

EXERCISE 2

Convert Bare Earth Grids into a FUSION DTM Format

```
C:\Users\ericrounds>ascii2dtm
ASCII2DTM v1.30 <FUSION v3.60> <Built on Oct 6 2016 08:43:46> DEBUG
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Converts an ASCII raster surface model into the PLANS format used by FUSION

Syntax: ASCII2DTM [switches] surfacefile xyunits zunits coordsys
                                zone horizdatum vertdatum gridfile
surfacefile  Name for output surface file <stored in PLANS DTM format
              with .dtm extension>
xyunits      Units for LIDAR data XY <M for meters or F for feet>
zunits       Units for LIDAR data elevations <M for meters or F for feet>
coordsys     Coordinate system for LIDAR data:
              0 for unknown
              1 for UTM
              2 for state plane>
zone         Coordinate system zone for LIDAR data <0 for unknown>
horizdatum   Horizontal datum:
              0 for unknown
              1 for NAD27
              2 for NAD83
vertdatum    Vertical datum:
              0 for unknown
              1 for NGVD29
              2 for NAVD88
              3 for GRS80
gridfile     Name of the ASCII grid file containing surface data...
              file must be ESRI ASCII raster format

Switches:
Switches are preceded by a "/". If a switch has multiple parameters after
the ":", they should be separated by a single comma with no spaces before
or after the comma.
```

Introduction

In order to produce canopy metrics with the AreaProcessor, a digital elevation model (DEM) is needed. Vendors will generally produce the DEM and deliver it to their client in an Arc Grid or similar format (e.g., TIFF or IMG). To work with the data in FUSION, you will need to convert that file type to a .dtm, which requires two conversions; the first is from Grid to ASCII in ArcMap, and the second is from ASCII to DTM in FUSION. This workflow is the same whether your data is in Arc Grid, TIFF or IMG format.

Objectives

- The objective of this exercise is to convert an ArcGIS bare earth grid (vendor deliverables) into a DTM format that works in FUSION.

Prerequisites

- Completion of Lidar Point Cloud Processing Exercise 1.
- Familiarity with FUSION.



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Part 1: Convert Bare Earth Grids into ASCII format

A digital elevation model (DEM) in the .dtm file format is required to complete various tasks in FUSION. It is important to note that there is a difference between a DTM and a .dtm file type. Typically, a digital elevation model (DEM) and a digital terrain model (DTM) are the same thing; they represent the bare Earth surface. A .dtm, however, refers to a specific file type that is primarily used only in FUSION. A few of the uses of .dtm formatted elevation data are listed below.

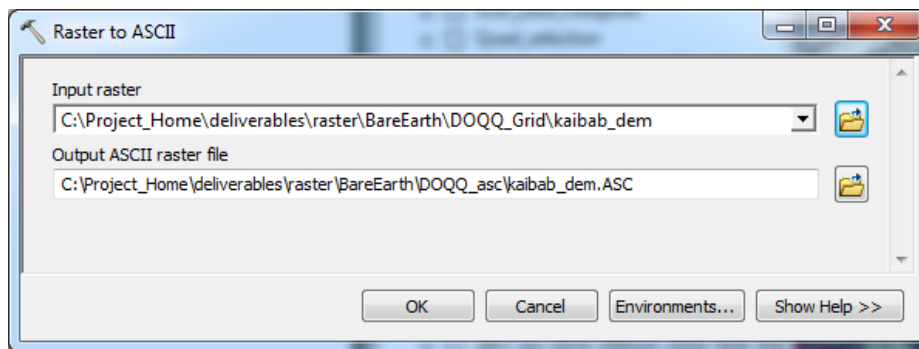
- The DEM is used to display the ground surface beneath the point cloud.
- The DEM is used to normalize the point cloud to heights above ground (normalize the topography so you can compare tree heights).
- The DEM is used as input in any FUSION utility that requires a normalization of the point cloud.

The DEM provided in this exercise is in Arc Grid format, and you will have to use a tool in ArcMap to perform the first data conversion.

A. Raster to ASCII in ArcMap

The first step of this process is to convert the Arc grid raster to an ASCII file in ArcMap.

