Ten Commandments of Multibeam

or

"Ten Way Points on the Way to Successful Surveys"

C.O.P/M.U.G. Atlantic City, NJ

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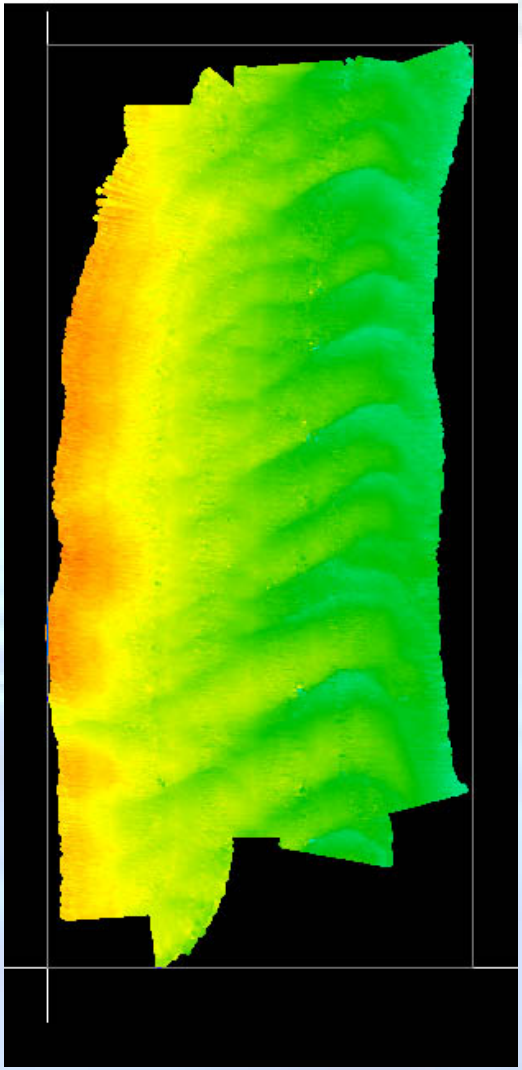
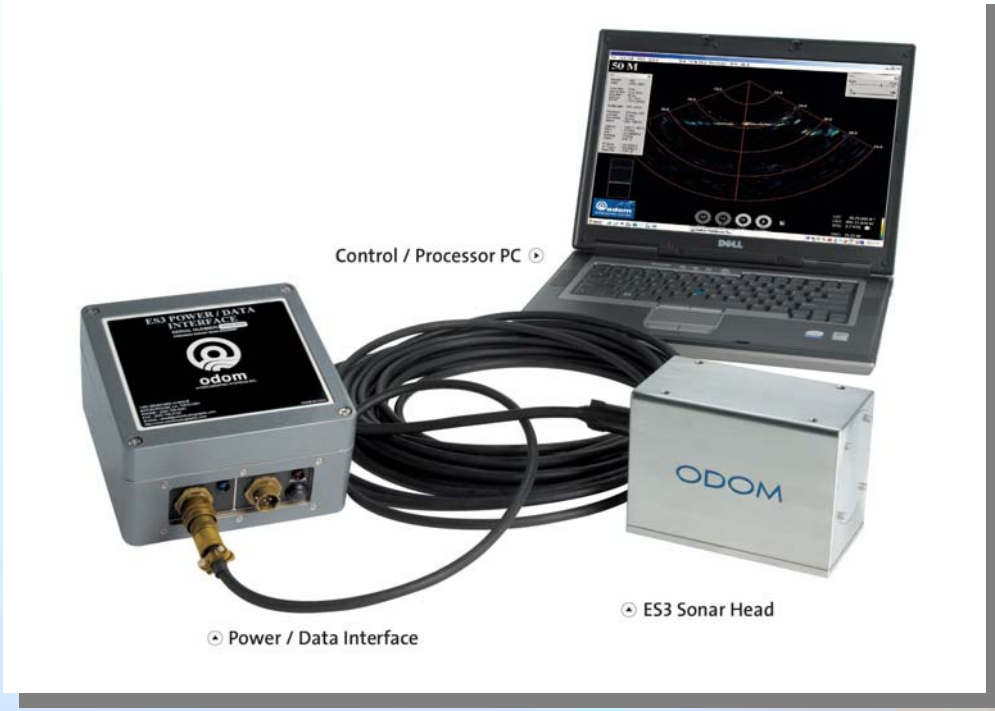
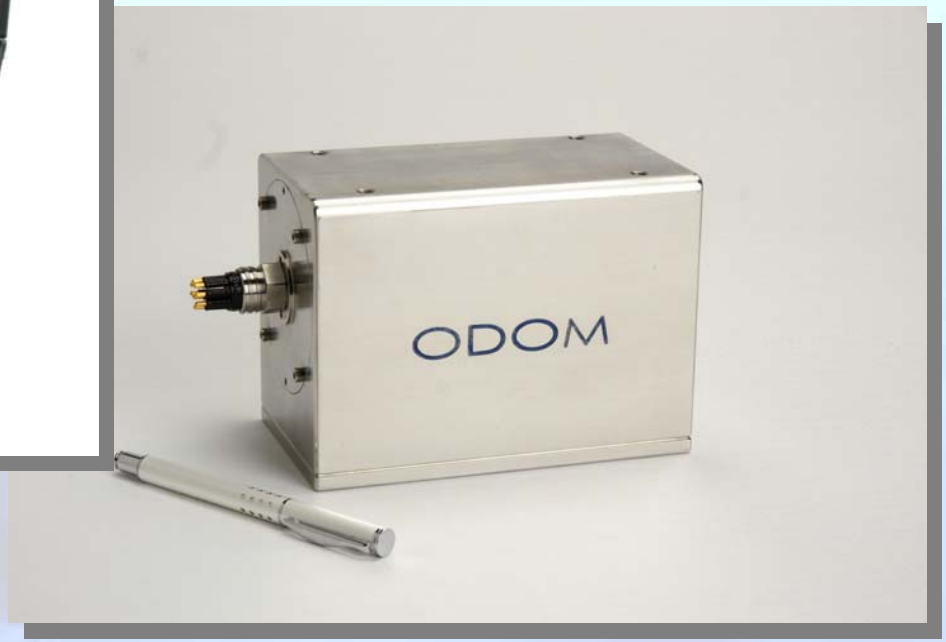
So you bought a brand new shiny multibeam - now how are your going to put it to work?

To follow are some rules to remember even before you begin your first job.



ES3 System Components- Compact and Portable Design





Commandment #1

Understand the job at hand:

Do you have a clear set of specifications that include the details of the final product you are expected to provide. Do you understand what the final product really is?

Do you understand the limitations as well as the advantages of your system (including all of its peripherals)?

The better your understanding of the job up front the easier the final product will be to produce.

Commandment #2

Invest in quality!

Buy the very best suite of sensors you can afford!

Get the best Motion Sensor, the best Heading sensor, the best GPS, the best Velocimeter and the fastest computers you can afford!

Do you really want to spend “beau coup” thousands of dollars for a multibeam and then connect it to cheap, inaccurate peripherals?

Commandment #3

Read the Manual, Read the Reference Material!

Even before the gear arrives make sure the surveyor you're depending on to drive you new multibeam spends plenty of quality time with the manuals.

The Corps Manual, Manufacturer's Operator Manuals all are good sources for background information.

Understand the technology and the terminology that define the system before you open the box.

Commandment # 4

Invest in TRAINING!

