W00119-W00120

NOAA FORM 76-35A

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

DESCRIPTIVE REPORT

Type of Survey HYDROGRAPHIC

Field No.

Registry No. W00119-W00120

LOCALITY

State OREGON

General Locality Siletz Bay

Sublocality Salmon River to Depoe Bay

2007

CHIEF OF PARTY

Terry Sullivan, Seavisual Consulting, Inc.

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28 (11-72)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTER NO.

W00119-120

HYDROGRAPHIC TITLE SHEET

INSTRUCTIONS The hydrographic sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the office.

FIELD NO.

State: OREGON

General Locality: Siletz Bay

Sublocality: Salmon River to Depoe Bay

Scale: N/A

Dates of Survey: 10/02/2003 - 10/03/2003
10/04/2003 - 10/07/2003

Instructions Dated:

Project No.:

Vessel: F/V TACKLEBUSTER

Chief of Party: Terry Sullivan

Surveyed by:

Soundings taken by echo sounders: Reson Seabat 8101 echosounder

Graphic record scaled by:

Graphic record checked by:

Evaluation by: LT J. Lomnicky

Automated plot by: N/A

Verification by: LT J. Lomnicky, K. Reser

Soundings in: Fathoms and Feet at MLLW

REMARKS: Time in UTC. UTM Projection Zone 10

Revisions and annotations appearing as endnotes were generated during office processing.

As a result, page numbering may be interrupted or non-sequential

All separates are filed with the hydrographic data.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF COAST SURVEY
Pacific Hydrographic Branch
Seattle, Washington 98115-6349

June 18, 2007

CDR Donald W. Haines, NOAA
I have reviewed this document
2007.06.28 16:44:16 -07'00'

MEMORANDUM TO: Commander Donald W. Haines, NOAA
Chief, Pacific Hydrographic Branch

John Lomnicky
I am the author of this document
2007.06.18 12:22:25 -07'00'

FROM: LT John J. Lomnicky, NOAA
Benthic Mapping Specialist

SUBJECT: Review of Outside Source Data Surveys W00119 and W00120
Seavisual Consulting Inc./Oregon Dept. of Fish and Wildlife
The Rocky Reef Shallow Water Mulitbeam Sonar Survey

I have reviewed outside source hydrographic surveys W00119 and W00120 with regard to data integrity and completeness of the data submission package, survey field procedures, data processing and quality assurance methods, and overall data accuracy and data quality. Surveys W00119 and W00120 exhibit the following deficiencies with regards to the specifications and requirements set forth in the NOS Hydrographic Surveys Specifications and Deliverables Manual (HSSDM):

- Data were supplied to PHB in gridded ASCII .xyz format only, which cannot be opened in Caris HIPS and SIPS. Data was reviewed in Caris Base Editor 2.0. Full resolution data, as defined in HSSDM 8.5.3, were not supplied.
- The 2m resolution of the supplied data does not meet the resolution recommendations for the surveyed depths as defined in HSSDM 5.1.1.3.
- Coverage requirements set forth in HSSDM 5.1.2 were not met. “Holidays” exist throughout the survey areas.
- Tidal, sound velocity, metadata, system calibration and vessel configuration files were not submitted in accordance with HSSDM 8.5.5.
- Because data were only provided in gridded ASCII .xyz format, a crossline comparison cannot be completed. A single crossline was completed in the southern area, and no significant problems/errors were noted.
- NOAA provided/approved water levels were not applied to the data. Water level data was acquired and applied by the surveyor.

Special attention should be given to the following:

- Refer to the Hydrographic Survey Outside Source Data Quality Assurance Checklist for recommendations in specific areas.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF COAST SURVEY
Pacific Hydrographic Branch
Seattle, Washington 98115-6349

25 June 2008

David Neander
2008.06.27 09:52:32 -07'00'

MEMORANDUM TO: Commander David Neander, NOAA
Chief, Pacific Hydrographic Branch

Digitally signed by Katie Reser
DN: cn=Katie Reser, c=US, o=NOAA, ou=Pacific Hydrographic Branch, email=katie.reser@noaa.gov
Date: 2008.06.27 09:26:10 -07'00'

FROM: Katie J. Reser
Physical Scientist, Pacific Hydrographic Branch

SUBJECT: Application of Outside Source Data Surveys
W00119-W00120
Oregon Department of Fish and Wildlife
(survey conducted by Seavisual Consulting, Inc.)
Reson 8101 Multibeam Sonar Data

I concur with all recommendations by the reviewer LT Jay Lomnicky except where noted in this report.

