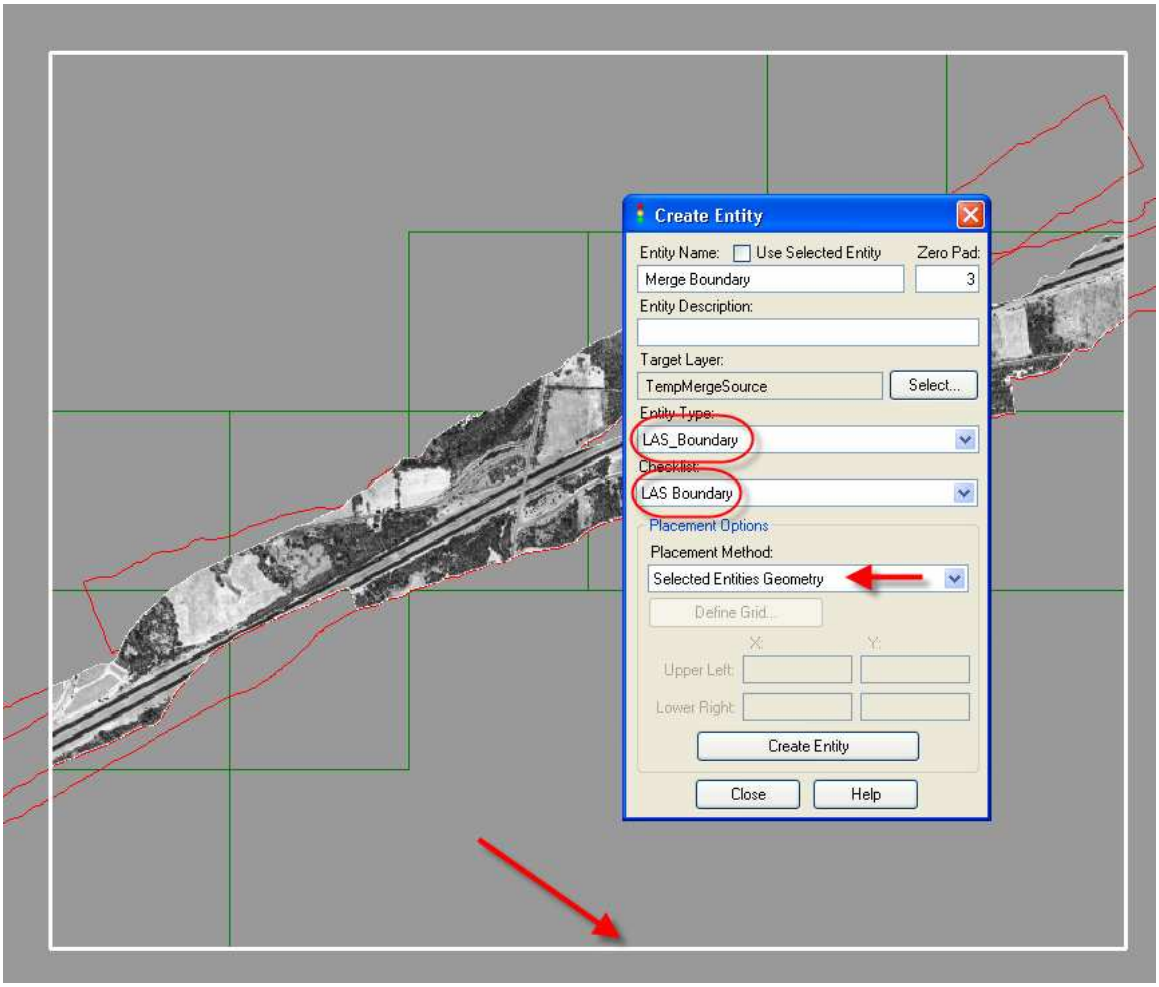


E. We will now use the GeoCue 'Merge' command to merge data from the 'missing' flight lines into the existing working segments. In general a 'Merge' is done by creating a merge boundary, of type LAS_Boundary, associating the working segments we want to merge 'from' with this boundary, and then designating the working segment layer we want to merge 'into' as the target layer. We can apply various filters, such as by Source or by Class, along the way to make sure we are only merging the data we want to. We can also merge from multiple source layers and assign a priority to each layer so that the 'best' data will be used in areas of overlap. This approach is very flexible and there are several methods to achieve the same result.