A multibeam and all its peripherals cost roughly the same as that shiny red Ferrari you always wanted. Would you let a guy with no drivers license drive your new Ferrari?

Same deal here! Pay for the factory guy to come out and help with the installation. Let him show your operators how the system works! You'll get more out of the system sooner and your people will be much more confident and productive.

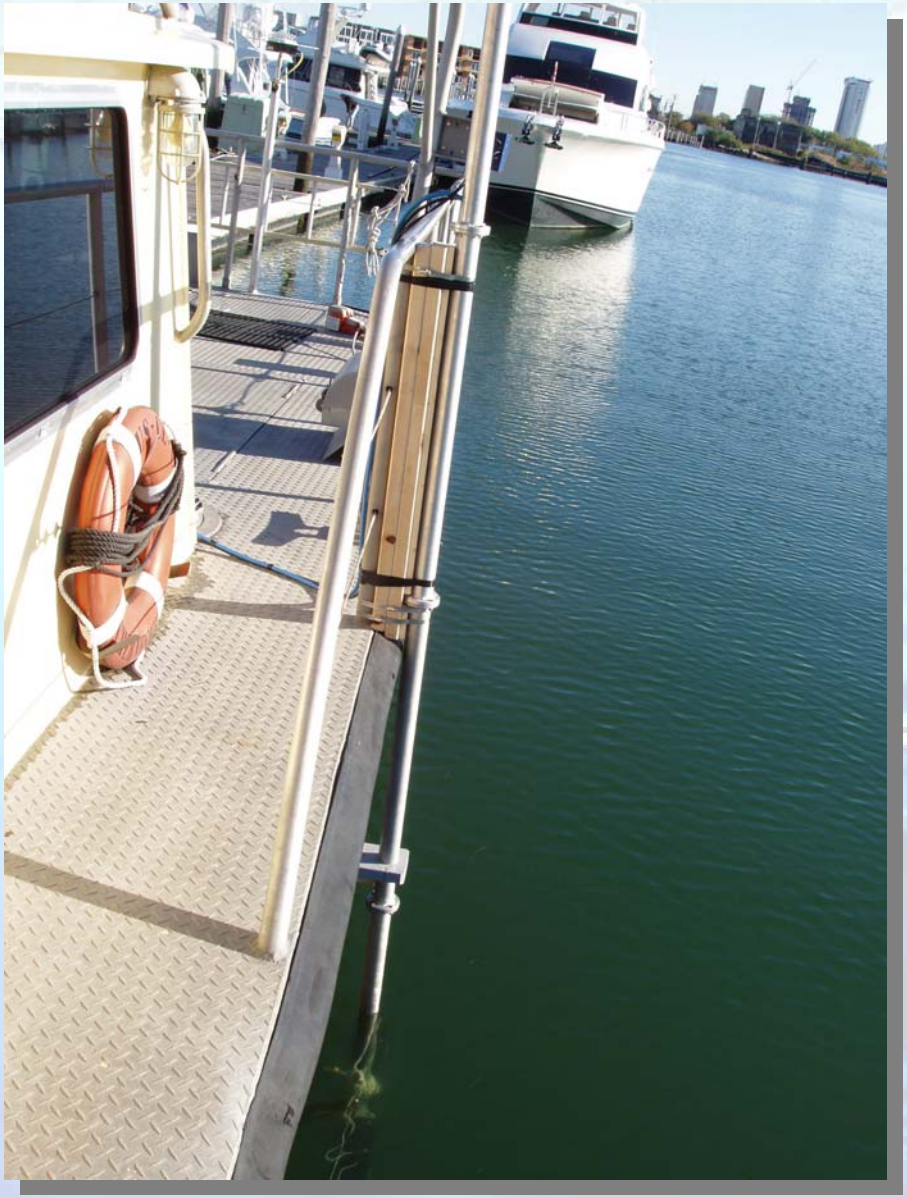
Commandment #5

Focus on the Installation

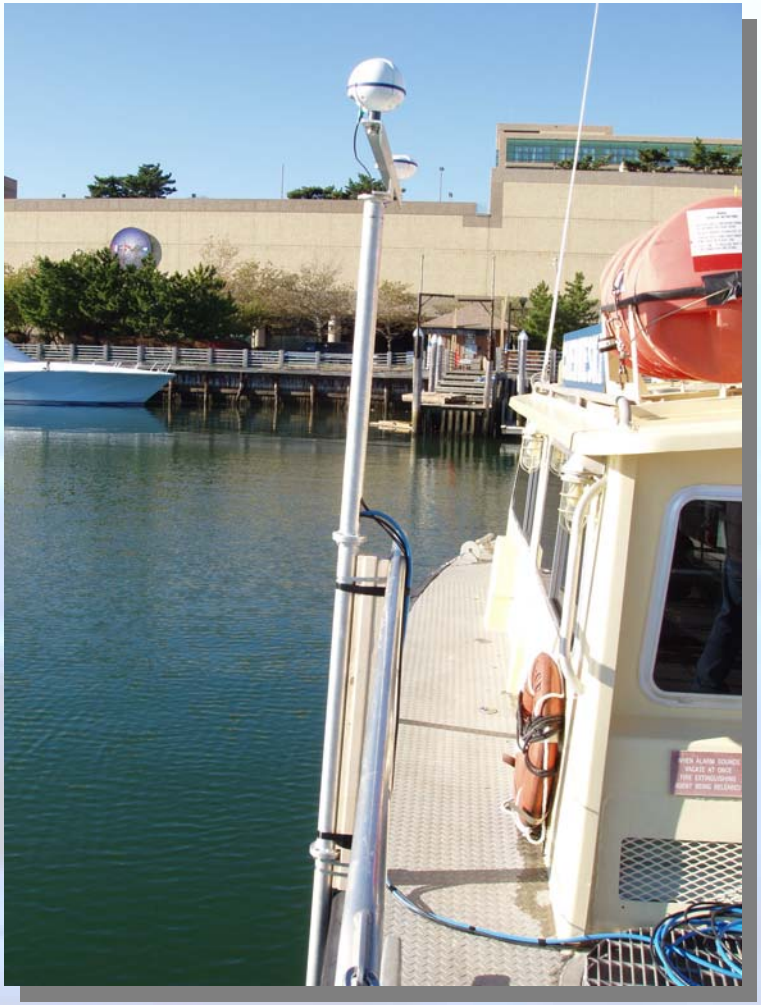
Find the best possible home for the echo sounder!

Help the sonar out! Install it where it sees clear water. Air bubbles are our enemy! So are rocks and snags and the bottom of course, but think about what the ideal location for the multibeam would be.

Before you pull out the Bulldog Tape, Yellow Rope, and plastic pipe for that "temporary" installation, understand that the accuracy of the data you're about to try to get paid for, depends hugely on how well the Sonar Head and the MRU are mechanically tied together. Any movement relative to the two sensors translates into errors in the data.



Violates Rule #5!



GPS Heading Device

Portable Over-the-Side Mount

Transducer Housing containing the ES3 Sonar Head and Motion Sensor

Commandment #6

"Measure twice, cut once!" ***Shop class 8th grade.***

After installation of the Sonar, make sure you determine exactly where every sensor is in relation to your reference point.

Whether you use the MRU/IMU as a reference or the sonar head, know where each component of the system is in relation to the others.

It's a pain, but it will show up in your data if you do not do a good job.