Summary of compilation:

- Soundings have been applied
- No rocks or shoals were superseded
- Shoreline was retained as charted
- Bottom characteristics were retained
- No aids to navigation exist within the limits of the suveys
- No additional Dangers to Navigation were found during compilation

It is recommended that OSD surveys W00119-W00120 supersede charted information as depicted in Hcell W00120_hc with associated bluenotes and applied to chart 18520 and ENC US3OR01M.

Hcell Supplemental Report is attached.

Reviewed and approved: _____

Digitally signed by Gary C. Nelson
DN: cn=Gary C. Nelson, c=US, o=NOAA, ou=Pacific Hydrographic Branch, email=gary.nelson@noaa.gov
Date: 2008.06.27 09:16:30 -07'00'

Gary Nelson, Cartographic Team Leader
Pacific Hydrographic Branch

David Scharff
AWOIS and Surf Check
2008.07.24 15:48:17 -04'00'

Registry No: W00119 & W00120

State: Oregon

General Locality: Siletz Bay

Sub Locality: North of Siletz Bay (W00119) and South of Siletz Bay (W00120)

Dates of Survey: 10/02/2003 - 10/07/2003

OSD Supplier: Oregon Department of Fish & Wildlife (conducted by Seavisual Consulting Inc.)

OSD Project No: n/a

Reviewer: LT Jay Lomnicky **Review Date:** 06/13/2007

A. Reports

Report Type	Format	Document Title	Date
Descriptive Report or equivalent	.pdf	The Rocky Reef Shallow Water Mulitbeam Sonar Survey	??
Data Acquisition and Processing Report or equivalent	none	none submitted	n/a
Horizontal and Vertical Control Report or equivalent	none	none submitted	n/a
System Certification Report or Equivalent	none	none submitted	n/a
Other			

B. Data

Data Type	Format	Description (Raw, Processed)
Smooth Sheet Sounding Plots	none	
XYZ ASCII Files	.xyz	processed data, 2 meter resolution (1)
Multibeam	none	
Side Scan Sonar	none	
LIDAR	none	
Single Beam	none	no(6)

Data Type	Format	Description (Raw, Processed)
Detached Position Point Feature	none	
Kinematic / Static GPS	none	Differentially corrected GPS positioning applied to data, but raw data not submitted
Sound Velocity	none	sound speed corrector applied, but data not submitted
Water Levels	none	Data not submitted (2)
AWOIS	none	
DtoN	none	
Shoreline	none	
Bottom Sample	none	

yes All data open correctly and without error (MBES lines, SSS lines, VBES, Crosslines, Fieldsheets, Smooth Sheets, Sessions, DTM's, BASE grids, Mosaics, and DP's).

C. Sensors

List all sensor(s) that were used to acquire data.

Sensor	Manufacturer	System	Model	Vessel / Platform
MBES	Reson	SeaBat	8101	Charter Vessel TACKLEBUSTER
VBES	Odom		Hydrotrac	Charter Vessel TACKLEBUSTER
HPR	TSS	MRU	DMS05	Charter Vessel TACKLEBUSTER
Sound speed	SBE	SVP	SBE 19 SEACAT	Charter Vessel TACKLEBUSTER
Heading	TSS/SG Brown	Gyro	Meridian	Charter Vessel TACKLEBUSTER
Position	Trimble	DGPS	AG132	Charter Vessel TACKLEBUSTER
Water Leve	Valeport	Tide gauge	VTM710	onshore
		8101		

yes (3) Are all sensors listed above capable of meeting NOAA HSSDM accuracy and object detection requirements? Provide information in the comments section.

II. DATA ACQUISITION AND PROCESSING

A. System Calibrations and/or Certifications

unknown A sensor offset and alignment survey was conducted to NOAA HSSDM requirements

no Offset values provided

yes Patch tests were conducted for shallow-water multibeam systems

no Alignment bias and latency values provided

yes Draft measurements were conducted

✔ Static Draft ✔ Dynamic Draft ___ Loading

no Draft values were provided

unknown Sensors were calibrated in accordance with manufacturer requirements and NOAA specifications

no Calibration reports were provided.

B. Sound Velocity Corrections

no Sound velocity sampling regimen is in accordance with NOAA HSSDM requirements

yes Sound velocity profiles were supplied

yes All profiles appear valid

C. Water Levels

yes Water level measuring equipment and methods are consistent with NOAA equipment and methods and are capable of meeting specifications

Equipment / method used: aleport VTM710 tide gauge

no Tide corrector files were supplied

n/a All tide correctors appear valid

yes Water level correctors applied to sounding data

___ Verified ✔ Observed ___ Predicted ___ NOAA Zoning ___ Other zoning

no Water level error estimate provided by CO-OPS

Water level / zoning error estimate: _____

E. Survey Methodology

yes The surveyor has conducted adequate quality control of horizontal positioning data

no DTM, BASE surface, and/or mosaics indicate that seafloor coverage requirements (per NOAA HSSDM) were met and no significant coverage holidays exist.

no All least depths over shoals, wrecks, rocks, obstructions, and other features have been determined

yes The Hydrographer has conducted the required quantity of cross lines, or acquired sufficient redundant data, in accordance with the HSSDM, to assess internal data consistency.

