

# University of Idaho

## College of Natural Resources

### Department of Fish and Wildlife Resources

PO Box 441136

Moscow, Idaho 83844-1136

Phone: 208-885-6434

Fax: 208-885-9080

[fish\\_wildlife@uidaho.edu](mailto:fish_wildlife@uidaho.edu)

[www.cnrhome.uidaho.edu/fishwild](http://www.cnrhome.uidaho.edu/fishwild)

## Standard Operating Procedure for Bathymetric Mapping with Humminbird 365i and Dr. Depth Software

September  
26

2012

---

**DOCUMENT NUMBER: UIDAHO BATHY SOP 1**

For use in the Limnology laboratory and associated field work with the University of Idaho – Moscow campus.

**Contacts:** Dr. Frank Wilhelm, Elliott Reams

## **Table of contents:**

<i>Standard Operating Procedure for Bathymetric Mapping with Humminbird 365i and Dr. Depth Software</i>	<b>1</b>
1.0 SCOPE AND APPLICATION	<b>1</b>
2.0 DETECTION LIMIT	<b>1</b>
3.0 EXPLANATION OF TEST METHODS	<b>1</b>
4.0 HUMMINBIRD 365i FIELD OPERATION	<b>1</b>
5.0 CREATING A BATHYMETRIC MAP USING 365i DATA	<b>3</b>
6.0 EQUIPMENT AND SUPPLIES	<b>12</b>
<i>APPROVALS</i>	<b>12</b>

## Standard Operating Procedure for Bathymetric Mapping with Humminbird 365i and Dr. Depth Software

### **1.0 SCOPE AND APPLICATION**

- 1.1 This Standard Operating Procedure describes the field depth collection and software data processing to create original bathymetric maps of previously unmapped water bodies.
  - 1.1.2 The procedures described here list the set-up, calibration and reporting procedures. The user must read the instruction manuals for the Humminbird 365i gps/sonar unit (available in room 216D above the office computer as well as on the office computer under the folder C:\Users\Wilhelm Lab\Dropbox\LIMNOLOGY LAB COMP\FISH415 - Limnology 2012\Equipment Manuals.

### **2.0 DETECTION LIMIT**

- 2.1 The operating ranges for this method are dependent on the strength of the GPS signal available to the 365i combo unit. Be sure to note the  $\pm$  (ft) value of the GPS signal during operation. Heavily wooded areas or other overhead obstructions may introduce interference.

### **3.0 EXPLANATION OF TEST METHODS**

- 3.1 The Humminbird 365i combo unit uses an internal GPS antenna and 200/83 khz dual beam sonar transducer to map the location and depth range of a specific spot within a water body.
- 3.2 While recording on the Humminbird 365i combo unit the information for Lat/Lon coordinates are stored on a pre-formatted 16 FAT SD-Card and stored for later examination. Depth information for each Lat/Lon value is stored differently for each khz beam from the transducer. The recorded files are in two formats when recorded to the SD-Card. The first format is the general allocation file for the Humminbird unit this is the .DAT file, this file recalls spatial information and connects it to the depth information. Humminbird units record the depth information from each khz of the transducer in .SON files located under the folder associated with the waypoint that started the original recording track.
- 3.3 Dr. Depth bathymetric mapping software utilizes a multi staged anistrophic smoothing spline algorithm to pair depth and location data into a 3D dimensional bathymetric map. More on this algorithm can be found in the shared limnology folder on the office computer in room 216D CNR at this location:  
C:\Users\Wilhelm Lab\Dropbox\LIMNOLOGY LAB COMP\FISH415 - Limnology 2012\Standard Operating Procedures\Anistrophic smoothing of point sets.pdf

### **4.0 HUMMINBIRD 365i FIELD OPERATION**

- 4.1 The Humminbird 365i combo unit has been modified into a mobile mapping unit. The pieces of the unit that are included in this package consist of; the portable

toolbox, 365i head unit, the transducer and extension stick, extension stick clamp, portable deep cycle battery and the pre-formatted SD-Card within the SD-Card slot of the 365i unit.

- 4.2 Launch the boat or suitable floatation device for sampling (float tube, raft, etc.). **REMEMBER LIFE JACKET(S)**. Connect the transducer extension stick to the vessel gunnel (with transducer stick clamp) so that the transducer is free of any obstruction in a 360 degree rotation. Open the toolbox being sure to have no obstructions above the 365i head unit, place the 365i head unit on to the mounting platform until the unit clicks into place, connect the **BLACK** power cable to the **BLACK** battery terminal. Turn on the 365i by holding down the power button. Press exit button the map warning screen.
- 4.3 Wait for the 365i to acquire an accurate GPS reading (approx. 2-3 minutes). Press the view button on the 365i unit until the recording screen is displayed. Press the menu button once. Use the arrow buttons to select "Start recording" tab, press the right arrow button once to start the recording. The top middle portion of the screen should flash a "Recording" bubble every 10 seconds if the unit is actively recording. The unit will now record to the SD-CARD no matter what screen view is selected. You can change the screen view to select only the sonar screen by pressing the view button. The recording can be stopped at any time in any view (sonar, map, bird's eye view, etc) by hitting the "Menu" button once, selecting the "Stop Recording" tab and hitting the right arrow. The recording process can only be started again within the Recording view window. Hit the "View" button until the Recording view window is displayed and repeat the previous process to start another recording. **1 GB SD-CARD will record roughly 9-10 hours of running time**, be sure to take time into account for the size of the card within the unit. During a recording session the amount of available time left on the SD-CARD will be displayed on the Recording view tab.
- 4.4 With the recording process started, make several passes over the area in which you want to create a bathymetric map. The areas that have been passed over will show up as a track log in the MAP view of the 365i unit. The closer your passes are to one another (within twice the GPS  $\pm$  accuracy value) the more accurate your completed map will be. Generally a minimum of 2 meters and a maximum of 4 meters apart from the previous path will yield acceptable results. **REMEMBER: The map will show a track log of where you have been regardless if the unit was RECORDING the depth or not.** Be sure to look at the unit often and see if the RECORDING bubble appears in the top central portion of the screen, if not repeat step 4.3 to establish a new recorded track-log.
- 4.5 Once you are satisfied with the track-logs created on the 365i you need to stop the recording. Go to the Recording screen by pressing the view button. Once at the recording screen press the menu button and select stop recording with the right arrow button. Once the recording has stopped hold down the power button for the required 3 seconds to fully turn off the 365i unit. Press the release button