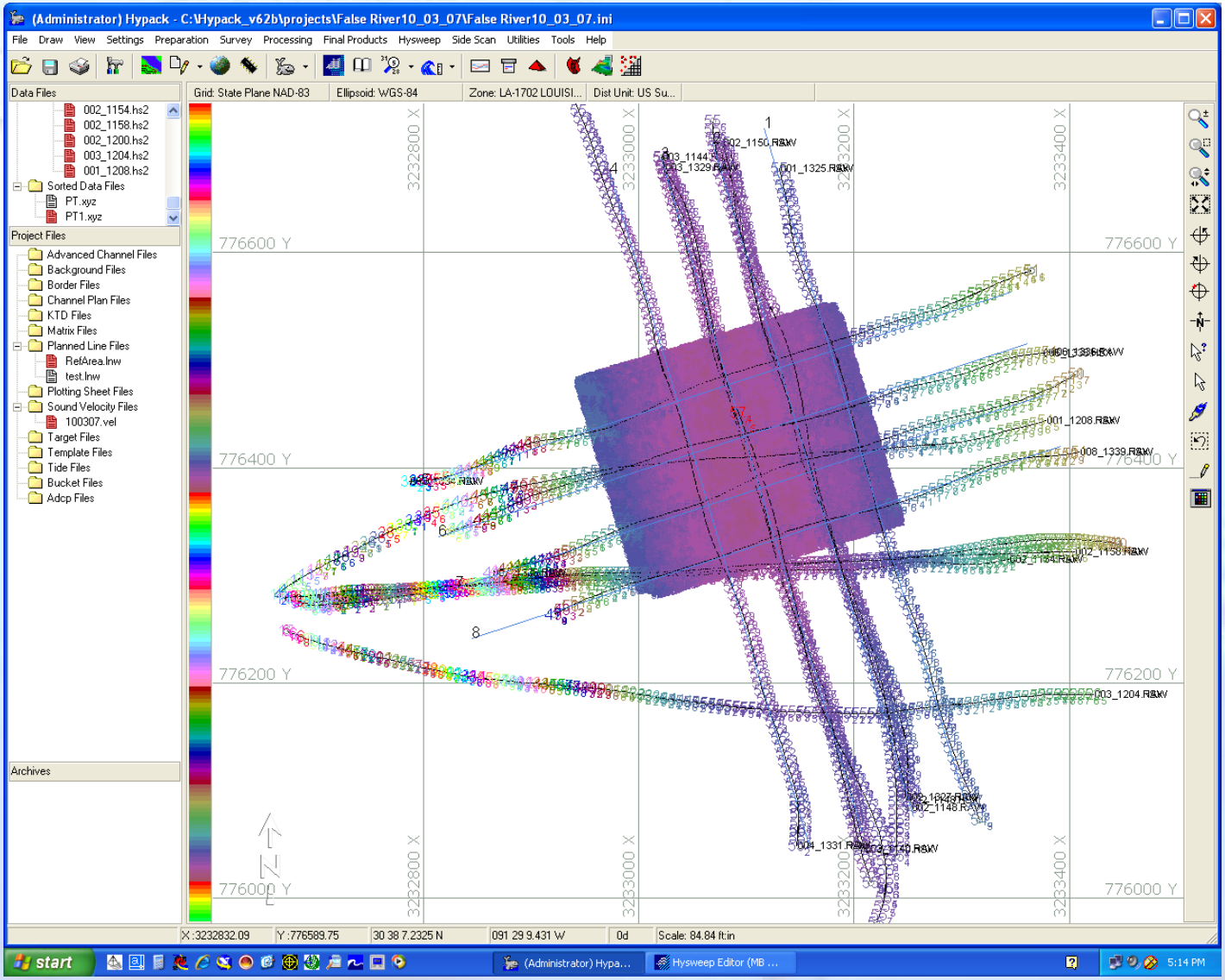
Commandment #7

Don't Take Short-cuts in the Calibration

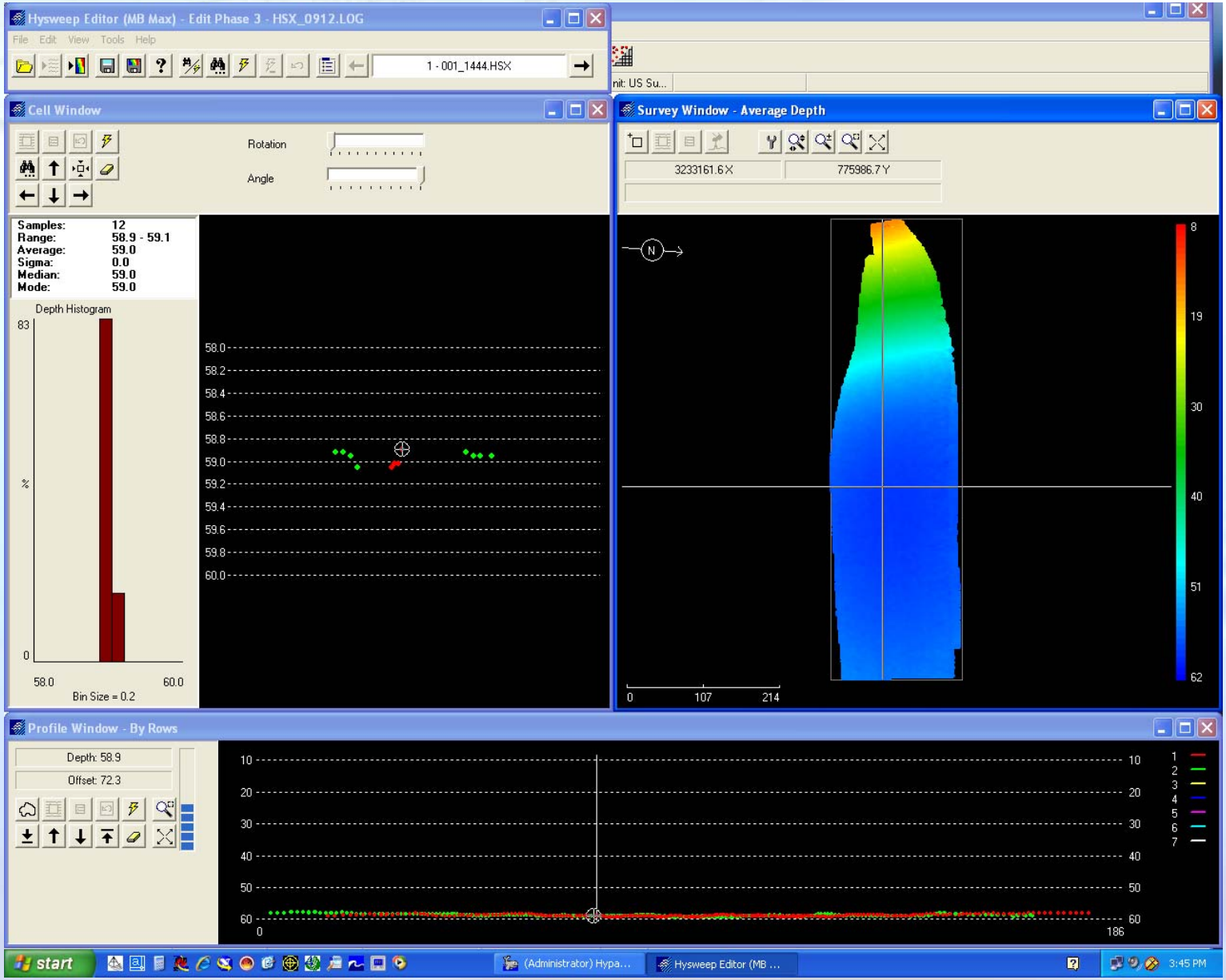
Leave nothing to chance!