1. Open **ArcMap**.
2. In **ArcToolbox**, select **Conversion Tools, From Raster**, and then **Raster to ASCII**.
3. To select the **Input raster** in the Raster to ASCII dialog box, click the folder icon and navigate to `\Project_Home\deliverables\raster\BareEarth\doqq-grid` and Select **kaibab_dem**.
4. To designate your Output ASCII file, navigate to:
`\Project_Home\deliverables\raster\BareEarth\doqq-asc` and name the file **kaibab_dem.asc**.
Don't forget to change the **Save as type** to **File (*.ASC)**.
5. Ensure the Raster to ASCII dialog looks like the below image, then click **OK**.



6. When the conversion process finishes, close ArcMap.

Part 2: Use the ASCII2DTM utility in FUSION

Now that we have our bare earth data in an ASCII format, we can use the ASCII2DTM FUSION utility to complete our second conversion.

A. Convert ASCII to DTM format

1. Open a Command Prompt by navigating to the search bar in the lower left-hand corner and typing **cmd**
2. Type **ascii2dtm** and press **Enter**
3. Please take a moment to briefly review the syntax and description information that appears.

Note: If you type in ASCII2DTM in the command prompt and do not see the syntax and description information for the ASCII2DTM utility, your environmental variables are not set up properly. Refer to Part 2 of Exercise 1 for instructions on how to properly set up the FUSION environmental variable for your computer.

4. It is also recommended that you review the FUSION manual for a better understanding of the **ascii2dtm** utility.

Note: for each tool, the FUSION manual provides an example of how to use the utility, often with multiple examples that show how to properly use the available switches. You can find these examples at the end of each tool-specific section.

5. We will use a batch file to facilitate the workflow and run the **ascii2dtm** utility. In Windows Explorer, navigate to **\Project_Home\processing**, right-click on **DoAsciiBE2Dtm.bat** and select **Edit** (or **Edit with Notepad++** if you have it installed). **DoAsciiBE2Dtm.bat** should now be loaded in Notepad. Alternatively, you can load it in your preferred text editor.
6. Let's briefly inspect the batch file structure and scripts, as seen in the following graphic (displayed in Notepad++).

```

1 md \Project_Home\deliverables\raster\BareEarth\doqq-dtm
2
3 cd \Project_Home\deliverables\raster\BareEarth\doqq-dtm
4
5 ascii2dtm kaibab_dem.dtm M M 1 12 2 2 \Project_Home\deliverables\raster\BareEarth\doqq_asc\kaibab_dem.asc
6
7 cd \Project_Home\processing

```

- i. Again, we create an output directory:
\Project_Home\deliverables\raster\BareEarth\doqq-dtm in line 1 with the DOS **md** (make directory) command. In line 3, we use the **cd** (change directory) command to designate the new directory as the working directory. This will allow us to simplify our script since we won't have to type out the .dtm output file path.
- ii. On **line 5**, you have the **ascii2dtm** command. Let's briefly review the syntax (see manual for more detail).
 - (a) ASCII2DTM [switches] surfacefile xyunits zunits coordsys zone horizdatum vertdatum gridfile
 - (b) **ascii2dtm**: FUSION's Command Line Executable.
 - (c) **Kaibab_dem.dtm**: Output DTM File. No file path required because we are working in the output directory.
 - (d) **M M 1 12 2 2**: xyunits, zunits, coordinate system, coordinate system zone, horizontal datum, and vertical datum parameters.

- (e) `\Project_Home\deliverables\raster\BareEarth\doqq-asc\kaibab_dem.asc`: Input ASCII file with file path included. It is not in the working directory, hence we must specify the full path.
- iii. No switches are used in the above script. The standard FUSION-LTK toolkit switches are supported. You can reference the standard switches in the FUSION manual.
- iv. In the final line of the batch file, after the FUSION utility has ran, we return to **C:\Project_Home\processing**
- v. Based on our knowledge of the data and the workflow, we have provided you with a batch file that you shouldn't need to edit for this exercise. In the future, you could use this batch and change the parameters and file paths to run on your own project.
- vi. Open a **Command Prompt** and change your directory to **C:\Project_Home\processing** by typing **cd C:\Project_Home\processing**
- vii. Type in **DoAsciiBE2Dtm** and press **Enter**. The batch file should start processing. It will take a few minutes to process.