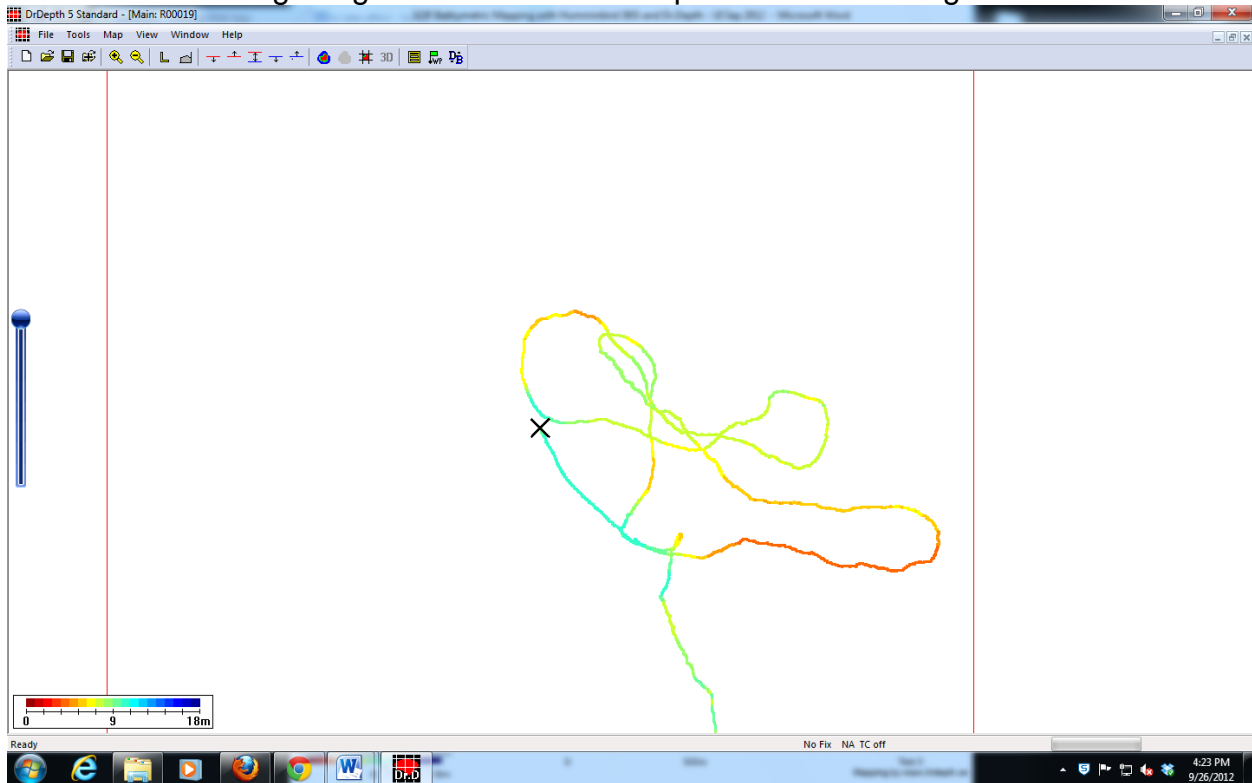
on the back of the 365i head unit and lift the unit off of the mounting bracket. Remove the **BLACK** power cable from the battery. Package the portable 365i unit **EXACTLY** the way it was before operation.

- 4.6 To recharge the portable battery use the Speed Charge battery rechargers by Schumacher located in room 216 D at the 2 amp slow charge rate. If in the field use the small wall socket charger (single stage unregulated bulk charger) located in the LIMNO-BATHY box (orange toolbox). **IF CHARGING WITH UNREGULATED BULK CHARGER (SMALL WALL CHARGER) DO NOT CHARGE FOR MORE THAN 15 CONSECUTIVE HOURS IT WILL DESTROY THE BATTERY.**