Multibeams are unforgiving monsters that delight in showing up your mistakes! So you better have bar checked, run the patch test at least twice and the performance test at least once, and cut single beam lines through the reference area before you run that first line.

Accurate sound velocity information at the sonar head and frequent sound velocity profiles in estuarine areas are crucial to a successful survey!



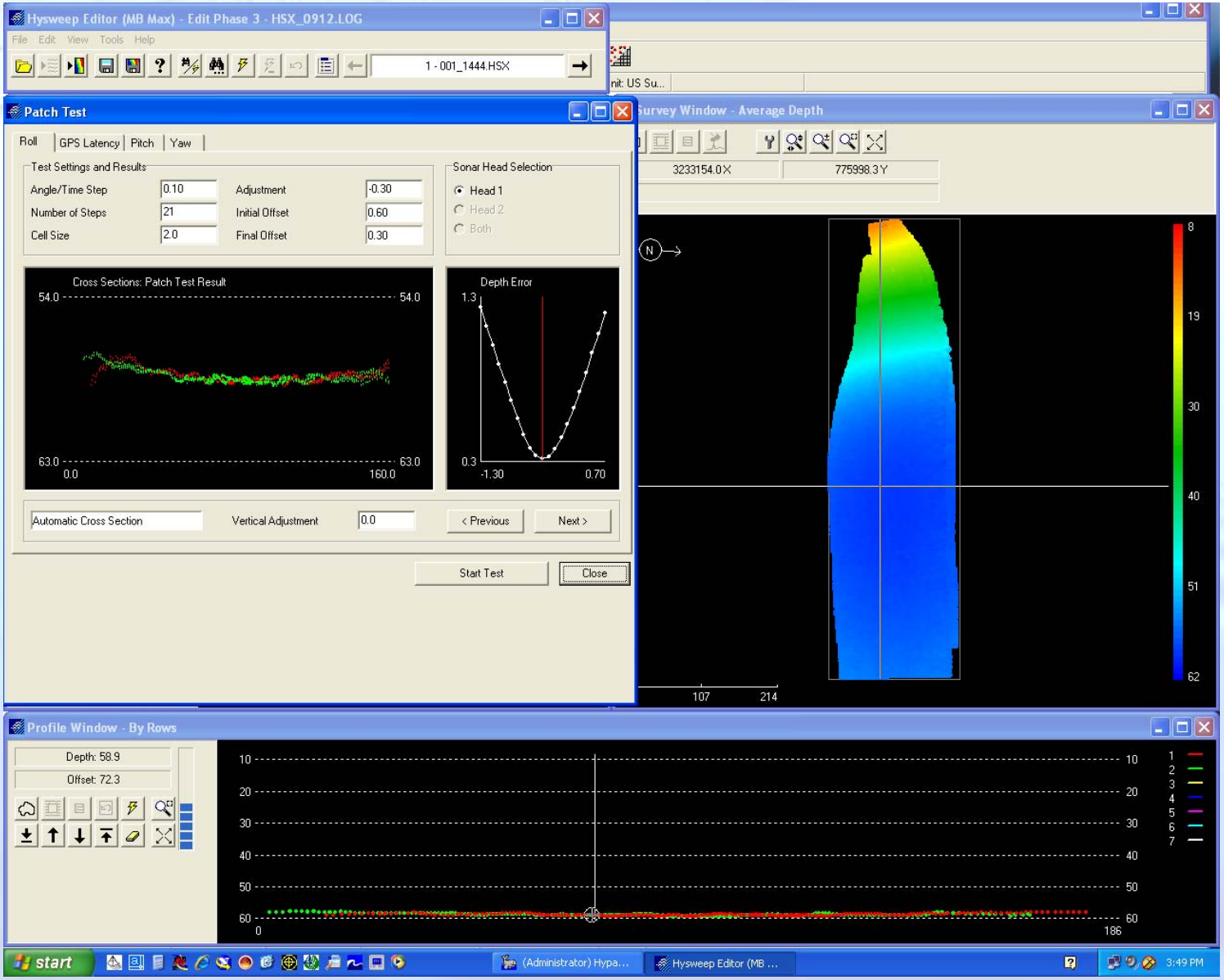
Reference Surface plus Patch Test Lines



Initial Roll Test Screen

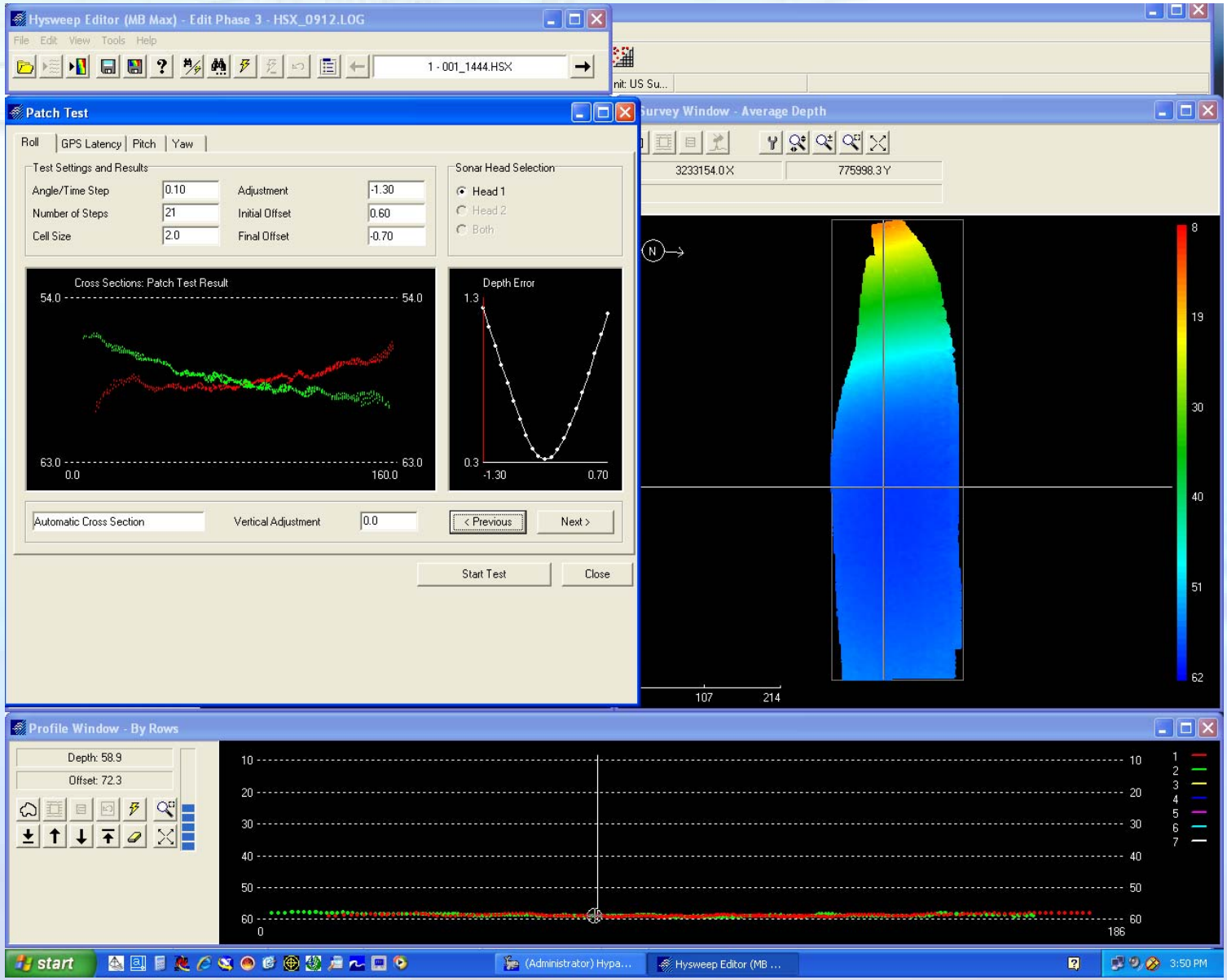
12 Pings in the cell

Extremes: 58.9 – 59.1

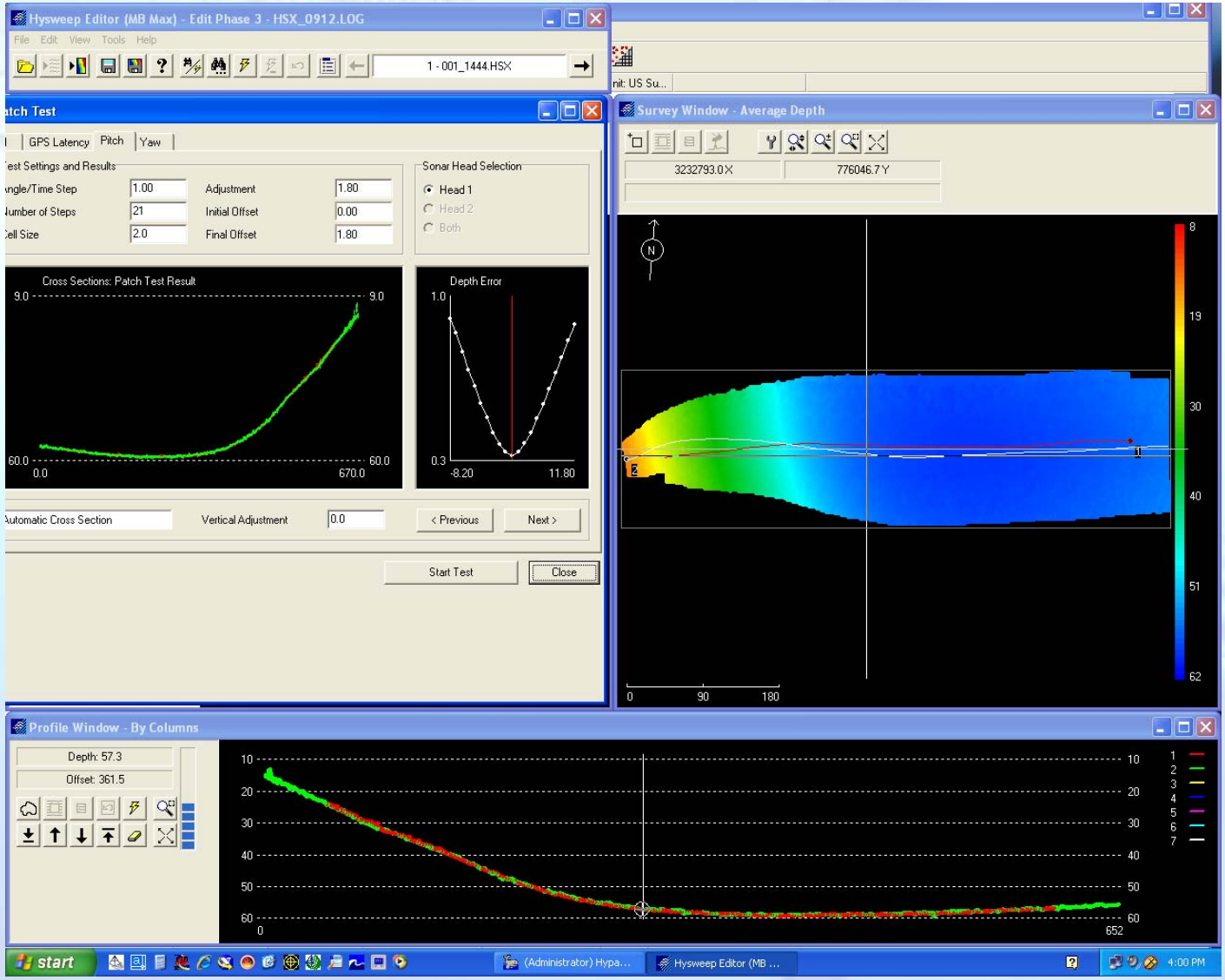


Roll Test

Run over a flat area from opposite directions comparing the offset between the sonar and the motion sensor across the swath