F. Data Processing and Quality Control

yes An adequate description of data processing and quality control methods is provided in documentation.

Processing software used: Hypack Max 2.12

yes Data processing methodology is robust enough and adequate to provide a dataset suitable for charting.

yes Data have been reviewed and are cleaned appropriately with no noise, fliers, or systematic errors noted.

no (4) Crossline agreement or redundant data overlap has been visually inspected by the hydrographer

no Disagreements have been noted

no (5) A Chart comparison was conducted by the hydrographer

yes Disagreements have been noted.

III. DATA QUALITY AND RESULTS

A. Internal Data Consistency

no — Full resolution data was provided in order to gauge the adequacy of cleaning and/or processing of the data.

no(6) — A review of the data reveals no positioning errors exceeding NOAA specifications

no(4) — Crossline agreement or redundant data overlap shows no disagreements exceeding NOAA HSSDM tolerances.

no — **A**nomalous data (fliers, noise, etc) were apparent in the BASE surface, DTM, and/or selected sounding set.

no(6) — Are there any tide errors exceeding NOAA HSSDM requirements observable in the data

no — Are there any observable SV errors exceeding NOAA HSSDM accuracy standards.

yes — All shoals are valid (no fliers) and the proper least depth has been retained.

yes (7) — Where multiple systems, platforms, and/or sensors were used, junctioning or overlapping data agree within NOAA HSSDM tolerance between platforms.

n/a — Any statistical assessment of the data (e.g. BASE standard deviation, QC reports, etc) indicate that data agree within NOAA HSSDM tolerances.

B. Error Budget Analysis

no — An error budget analysis was provided by the surveyor

n/a — The error budget analysis indicates that data are capable of meeting NOAA HSSDM standards

n/a — The evaluator concurs with the provided error budget analysis

no — The evaluator has conducted an error budget analysis

n/a — The error budget analysis indicates that data are capable of meeting NOAA HSSDM standards

D. Automated Wreck and Obstruction Information System (AWOIS) Items

no — AWOIS Items are located within the limits of the survey.

n/a — AWOIS Items can be sufficiently confirmed or disproved using data from this survey (Attach AWOIS pages to the certification memorandum.).

E. Dangers to Navigation

no Dangers to Navigation (DTONs) were selected and submitted by the surveyor / data provider

n/a DTONs have been verified by the office evaluator.

yes (8) Additional DTONs were noted during office evaluation and submitted

F. Aids to Navigation

no Aids to Navigation (ATONs) were positioned during this survey

n/a New ATONS were positioned during this survey

n/a Survey positions match charted positions

n/a The surveyor / data provider issued DTONs or notified the USCG for any ATON discrepancies

n/a ATON discrepancies were noted during office evaluation and submitted as DTONs.

G. Shoreline and Bottom Samples

no The shoreline (MHW and/or MLLW lines) were included as part of this survey

n/a Surveyed shoreline matches charted shoreline

n/a Surveyed shoreline compares with NGS/RSD source data

n/a Surveyed shoreline should be used to revise nautical charts

no Shoreline features were positioned during this survey

n/a Surveyed features match charted shoreline

n/a Surveyed features compares with NGS/RSD source data

n/a Surveyed features should be used to revise nautical charts

no Bottom samples were acquired during this survey

n/a Bottom sample spacing was in accordance with NOAA HSSDM requirements

n/a Bottom samples should be used to update NOAA charts

IV. COMMENTS

1. Data were supplied in two ASCII XYZ files named "seletznorth.txt" (sic) and "siletzsouth.txt". ASCII files were imported into Caris Base Editor 2.0 at the native resolution (2 meters). Many holidays exist.

2. Data were corrected utilizing a temporary gauge, leveled to NOS benchmarks (NO 6 1973 and PORT MON NO 5), acquiring data at 10 minute intervals. NOAA provided water levels were not utilized.

3. Details for those instruments not used within the NOAA fleet:
Odom Hydrotrac VBES- http://www.odomhydrographic.com/pdfs/Hydrotracmar06.pdf
TSS/SG Brown gyro compass - http://www.tss-international.com/surveyor.html
Valeport VTM710 tide gauge - http://www.tss-international.com/surveyor.html

4. 5% crosslines were required for the project. Details for the crossline comparison are contained in the report. Although systemic errors, such as vertical offsets, are not apparent in the data set, only xyz files were supplied, therefore a repeatable check of the crosslines can no longer be performed.