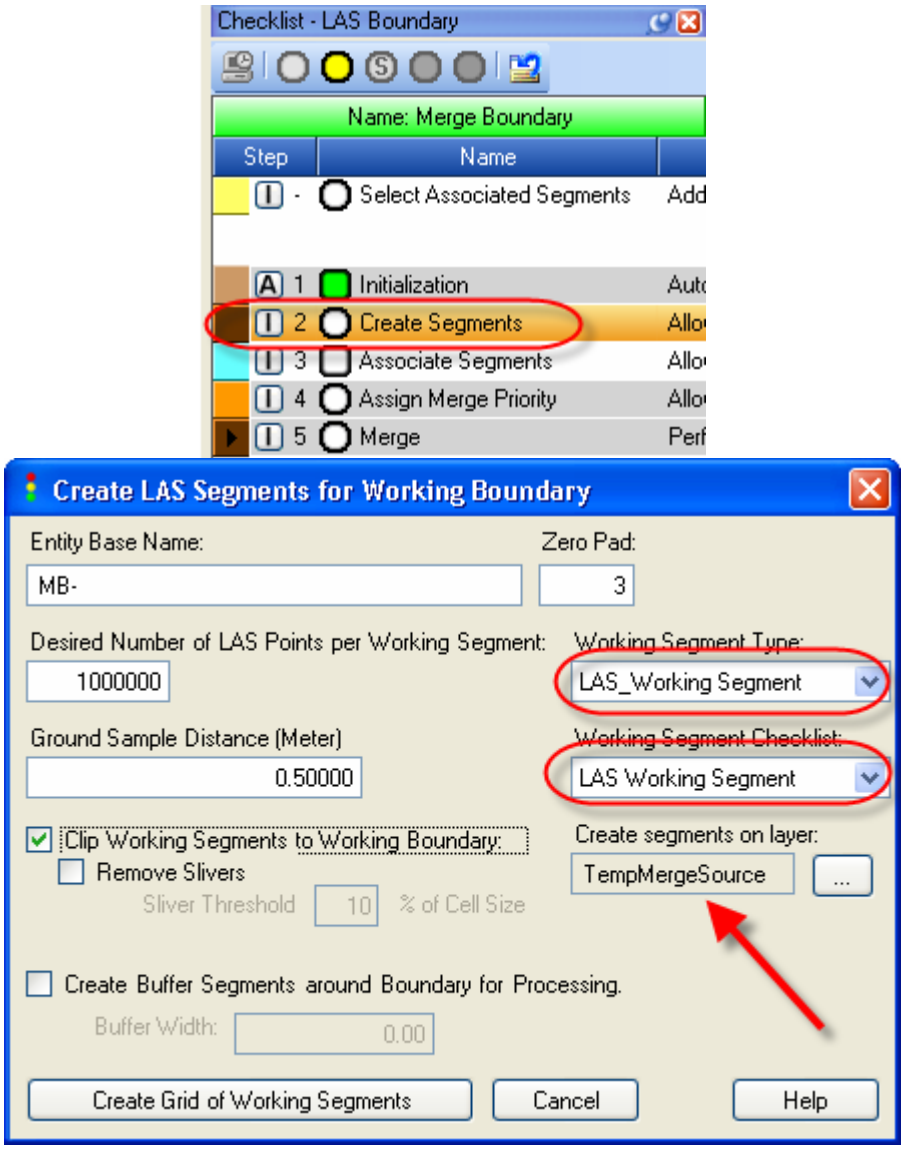
F. In this example, missing flight line data, the best approach is to create a temporary merge layer and a temporary merge boundary that covers the area with the missing source data. The temporary layer should be an LAS_Working layer and have the same coordinate system as the working segment layer we are going to merge the data with:



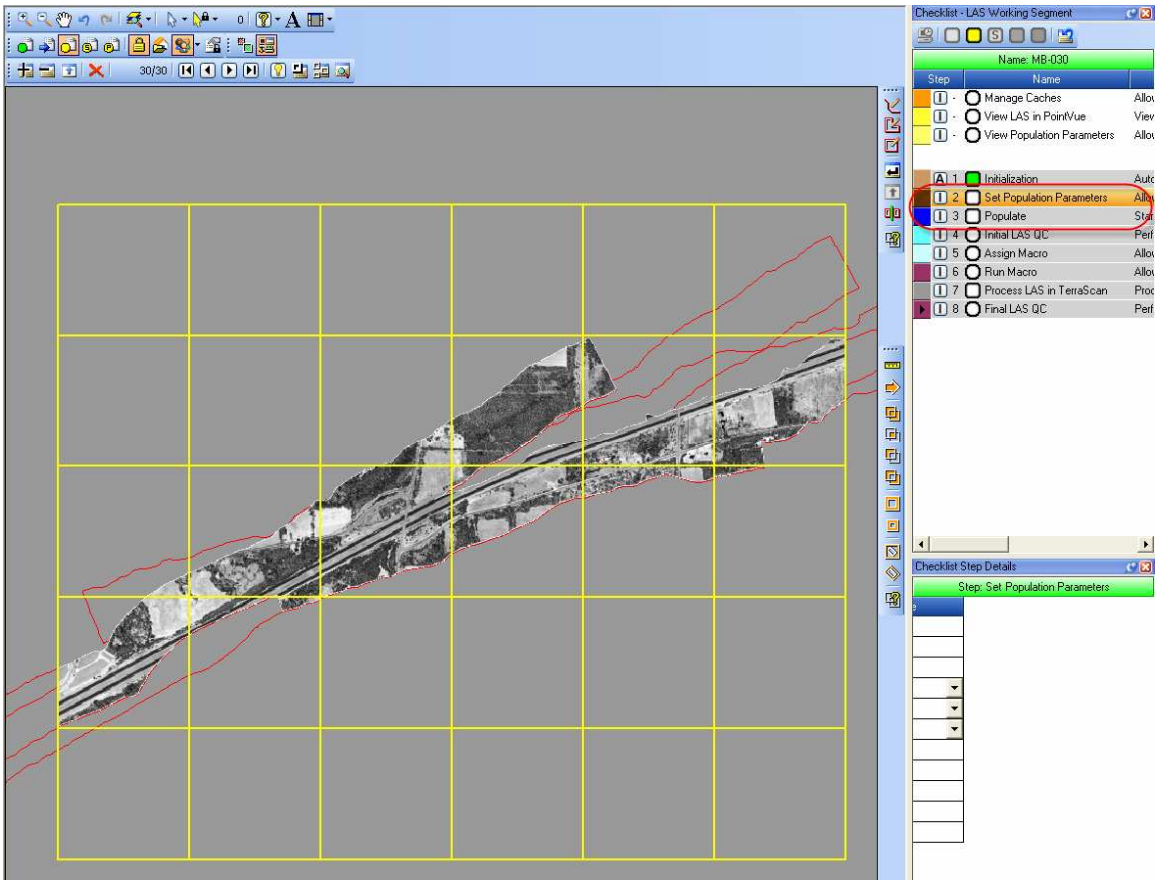
G. A merge boundary can be any desired shape that covers the area over which we want to merge data. If, for example we had a single missing flight line, we could use the footprint of the strip as the merge boundary. Since in this example we have two missing sources and a central area of interest, we will simply use a bounding rectangle. Note that the merge boundary needs to be assigned an entity type of LAS_Boundary and a checklist of LAS Boundary:

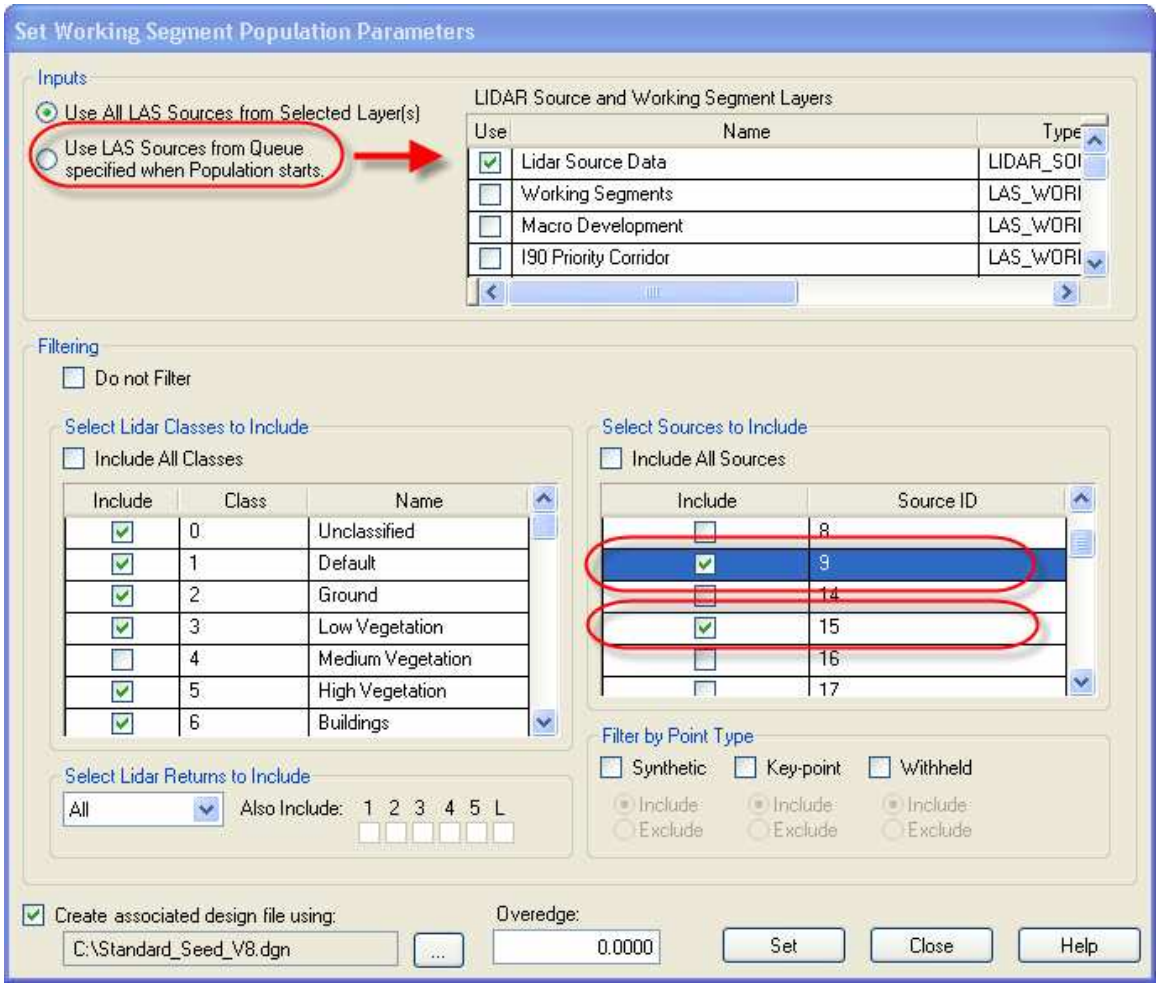


H. We next need to create working segments on our temporary layer that we will populate from the missing source data prior to merging them with our actual working segments. These temporary working segments can be created using any of the normal methods or directly from the LAS Boundary checklist step 'Create Segments' using the automated gridding tool, which is the approach we will use for this example:



I. This created a grid of 30 tiles covering our area of interest. We will now populate these temporary working segments using only the 'missing' source data:

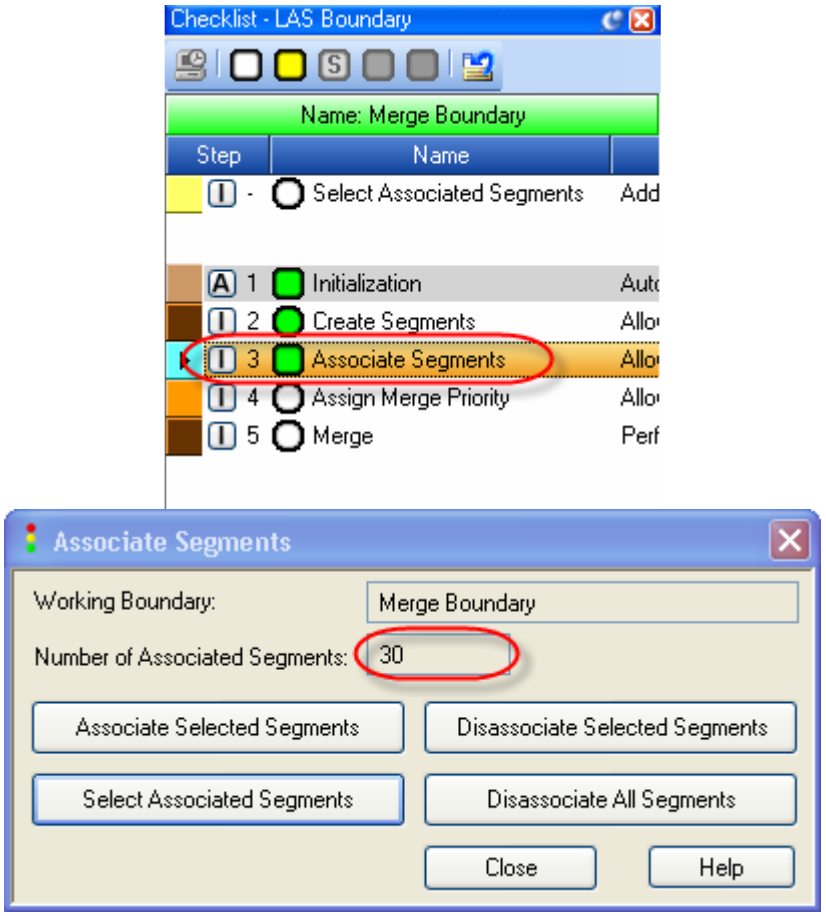




J. Notice that we used the "Use All LAS Sources" option, selected our original Lidar Source Data and then filtered by 'Select Sources to Include'. An alternative approach would be to use the "Use LAS Sources from Queue" method, place the missing strips in a named queue and then specify that queue when running the populate process.