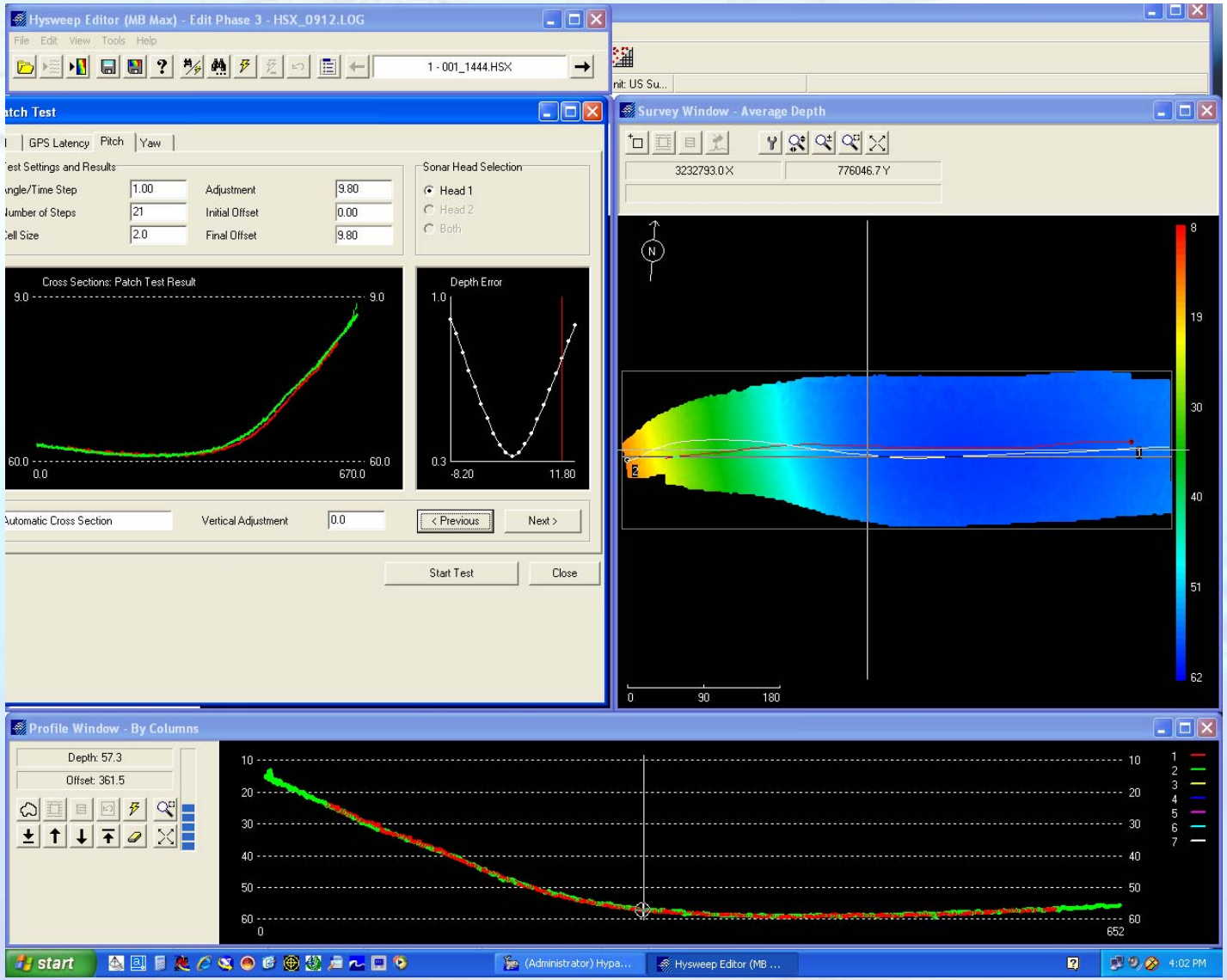


Choosing the wrong roll offset

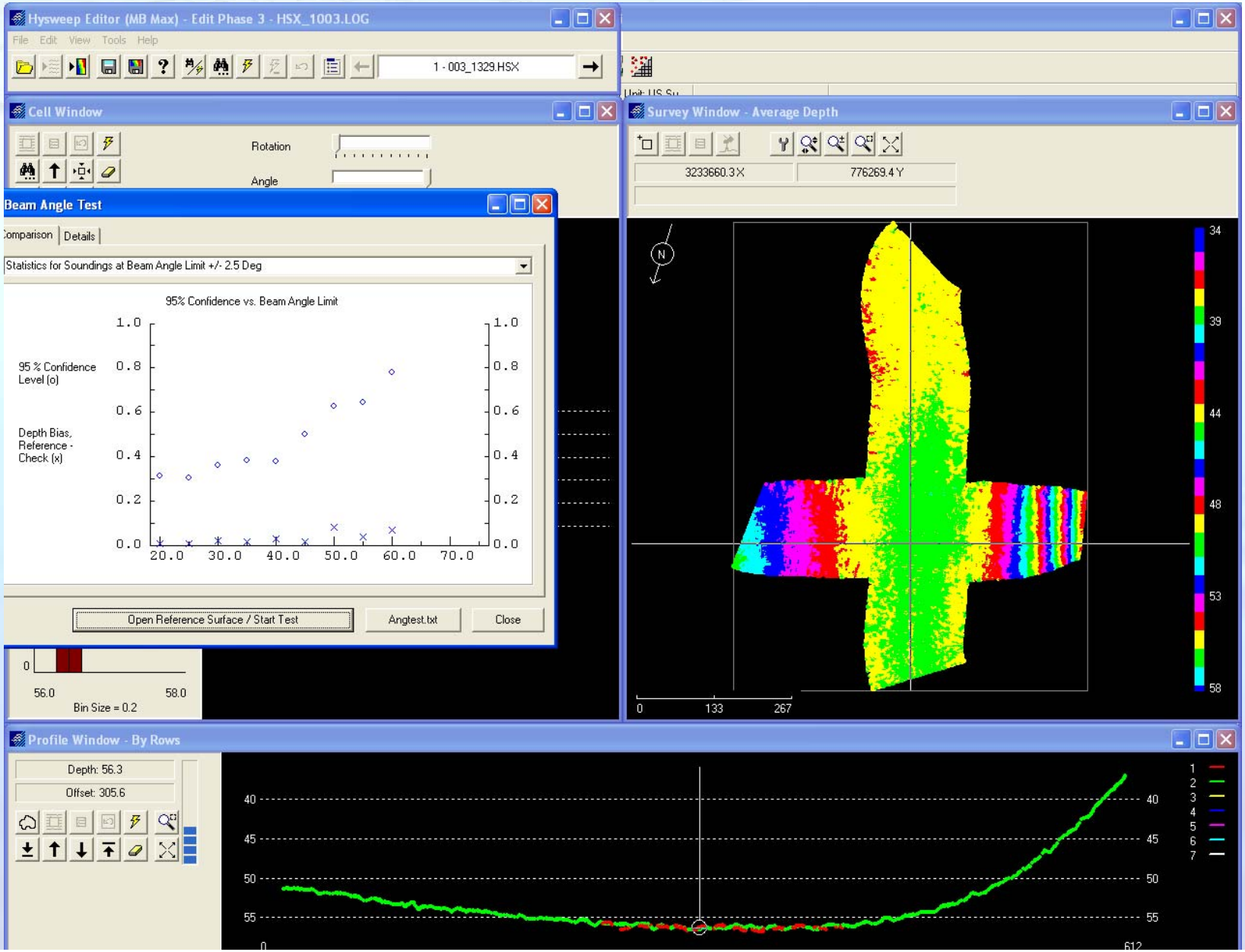


Pitch Test

Again two lines run in opposite directions up and down a slope.



Poorly adjusted Pitch offset produces measurement errors


Hysweep Editor (MB Max) - Edit Phase 3 - HSX_1003.LOG
File Edit View Tools Help
1 - 003_1329.HSX
Cell Window
Rotation
Angle
Beam Angle Test
Comparison
Details
Statistics for Soundings at Beam Angle Limit +/- 2.5 Deg
95% Confidence vs. Beam Angle Limit
95 % Confidence Level (o)
Depth Bias, Reference - Check (x)
1.0
0.8
0.6
0.4
0.2
0.0
20.0
30.0
40.0
50.0
60.0
70.0
Open Reference Surface / Start Test
Angtest.txt
Close
0
56.0
58.0
Bin Size = 0.2
Survey Window - Average Depth
3233660.3 X
776269.4 Y
N
34
39
44
48
53
58
0
133
267
Profile Window - By Rows
Depth: 56.3
Offset: 305.6
40
45
50
55
1
2
3
4
5
6
7

Commandment #8

Understand the Data Acquisition Software

Once you've read the manuals and the system is installed, what's left may be the biggest challenge of all!

Learn the "ins and outs" of the Data Acquisition Software.

Again, training and practice (time) are key.

Commandment #9

Make a list!

Don't trust your memory!

Your old "Procedures Manual" from your single beam surveys can be a good starting point, but it is not enough for multibeam work.