5. Chart comparison performed at PHB.

6. Internal data consistency cannot be determined from line to line, because only .xyz files were provided. Trends in the data do; however, tend to match the charted soundings, contours and features.

7. A daily VBES vs. MBES test was completed. The results can be found in the report.

8. See attached Chart Comparison

Affected charts

Chart	Scale	Edition	Date

See Attached pages

Smooth Sheet Soundings

n/a

Reported Obstructions

n/a

Charted Features

n/a

New Features

n/a

W00119 & W00120 Chart Comparison

Affected Chart:
Chart 18520 26th Ed., Oct. 2005 (1:185,238)

W00119 & W00120 generally agree with the chart within 1 fathom, with these surveys generally being slightly deeper than the chart, except over reefs where the chart is generally deeper.[1] Acquisition of ~100% SWMB coverage reveals shoaling/reefs which are not depicted on the chart. Many holidays exist in the coverage, though their sizes and general trends of the surrounding coverage suggest that no major obstructions are likely present.[2] There are several shoals/reefs near charted soundings which may warrant changes to the chart and submission as DToNs.

A narrow strip of reef near a charted 13 fathom sounding (centered at approximately 44° 59.83N / 124° 02.21W) has a shoalest depth of 9.7 fathoms positioned at 44° 59.93N / 124° 02.30W (Fig. 1).[3]

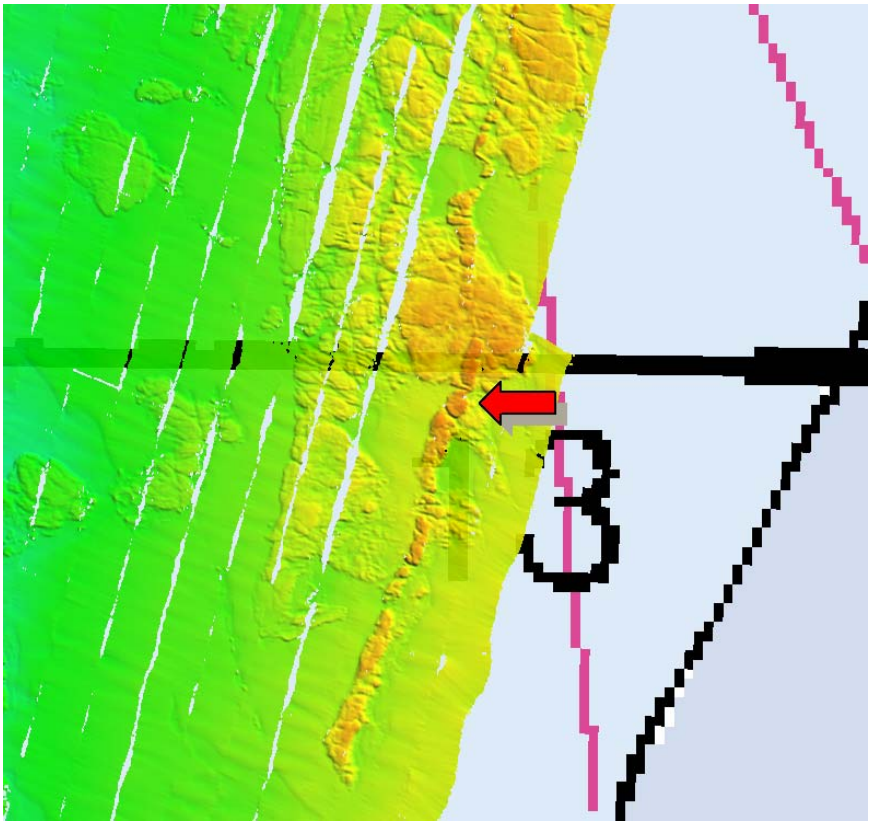


Figure 1. 9.7 fathom reef (arrow points to general vicinity of shoalest sounding)

A small patch of reef immediately south of a charted 15 fathoms sounding (centered at approximately 44° 57.98N / 124° 04.06W) has a shoalest depth of 8.0 fathoms positioned at 44° 57.87N / 124° 03.97W (Fig. 2).[4]