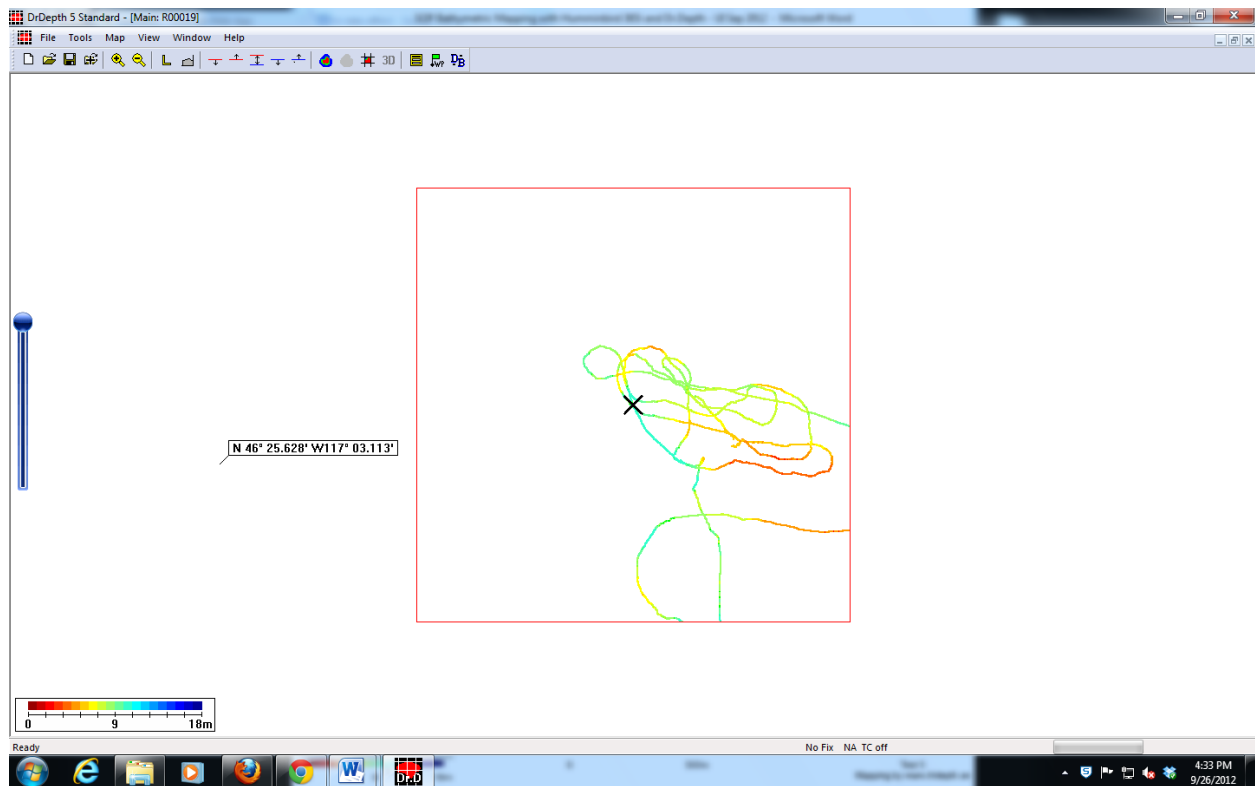
## **5.0 CREATING A BATHYMETRIC MAP USING 365i DATA**

- 5.1 With the 365i disconnected from power remove the SD-CARD from the card slot in the lower right hand portion of the unit. Be sure to replace the SD-CARD slot door onto the unit.
- 5.2 Transfer all files from the SD-CARD to the laboratory computer or flash disk. Be sure to keep the same file structure as the SD-CARD (keep the same folder orientation in the new parent folder:  
C:\YOURNEWFOLDERNAME\RECORD\ROOOX\ROOOX.SON.)  
**Do not leave the files on the SD-CARD for processing; it will significantly slow down your processing speed.**
- 5.3 Load the Dr. Depth program located on the laboratory computer in room 216D. **Recordings from the Snake and Clearwater Rivers Idaho (USA) will be used for demonstration.**
- 5.4 Select import data from the on screen buttons or from the menu bar: file → import/convert
- Select the .DAT file transferred to the computer.
  - Select yes if asked to apply latency corrections.
  - Dr. Depth will convert the file into .DRD file format and it will automatically save into the parent folder next to your .DAT file.
  - Open the newly created .DRD file by selecting from the menu bar: file → open
- 5.6 Dr. Depth only displays information inside of the red colored internal window; if some of your track log is not colored (not displaying depth data) you will need to change the size of the integral window. Menu bar: tools → settings → general
- Under the general settings tab select the appropriate size for your integral window select the size that will be appropriate for the completed map for example, if it is 400 meter diameter water body select the 500 meter x 500 meter window.
  - Dr. Depth will need to be reloaded for the changes to take effect, simply reload the .DRD file when the program restarts.

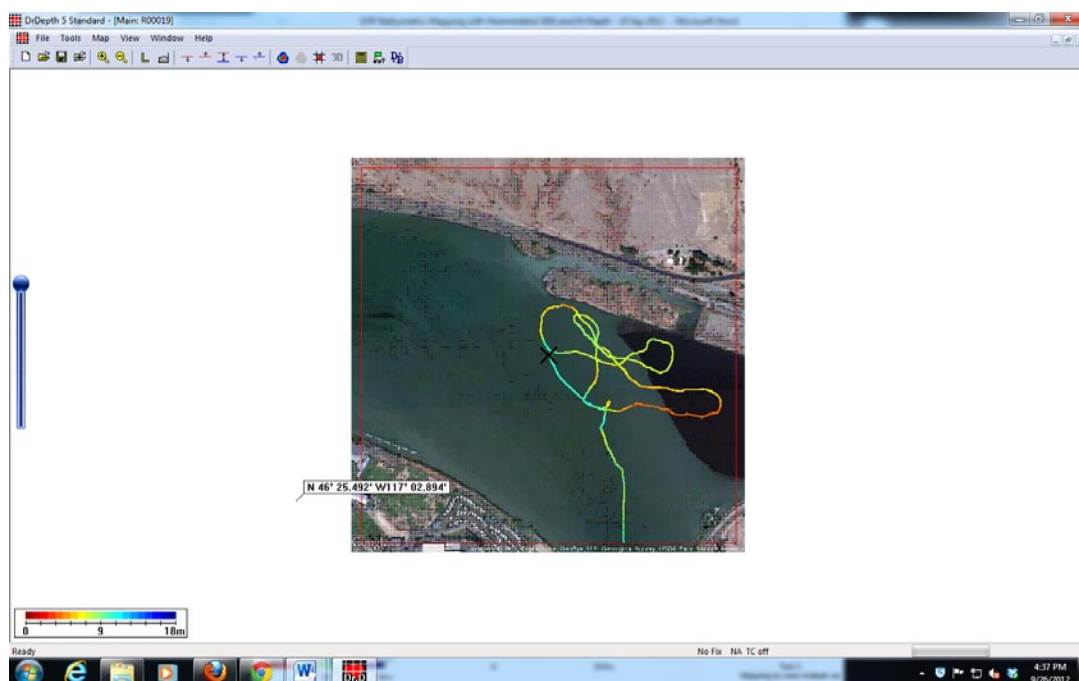
- 5.5 Dr. Depth will display your location and depth information in a grid pattern. To remove the grid right click on the white space and uncheck grid.