FUSION TIP— in some scenarios, you may have multiple ASCII files to convert. In order to convert multiple files from ASCII to DTM, you can create a separate line of script for each file.

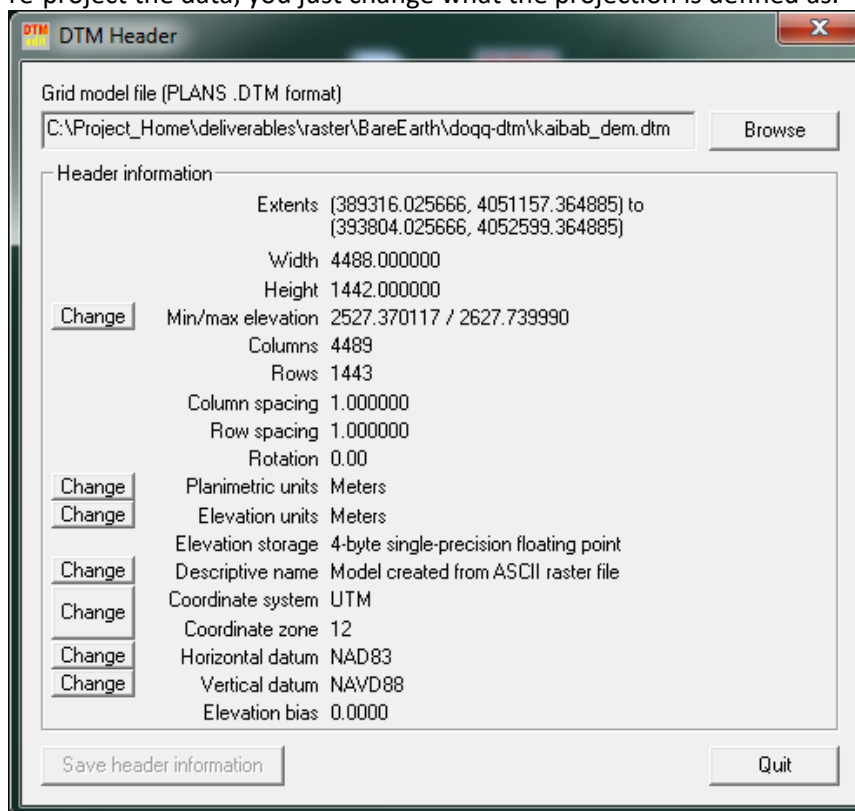
B. View the DTM Header

1. In Windows Explorer Navigate to:
`\Project_Home\deliverables\raster\BareEarth\doqq-dtm` It should now contain **kaibab_dem.dtm**
2. Drag and drop **kaibab_dem.dtm** onto the **DTMHeader.exe** shortcut you created in Exercise 1 (see following graphic). If you didn't create the shortcut, navigate to the **FUSION** directory, open **DTMHeader.exe** and load **kaibab_dem.dtm**



3. You should now see the header information for **kaibab_dem.dtm** displayed in the **DTM Header Dialog** box (see below). The DTMHeader.exe is a quick tool for checking the projection and units of output products.
 - i. You should also notice that you have the capability to edit the header information using the **Change** buttons. A note of caution: if you edit the projection information, you do not

re-project the data, you just change what the projection is defined as.



Note: In some scenarios, you may obtain lidar data with no associated bare earth model. If the lidar point data is not attributed with a ground point field (typically class 2), you can use the GroundFilter FUSION command line utility to filter out potential ground returns. You can then use the *GridSurfaceCreate FUSION command line utility to generate a grid (.dtm file) from the identified ground returns. If the vendor has attributed the lidar point data with a ground point field, you can use this information in conjunction with the ClipData Command to extract the appropriate ground points before you create the bare earth surface using the GridSurfaceCreate command line utility.*

Congratulations! You have successfully completed this exercise. You now know how to convert a bare earth surface from the default Arc grid format to a DTM, which can be used in Fusion.