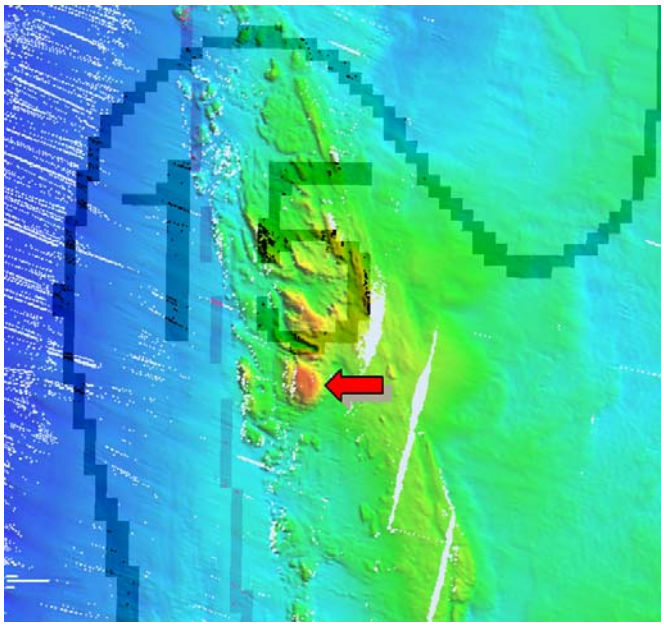


Figure 2. 8.0 fathom reef (arrow points to general vicinity of shoalest sounding)

A reef near a charted 11 fathoms sounding (centered at approximately 44° 57.20N / 124° 03.84W) has a shoalest depth of 5.1 fathoms positioned at 44° 57.35N / 124° 03.82W (Fig. 3).[5]

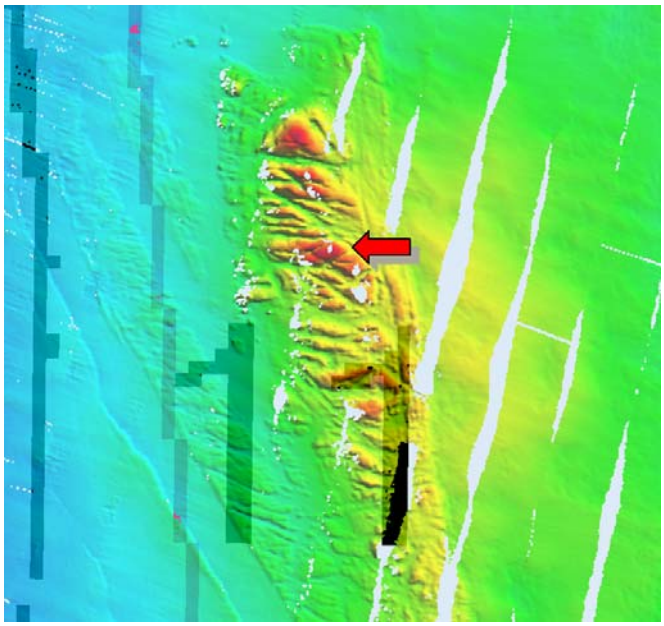


Figure 3. 5.1 fathom reef (arrow points to general vicinity of shoalest sounding)

A small patch of reef west of a charted 13 fathoms sounding (centered at approximately 44° 50.49N / 124° 04.36W) has a shoalest depth of 6.9 fathoms positioned at 44° 50.50N / 124° 04.53W (Fig. 4).[6]