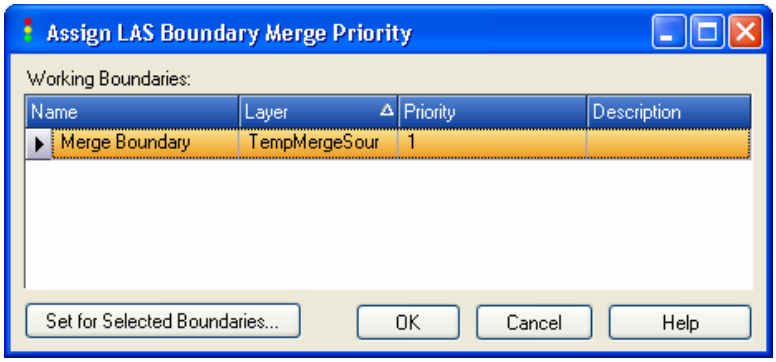
K. When merging LAS data from various sources, it is important to make sure the working segments we are going to merge 'from' are associated with the merge boundary we are going to use. Because in this example we generated our temporary working segments directly from the LAS Boundary checklist, they are automatically associated with the same boundary. If, instead, we had created our temporary working segments via the manual Create Entity dialog, or if we wished to merge existing working segments together, we would instead need to create the proper association to the boundary we will use. This is done via the 'Associate

Segments' step of the LAS Boundary checklist and the corresponding Associate Segments dialog:

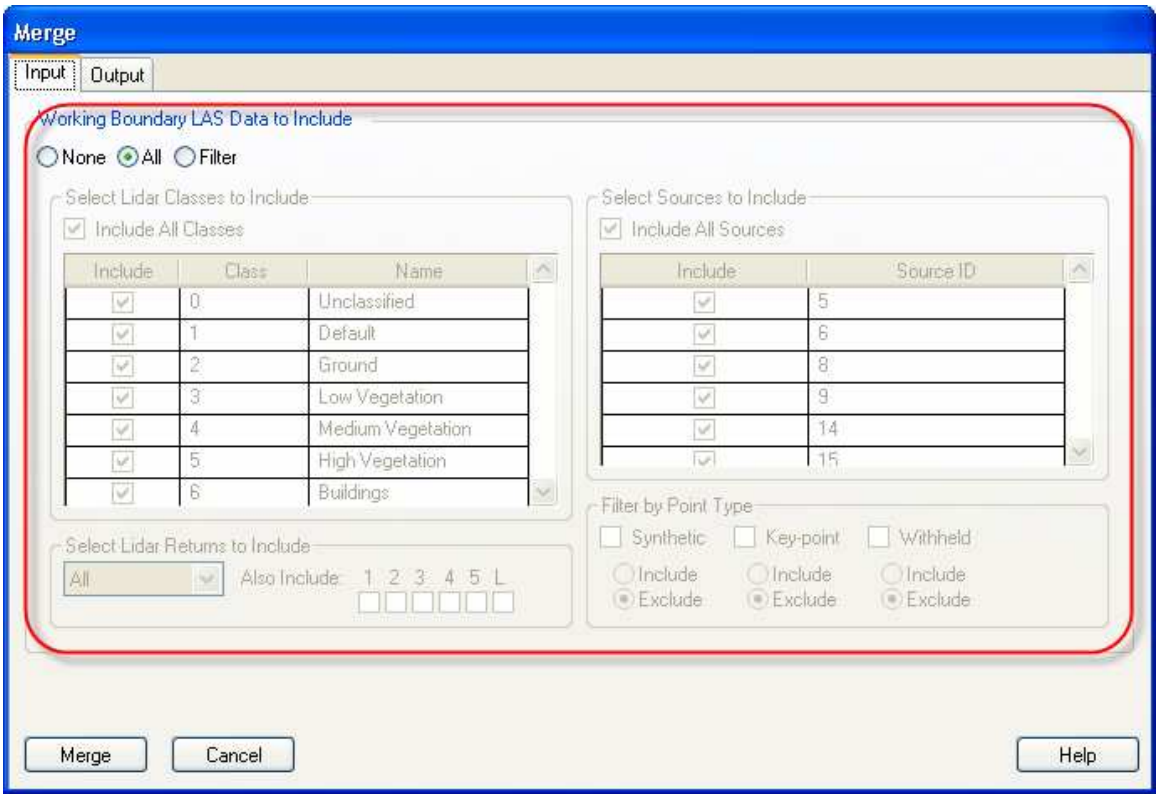


L. In this case our 30 temporary working segments are already associated with the Merge Boundary we created earlier, so there is no need to proceed any further with this dialog.

M. The next step is to merge data inside our boundary, via its associated working segments, into our existing working segments layer 'Tiles wt Missing Strips'. This will copy the LAS data from the temporary merge layer (remember this was populated from our two missing flight strips) into the existing working segments layer. Note that we could use the optional 'Assign Merge Priority' step to allocate priorities between different boundaries. This can be useful when merging multiple layers together and we want to give priority to one layer over another.