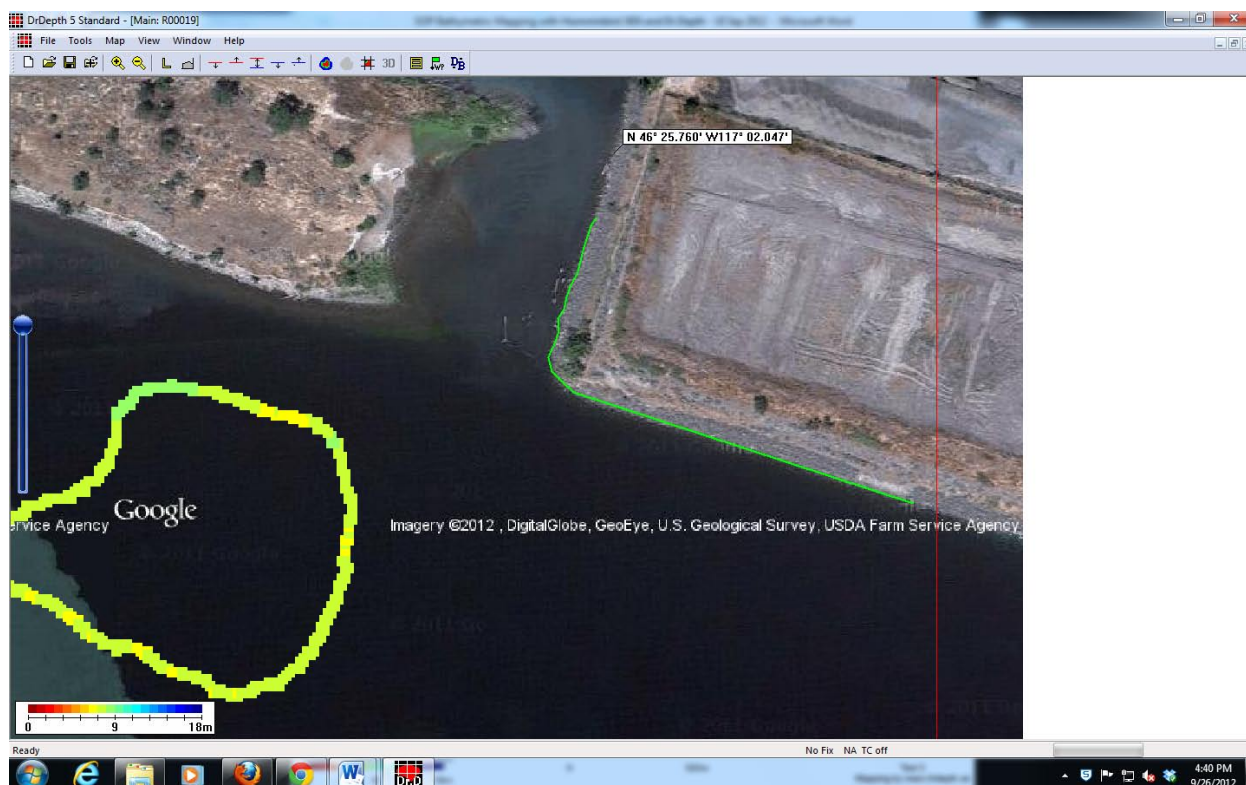
- 5.6 If you made multiple trips to an area or started and stopped the recording multiple times you will have to add additional Humminbird tracks to Dr. Depth, to do this import the additional files into Dr. Depth all at once, **if you only have one track recording move on to the next step.**
- File → import/convert
  - Select all .DAT files that were recorded on the water body
  - Add all new .DRD files to current screen
    - File → Add file or database
  - If multiple tracks were created it will be easier to make a project database to house your files.
    - Tools → Settings → Database manager
    - Select new from the database manager
    - Save your database in the parent folder under a descriptive name.
    - In the database manager add the .DRD files you wish to group together.
    - Close the database manager window.
    - You may now add the Dr. Depth database file instead of loading individual files by selecting: File → Add file or database



- 5.7 We now need to add a shoreline to your existing data, to do so we will draw in a line on Dr. Depth over a background image.
- 5.8 To insert a background image, right click on the white space and select background image. This will overlay a Google satellite image onto your track log.