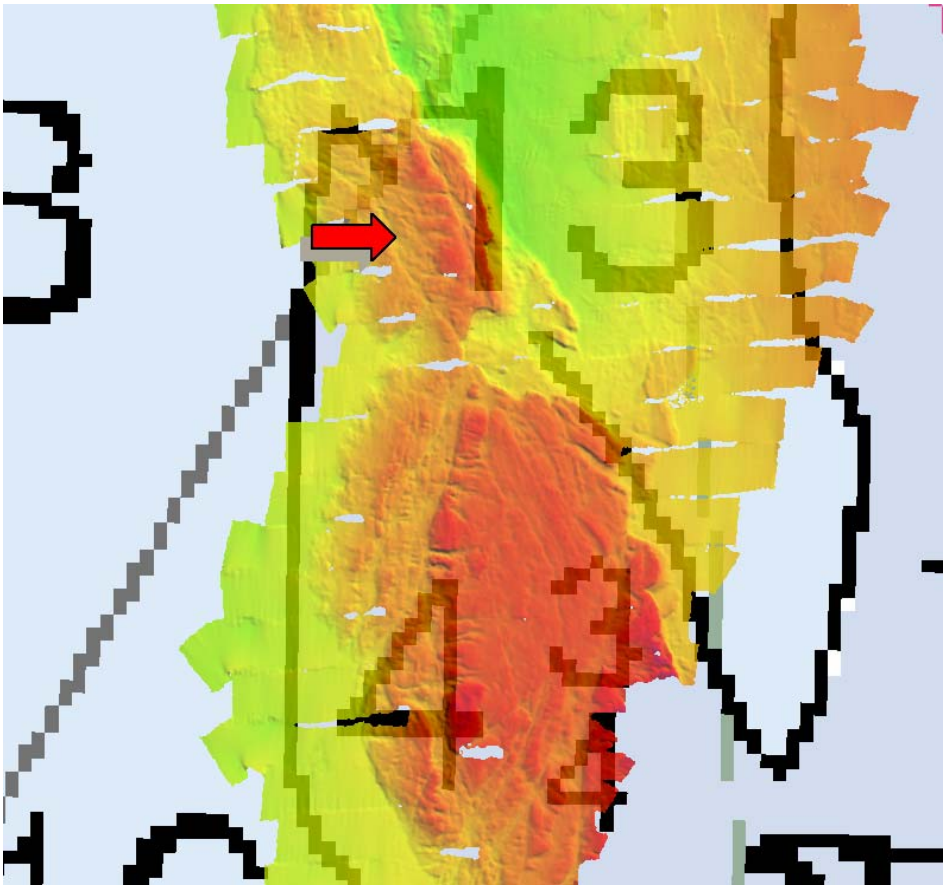


Figure 4. 6.9 fathom reef (arrow points to general vicinity of shoalest sounding)

[1] Concur with clarification. Since full resolution data was not submitted with this survey, charted data should be retained in areas where depths are shoaler than the survey data.
[2] Concur.
[3] Concur with clarification. DTON from survey W00119 has been applied to chart 18520. Retain charted 9 fathom sounding.
[4] Concur with clarification. DTON has been applied to chart 18520. Retain charted 8 fathom sounding.
[5] Concur with clarification. DTON has been applied to chart 18520. Retain charted 5 fathom sounding.
[6] Concur with clarification. DTON has been applied to chart 18520. Retain charted 6 fathom, ¾ foot sounding.

[1] Concur with clarification. Since full resolution data was not submitted with this survey, charted data should be retained in areas where depths are shoaler than the survey data.
[2] Concur.
[3] Concur with clarification. DTON from survey W00119 has been applied to chart 18520. Retain charted 9 fathom sounding.
[4] Concur with clarification. DTON from survey W00119 has been applied to chart 18520. Retain charted 8 fathom sounding.
[5] Concur with clarification. DTON from survey W00119 has been applied to chart 18520. Retain charted 5 fathom sounding.
[6] Concur with clarification. DTON from survey W00120 has been applied to chart 18520. Retain charted 6 ¾ fathom sounding.

W00119 and W00120 HCell Report

Katie Reser, Physical Scientist
Pacific Hydrographic Branch

Introduction

The primary purpose of the HCell is to directly update NOAA ENCs with new survey information in International Hydrographic Organization (IHO) format S-57. HCell compilation of surveys W00119 and W00120 utilized Office of Coast Survey HCell Specifications Version 3.0, May 2008 and Hcell User Guide Version 1.1, June 2008. The surveys were compiled together as HCell W00120 and will be used to update chart 18520, 1:185,238 (26th Ed.; October 05, NM 3/15/2008) and US3OR01M.

1. Compilation Scale

The densities of soundings in the HCell are compiled as appropriate to emulate those soundings of chart 18520, 1:185,238.

2. Soundings

2.1 Source Data

A 2 meter resolution BASE surface, **W00119_120** was used as the basis for HCell production following Branch certification.

A survey-scale sounding (SOUNDG) feature object source layer was built from the **W00119_120** surface in CARIS BASE Editor. A shoal-biased selection was made at 1:20,000 scale using a radius table with values shown in **Table 1**.

Upper limit (m)	Lower limit (m)	Radius (mm)
0	10	3
10	20	4
20	40	4.5
40	100	5

Table 1

2.2 Sounding Feature Objects

In CARIS BASE Editor soundings were manually selected from the high density sounding layer from **W00119_120**, and imported into a new layer created to accommodate chart density depths. Manual selection was used to accomplish a density and distribution that more closely represents the seafloor morphology and that emulates density and distribution of soundings on chart 18520 than is possible using automated methods. See section 10.1, Data Processing Notes, for details about the use of manual sounding selection for W00120. The sounding feature object source layer was exported as **W00119_120_CS**, and imported into HOM.

3. Depth Areas

3.1 Source Data

Using the BASE surface **W00119_120** a single depth area was generated. No depth contours were delivered per OCS HCell Specifications ver.3.0 and Hcell User Guide ver. 1.1.

3.2 Depth Area Feature Objects

One all-encompassing depth range, 7 meters to 60 meters, was used for all depth area objects below MLLW.