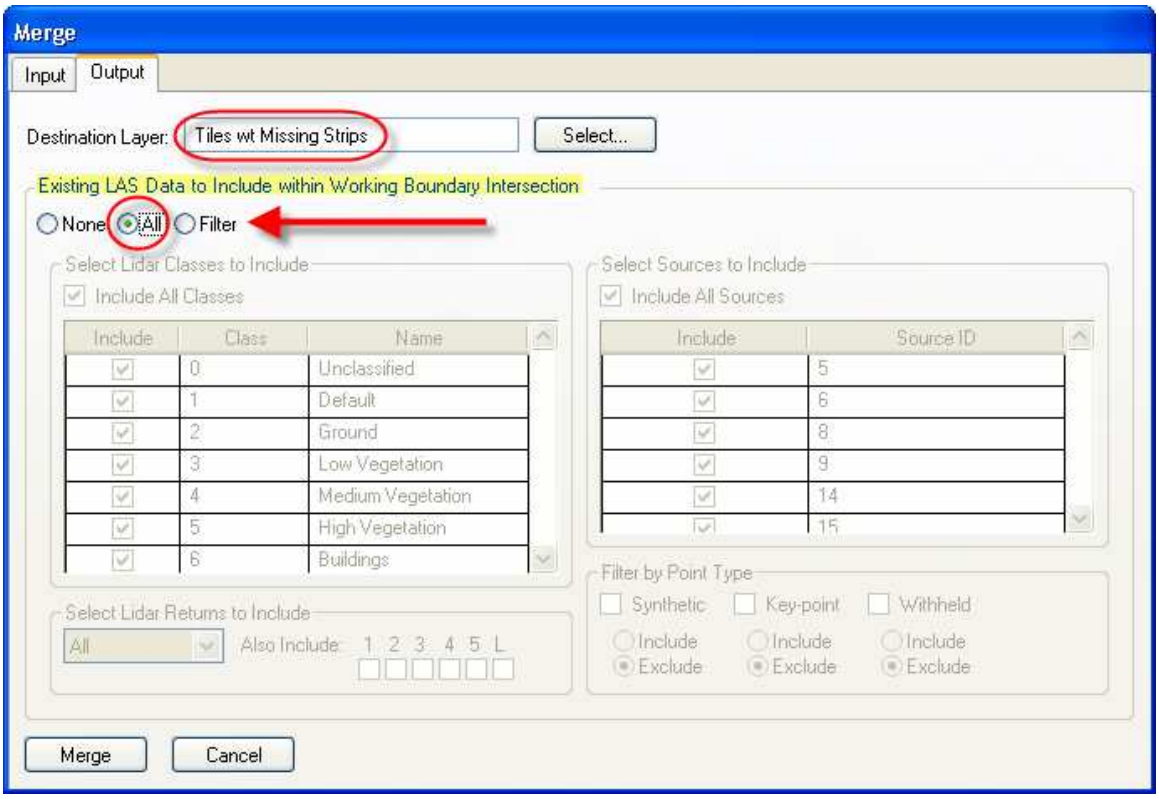


N. Selecting the 'Merge' checklist step of the LAS Boundary checklist presents us with the Merge dialog, which has two tabs; Input and Output. The Input tab lets us specify any filtering we want to apply to the input data (in this case the data from the two 'missing' flight lines that we used to populate our temporary working segments) by Class or by Source. For this example we don't need to filter anything out so we will include "All":



O. The Output tab lets us set the layer we are going to merge the data into; in this case the "Tiles wt Missing Strips" layer. We can also filter what data to keep in the existing tiles. This parameter is important to set properly. There can be examples where we might want to actually delete some of