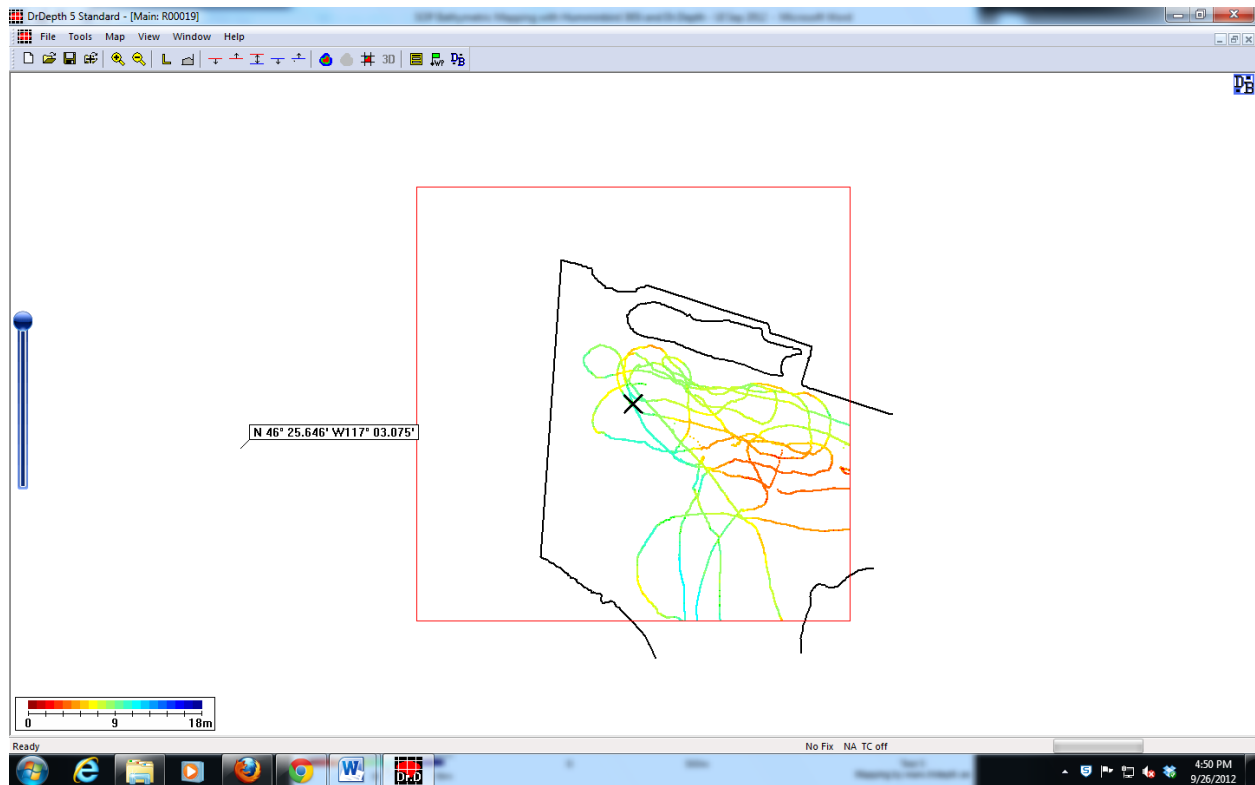


- 5.9 To draw a line in Dr. Depth zoom into a starting point on your shoreline and select from the menu bar: Tools → draw line.
- You can either free hand draw the shoreline or click one spot to the next working your way around the water body.
  - If a mistake is made you can delete partial parts of the line with the delete key.
  - Once you have made it around the shoreline of the water body and connect the two lines right click on the line.
  - The “Set data type” box will appear, depending on how you drew the line you will want to select one of the options. Dr. Depth considers the orientation of the line (consider yourself walking the line you just drew, if the water is to the left of where you walked select the Loop water to the left option, if the water was to your right select the Loop water to the right option).
  - Close the window, Dr. Depth will now create a new shoreline .DRD file for you, save it under a descriptive name (Lake X shoreline).
  - The file will be automatically added to your active window but not your database to add the file to the active database select from the menu bar: Tools → database manager, open your database and add the file, close the database manager.
  - To add islands repeat the above steps and be sure to select the correct water orientation.