4. Meta Areas

The following Meta object areas are included in HCell W00120:

M_QUAL
M_COVR

Meta area objects were constructed on the basis of a perimeter line delineating the surveyed limits. This perimeter was first used to create the Skin of The Earth (SOTE) layer, then was duplicated to the Meta object layers and attributed per the HCell Specifications, ver. 3.0 and Hcell User Guide ver. 1.1.

5. Survey Features

Surveys W00119 and W00120 contain four DTONs with the following surveyed depths:

17.795 meters (9.730 fathoms) at 44-59-55.63N, 124-02-18.08W
14.599 meters (7.983 fathoms) at 44-57-52.53N, 124-03-58.47W
9.240 meters (5.052 fathoms) at 44-57-20.99N, 124-03-49.04W
12.68 meters (6.933 fathoms) at 44-50-30.05N, 124-04-31.66W

The DTONs were reported by the office during the Survey Acceptance Review.

There were no AWOIS items located within the limits of surveys W00119 and W00120

No bottom samples were collected during surveys W00119 and W00120. All charted bottom samples within the surveyed area were imported into the W00120 HCell.

6. Shoreline / Tide Delineation

One depth area (DEPARE) was created for the SOTE.

7. Attribution

All S-57 Feature Objects have been attributed as fully as possible based on information provided by the Hydrographer and in accordance with OCS HCell Specifications, ver. 3.0 and Hcell User Guide ver. 1.1.

8. Layout

8.1 CARIS HOM Layering Scheme

100	Chart scale soundings
101	Survey scale soundings
200	Group 1 object (Skin of the Earth)
300	Point objects
600-602	Meta layers
800	Items used for creation of Blue Notes

8.2 Blue Notes

Notes regarding data sources are in CARIS HOM as layer 800 as a Shapefile set, **W00120_bluenotes_p**.

9. Spatial Framework

9.1 Coordinate System

All spatial map and base cell file deliverables are in an LLDG geographic coordinate system, with WGS84 horizontal, MHW vertical, and MLLW (1983-2001 NTDE) sounding datums.

9.2 Horizontal and Vertical Units

During creation of sounding sets in CARIS BASE Editor, and creation of the HCell in CARIS HOM, units are maintained as metric with millimeter resolution. NOAA rounding is applied at the same time that conversion to chart units is made to the metric HCell base cell file, at the end of the HCell compilation process.

A CARIS environment variable, uslXsounding_round, controls the depth at which rounding occurs. Setting this variable to NOAA fathoms and feet displays all soundings from 0 to equal to or greater than 11 fathoms as whole units.

In an ENC viewer fathoms and feet display in the format X**.**YZZZ, where X is fathoms, Y is feet, and ZZZ is decimals of the foot. For fathoms and feet between 0 and 10 fathoms 4.5 feet (10.75 fms), soundings round to the deeper foot if the decimals of the foot are X**.**Y75000 or greater. For fathoms and feet deeper or equal to 11 fathoms, soundings round to the deeper fathom if feet and decimals of the foot are X**.**45000 (X**.**Y75000) or greater. Drying heights are in feet and are rounded using arithmetic methods. In an ENC viewer, heights greater than 6 feet will register in fathoms and feet using the above stated rules.

HOM Units

Sounding Units:	Meters rounded to the nearest millimeter
Spot Height Units:	Meters rounded to the nearest meter

Chart Unit Base Cell Units

Depth Units (DUNI):	Fathoms and feet
Height Units (HUNI):	Feet (or fathoms and feet above 6 feet)
Positional Units (PUNI):	Meters

10. QA/QC

10.1 Data Processing Notes

Manual chart scale sounding selections were made for this survey. Experience has shown that in areas where bathymetry varied, automated sounding selection is impractical. None of the default sounding suppression options offered in CARIS BASE Editor or HOM yields an acceptable density and distribution of depths, generally bunching soundings nearshore with too sparse coverage seaward. While the customized options

are more practical for this type of terrain, an inordinate amount of time must be spent in experimentation with variations on the algebraic terms in order to devise the most suitable formula, and manual adjustments are still required to the resulting sounding set.

10.2 ENC Validation Checks

W00120 was subjected to QA and Validation checks in HOM prior to exporting to the HCell base cell (000) file. Full millimeter precision was retained in the export of the metric S-57 base cell data set. This data set was converted to a chart unit 000 file. dKart Inspector 5.0 (Service Pack 1) was then used to further check the data set for conformity using the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and the following geometry errors were found:

-Edge [00026] ERROR GG1018: (T0082) edge is used more than once in [FE-000055] DEPARE
-Area [00055] internal contour #37 ERROR GG1003: contour is degenerated
-Edge [00026] ERROR GG1018: (T0082) edge is used more than once in [FE-000054] M_QUAL
-Area [00054] internal contour #37 ERROR GG1003: contour is degenerated
-Edge [00026] ERROR GG1018: (T0082) edge is used more than once in [FE-000038] M_COVR
-Area [00038] internal contour #37 ERROR GG1003: contour is degenerated

The errors were discussed with Sean Legeer at MCD, and it was determined that the errors couldn't be fixed prior to submission. As per his guidance, W00120 HCell will be submitted as is.