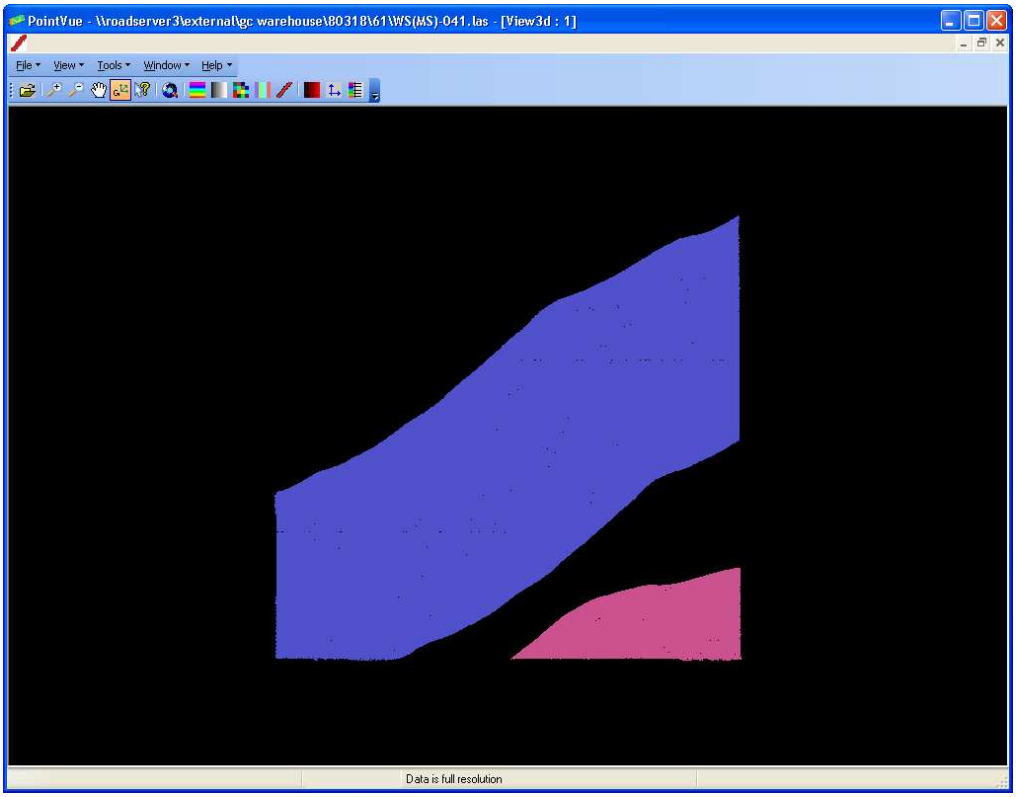
the data from the segments we are merging with. An example would be if we had a bad flight line X, re-flew the flight line as Y and now wanted to merge the Y data into all working segments at the same time as we deleted all X data. We could also filter on Class, to say, remove all X data that has been classified as ground, but leave the rest of the X data. However, for this example we want to keep all data in the existing segments (we are filling gaps, so all existing data is 'good') so we need to set to "All".



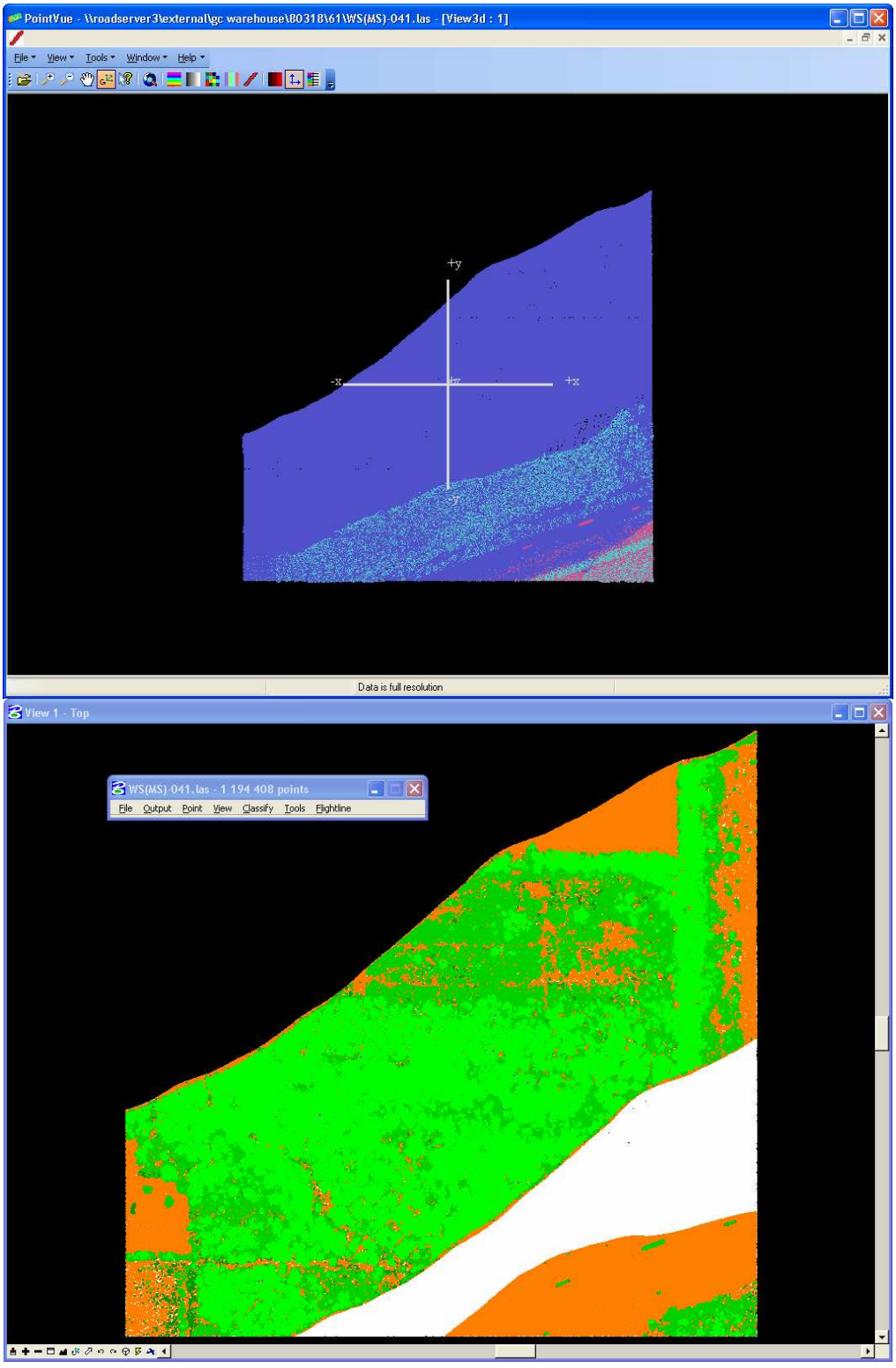
P. Once we have set the Input and Output options, we can have GeoCue process the 'Merge'. GeoCue will copy LAS data, filtered as indicated, from the working segments associated with the boundary (or boundaries) we specified, to the working segments on the target layer. It will keep existing data on the target layer as specified on the Output tab and create a single, new LAS file for each working segment on the target layer that includes all the merged data.