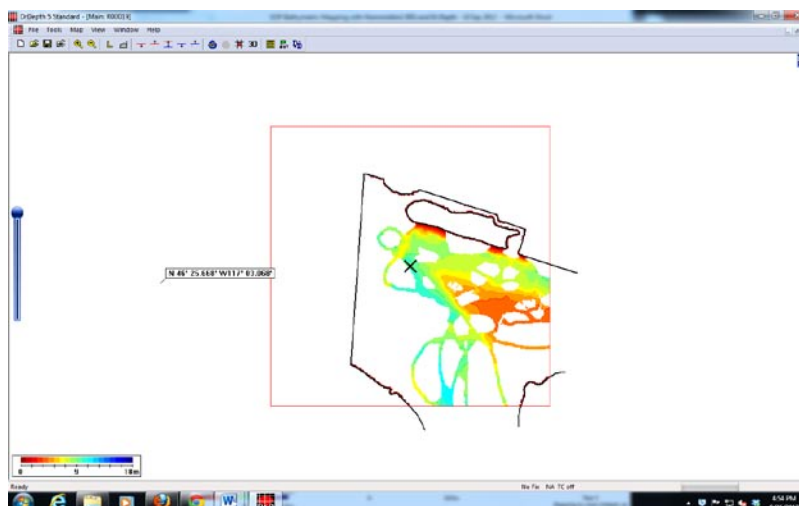




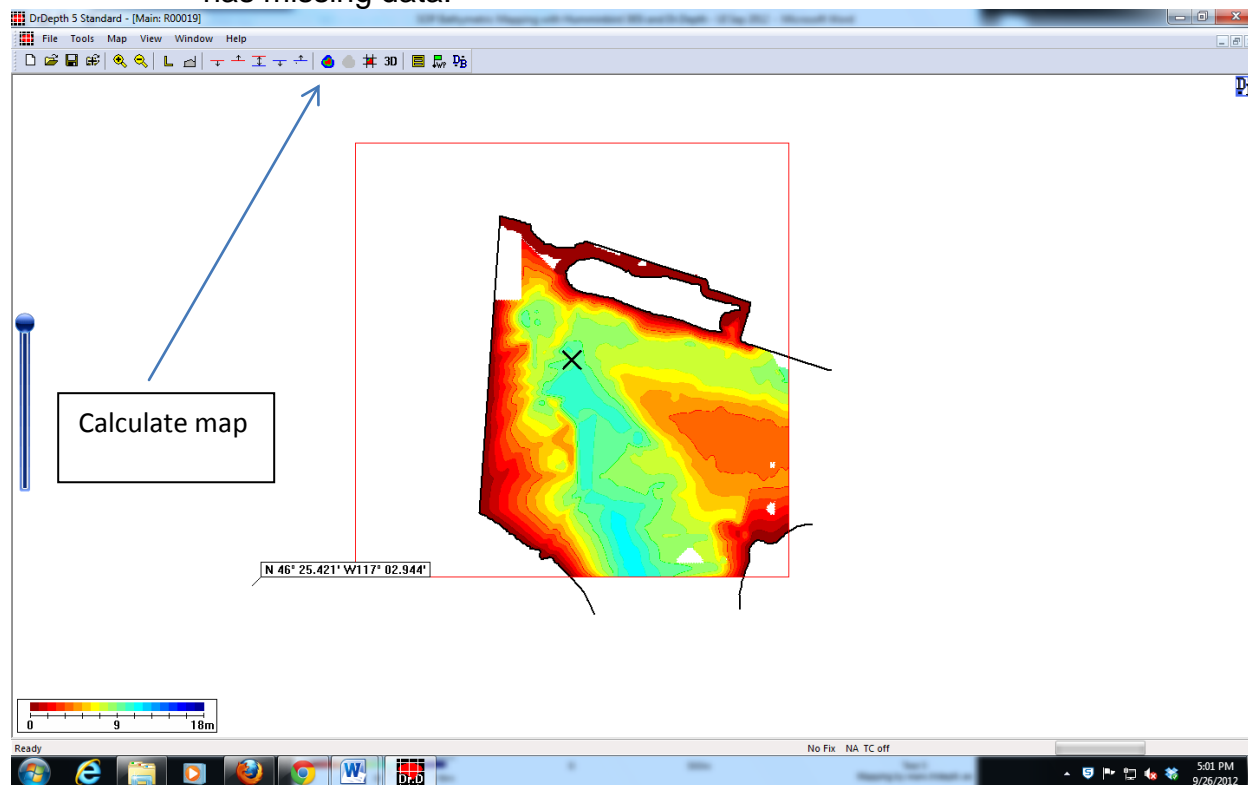
- 5.10 Right click and choose to remove the background map, you should now have a shoreline of your water body with a track-log and depth measurements throughout.



- 5.11 Now you can preview your bathymetric map and see if the amount of tracklogs created will yield a map at the highest resolution possible in Dr. Depth. To do this: Map → Calculate map
- Depending on the interpolation and extrapolation settings in Dr. Depth your water body may be in full color with enough information to fill in the gaps. In our example this is not the case.

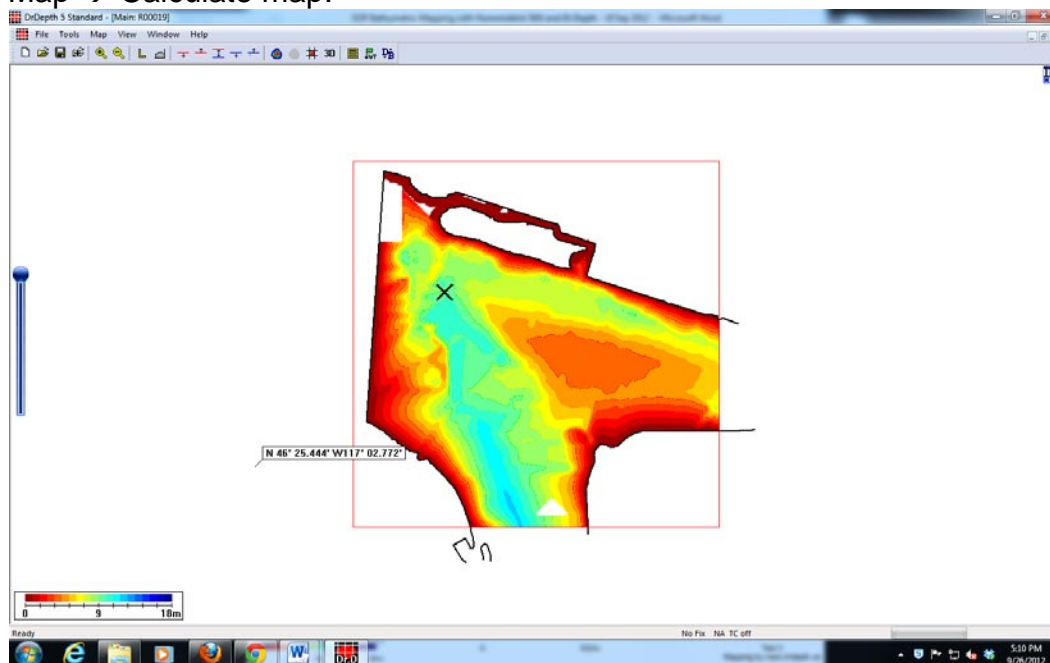


- 5.12 If substantial gaps in the track logs exist Dr. Depth will not even attempt to predict values at the highest resolution. **If enough information was collect in the field the interpretations will close the gaps nicely at the highest resolution, unfortunately this is not always possible.** To correct for missing data we can play with the interpolation and extrapolation settings in Dr. Depth. To increase/decrease these settings go to the menu bar: Tools → Settings → General , within the general settings box there are drop down menus including both Interpolation and Extrapolation characteristics. Switch these to a larger distance (50, 100, 200 meters etc.) Recalculate the map.
- In our example the area is so large and has so little data that both of these characteristics had to be set to the maximum to create this map which still has missing data.