Commandment #10

Review your data in the field

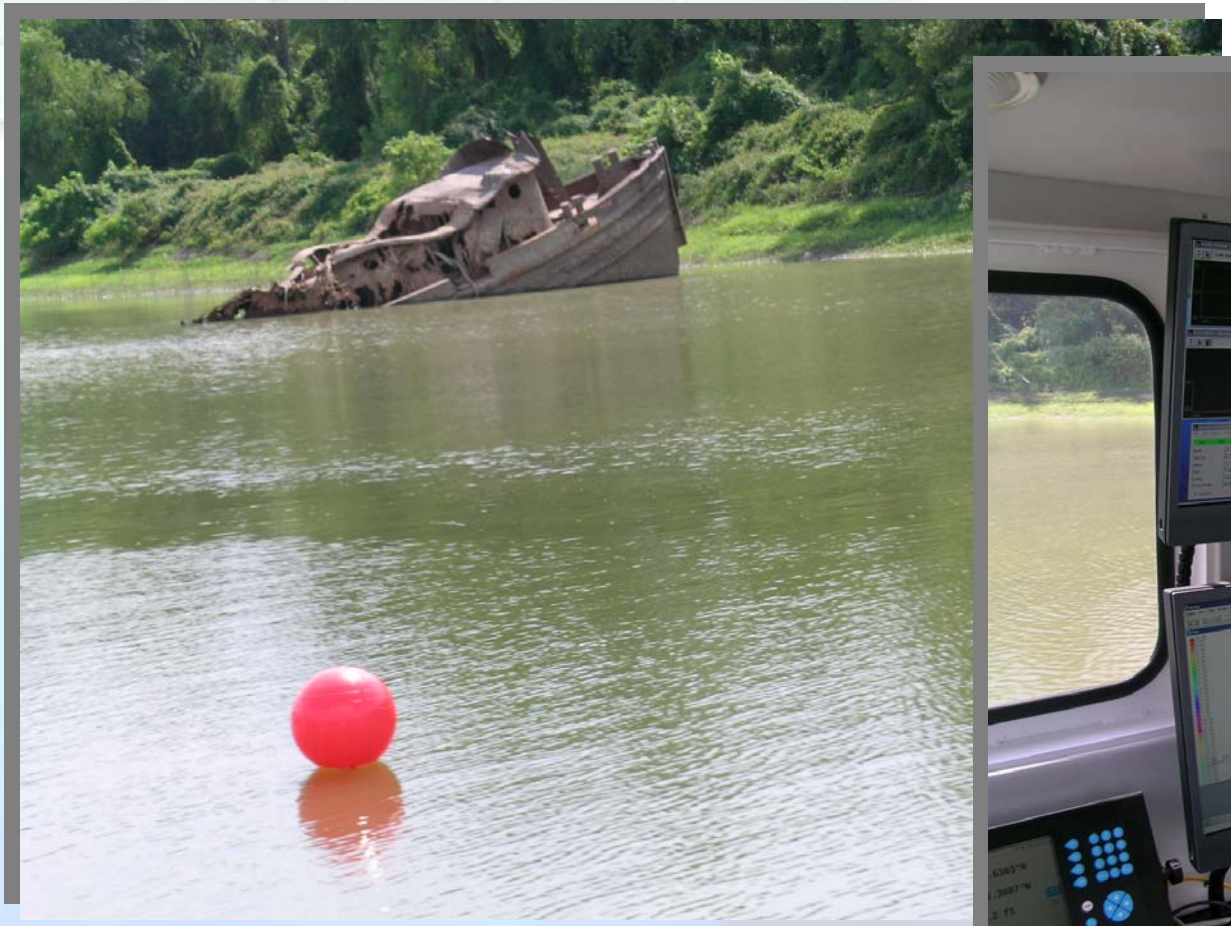
Process a representative amount of your data before you pack up and head to the house!

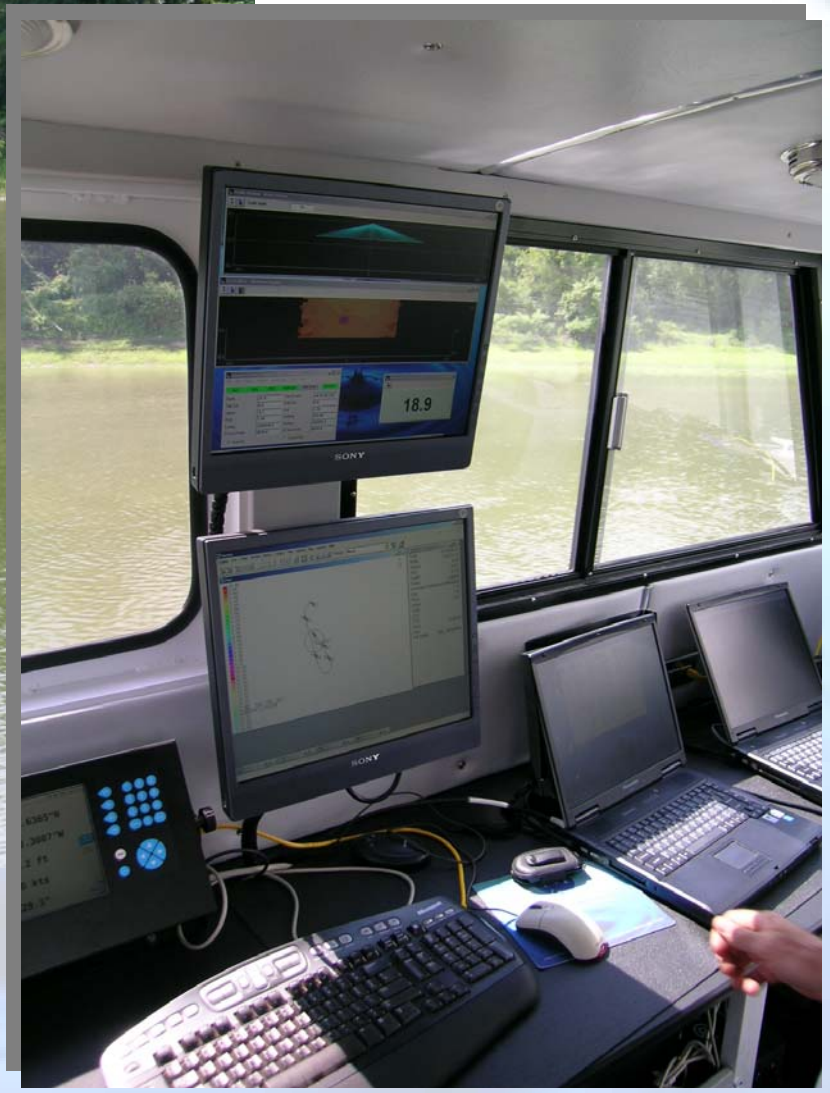
This should be an important item on your Survey Procedures List – just as big as calibration.

What's next for OHSI and the ES3?

Tests, Tests, and More Tests!