Q. In our example the actual merge process took about 1 minute. We can verify the results by returning to the sample tile we circled above on our "Tiles wt Missing Strips" layer to verify (a) the missing flight line data has been filled in, and (b) the original data is still classified and the new data is unclassified:

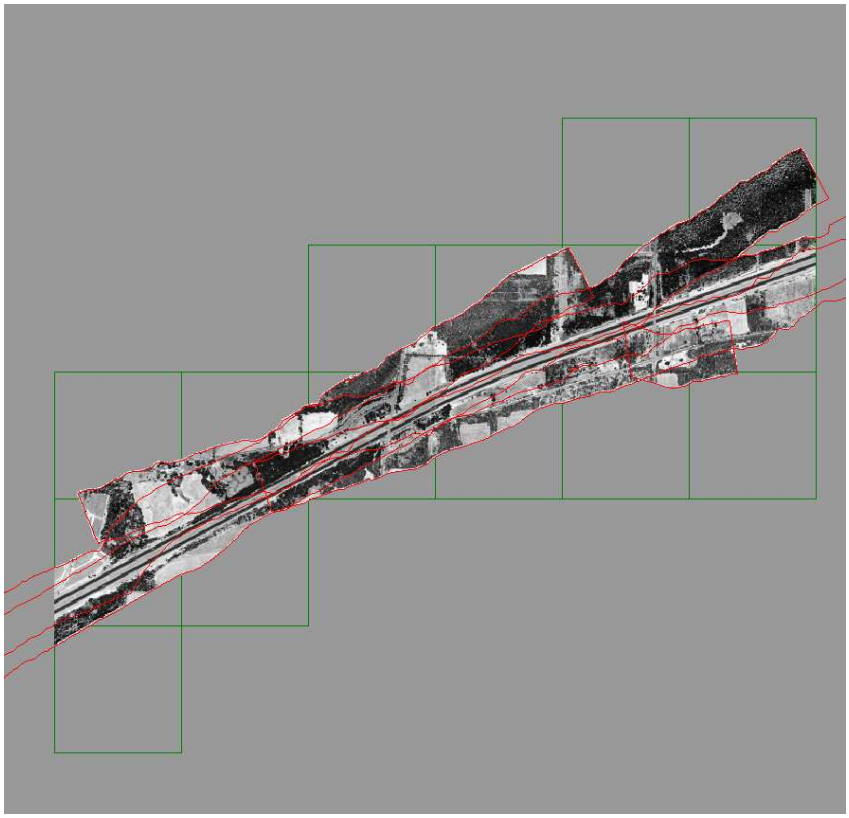
Before:



After:



R. We can also regenerate the intensity ortho images to make sure we have full coverage:



S. As a final step, we can delete the TempMergeSource layer and its corresponding working segments to save disk space. We could also keep this layer if we felt we might need to redo this merge process at some future date. Of course, we would also have to go back and classify the new merged data, assuming, as in this example, the new data was unclassified.

If you have any difficulties or questions in implementing this CueTip, please do not hesitate to contact me or one of the other GeoCue staff.