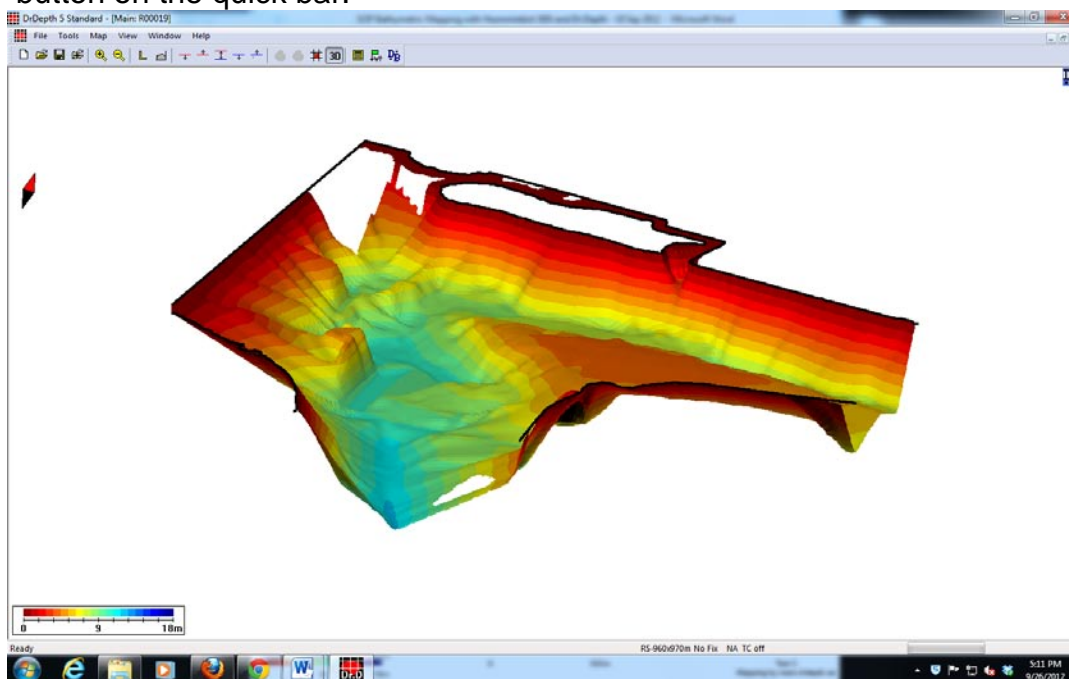


- 5.13 Be careful with the amount of inter/extrapolation used in the creation of your map too much and there is strong chance for error.

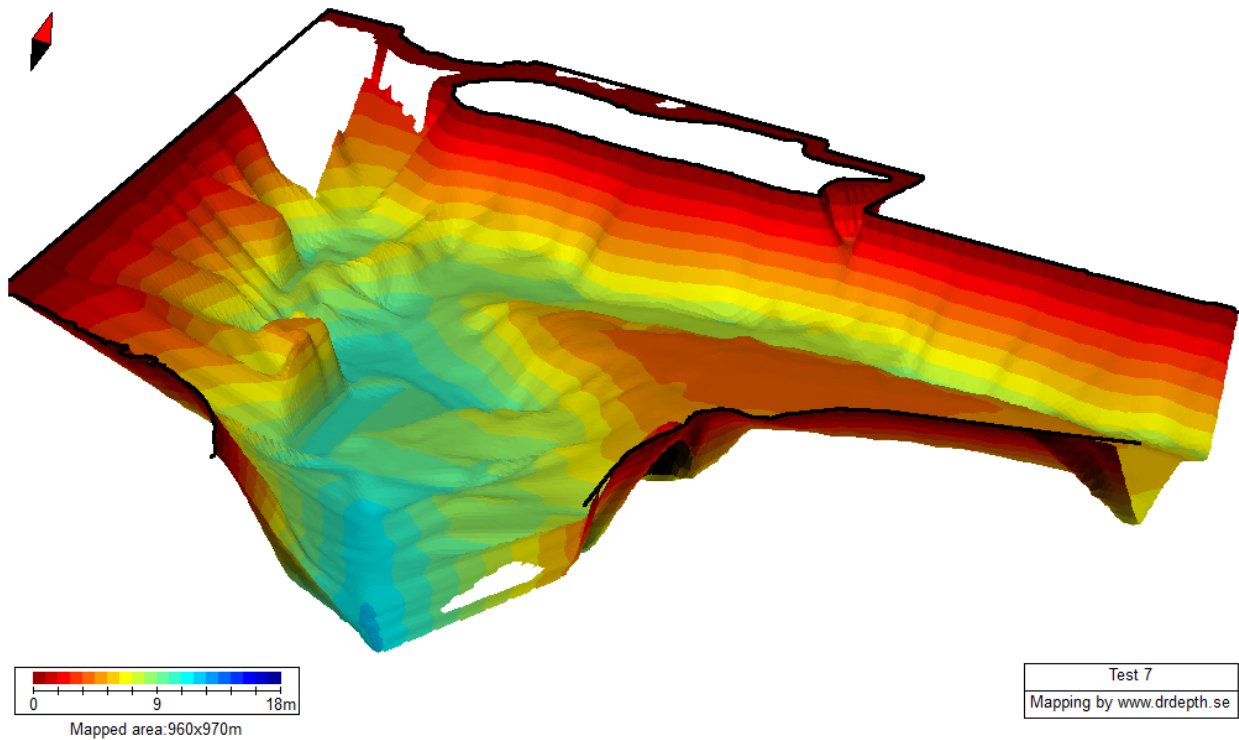
- 5.14 You can now move your integral map (red box) to show an area of the water body in which you wish to create a map. To do this click and drag your cursor on the screen and focus the middle of the screen to where you want the center of the integral map. Then on the menu bar: Map → Recenter map. If you moved part of your track log into the new integral map you will have to recalculate the map by either hitting the recalculate button on the quick bar or going to the menu: Map → Calculate map.