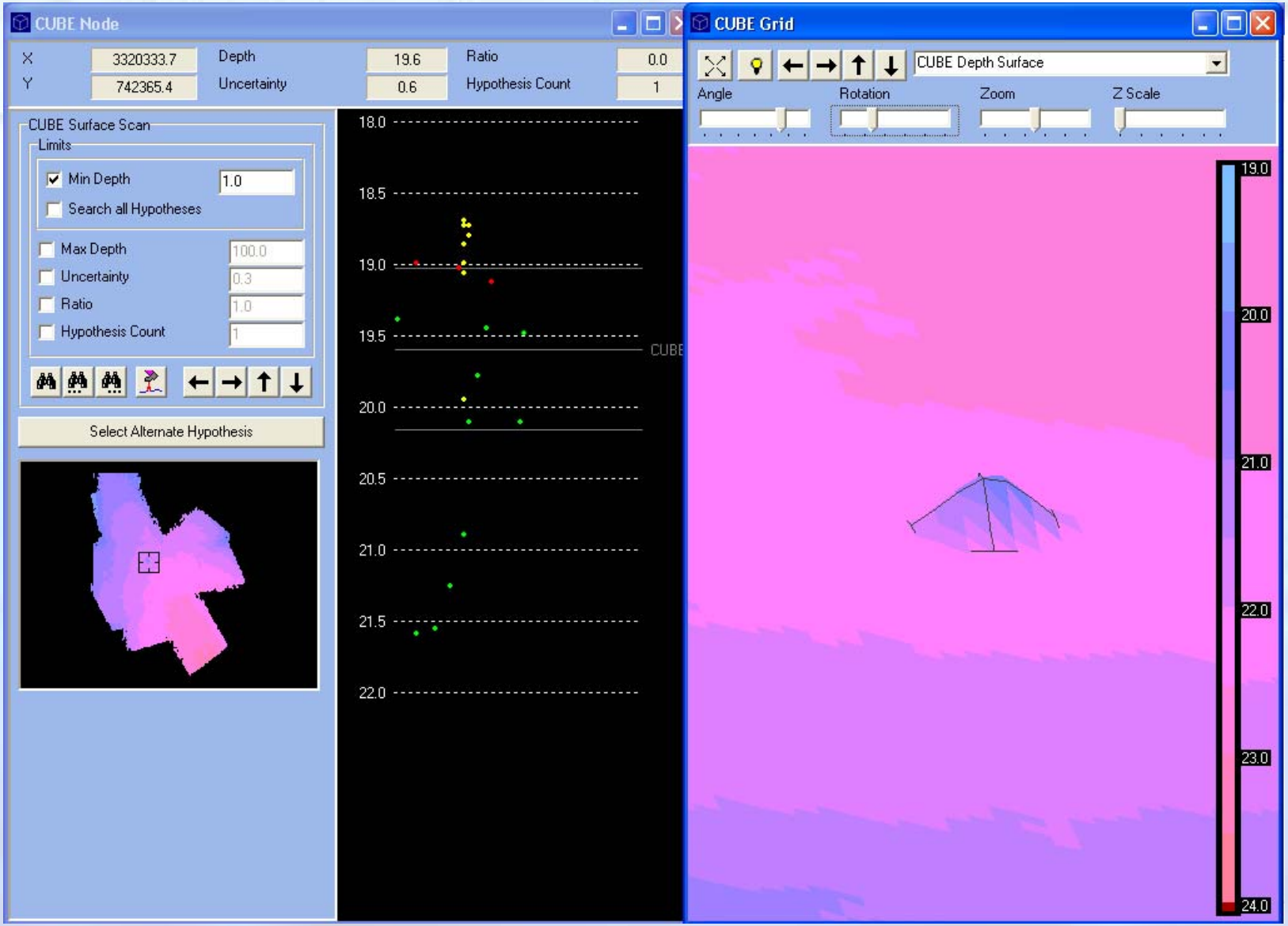
S44 Requirements - Preparing to deploy a 1 meter cube





Surveying the 1M Cube

Mississippi River "Barge Canal"


CUBE Node
X
3320333.7
Y
742365.4
Depth
19.6
Uncertainty
0.6
Ratio
0.0
Hypothesis Count
1
CUBE Surface Scan
Limits
Min Depth
1.0
Search all Hypotheses
Max Depth
100.0
Uncertainty
0.3
Ratio
1.0
Hypothesis Count
1
Select Alternate Hypothesis
18.0
18.5
19.0
19.5
20.0
20.5
21.0
21.5
22.0
CUBE Grid
CUBE Depth Surface
Angle
Rotation
Zoom
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19.0
20.0
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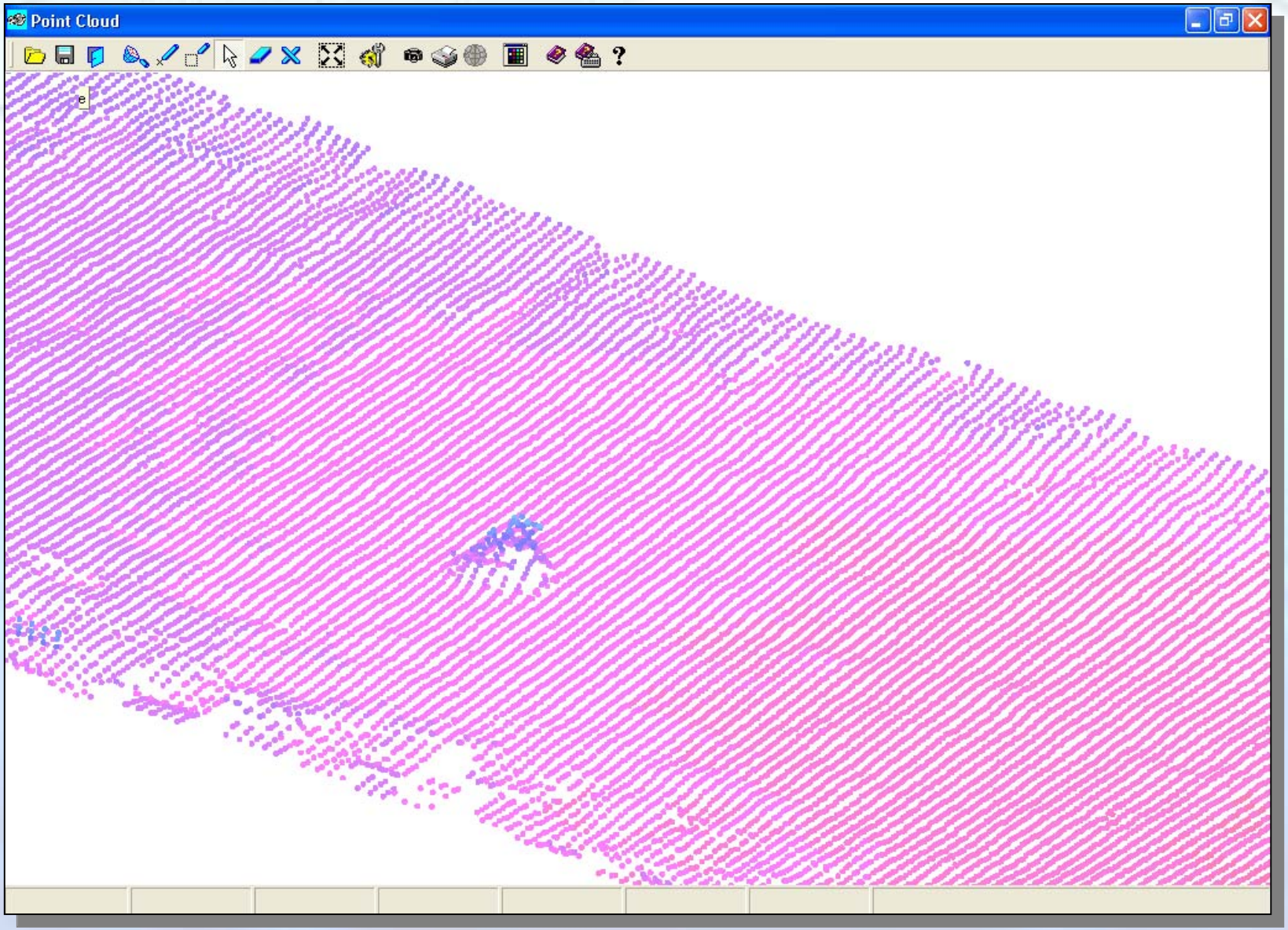
Point Cloud

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