- 5.15 You can now view your water body in 3 dimensions simply by hitting the 3D button on the quick bar.

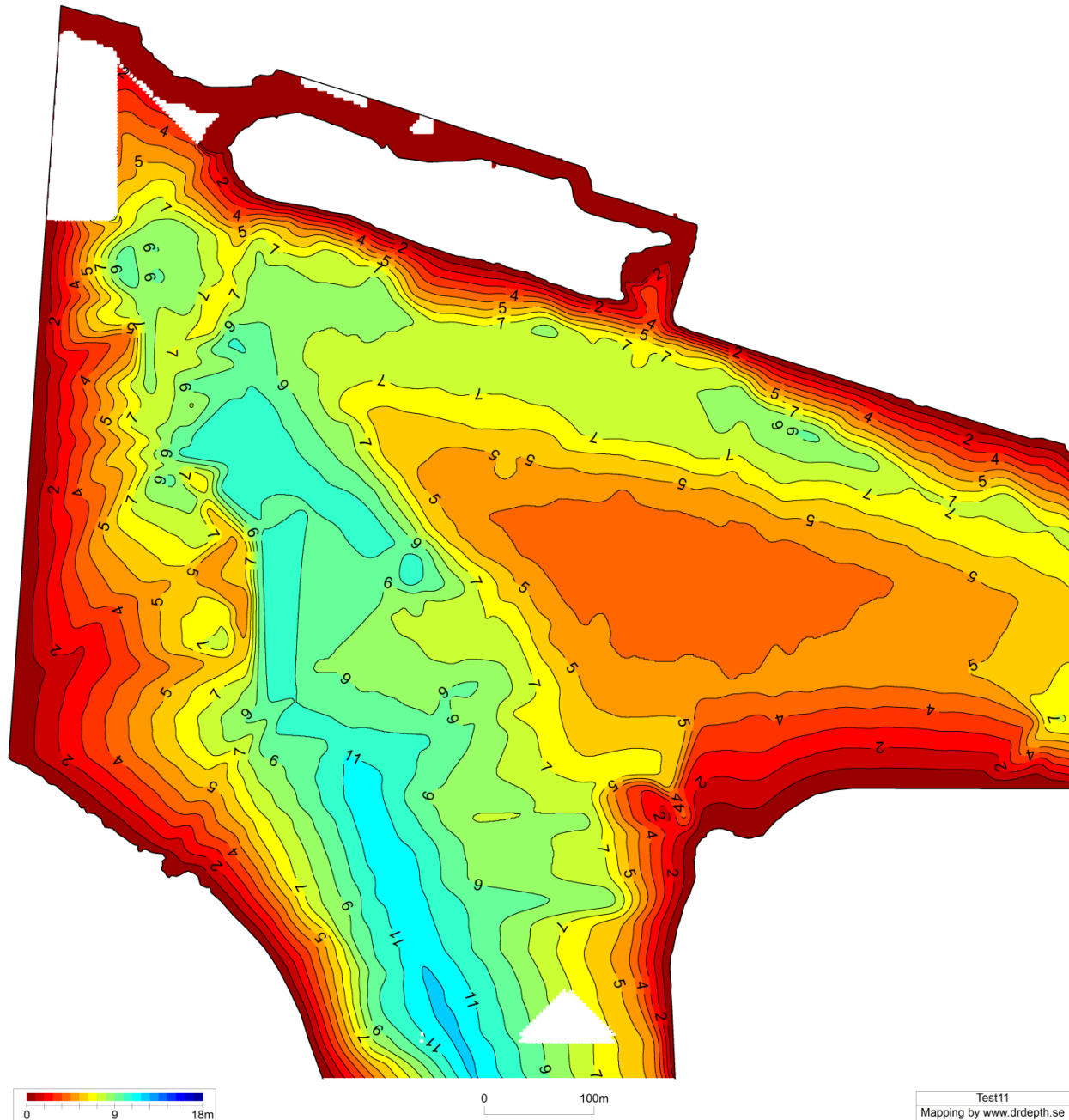


- 5.16 You can now export the image you currently see on screen. Menu bar: Tools → Create map image. Insert a title and the map will be saved to your specified location.



5.17 To create a 2 dimensional bathymetric map make sure your water body is in the red integral map of Dr. Depth and that 3-D view is off then select from the menu: Tools → Create map image.

- In 2D mode the map generator box will pop up with multiple options.
- Select contour lines with 3 pixels (width of line)
- Select the depth labels box with a size of 10
- Select ok, your map will be created with a legend and scale at your desired location.



- 5.18 Save your work and create a database for your files if you did not do so previously. Databases are the only way to save a completed map in Dr. Depth.

## 6.0 EQUIPMENT AND SUPPLIES

- 6.1 Limno-Bathy Box (Orange toolbox): Humminbird 365i head unit, SD card, transducer stick, transducer, transducer stick clamp, 12V battery.
- 6.2 Dr. Depth mapping software

## APPROVALS

APPROVED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

Dr. Frank Wilhelm.

University of Idaho – Moscow, Limnology, Fish and Wildlife Sciences

PREPARED BY: \_\_\_\_\_ DATE: April 9, 2012

Elliott Reams

University of Idaho – Moscow, PhD Student, Fish and Wildlife Sciences