11. Products

11.1 HSD, MCD and CGTP Deliverables

- W00120 Base Cell File, Chart Units, Soundings compiled to 1:185,238
- W00120 Base Cell File, Chart Units, Soundings compiled to 1:20,000
- W00120 Descriptive Report including end notes compiled during office processing and certification
- W00120 HCell Report
- Blue Notes shape files

11.2 File Naming Conventions

HOM file set prefix: *W00120_hc*

MCD Chart units base cell file: *US300120_CS.000*

MCD Chart units base cell file, survey scale soundings: *US300120_SS.000*

11.3 Software

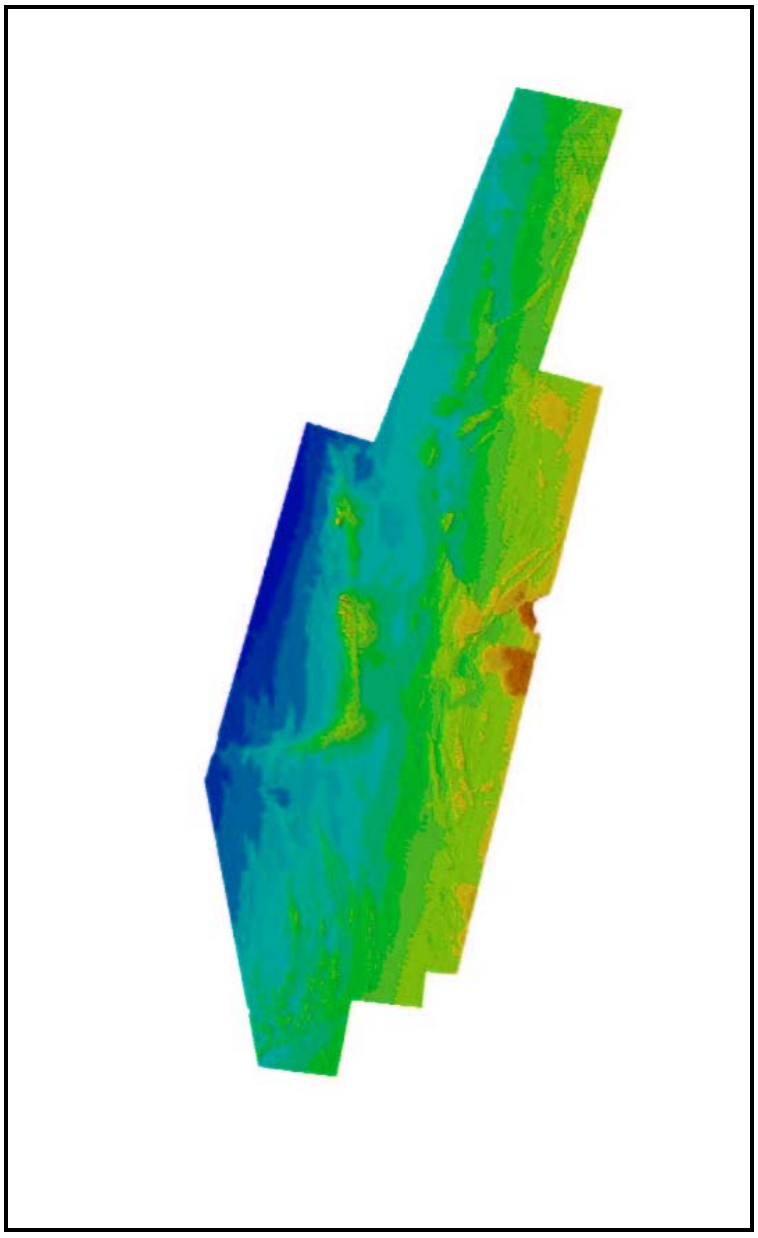
BASE Editor 2.1:	Combination of Product Surfaces and initial creation of the S-57 bathymetry-derived features
HOM 3.3:	Assembly of the HCell, S-57 products, QA
GIS 4.4a:	Setting the sounding rounding variable
dKart Inspector 5.0:	Validation of the base cell file

12. Contacts

Inquiries regarding this HCell content or construction should be directed to:

Katie Reser, Physical Scientist, PHB, Seattle, WA; 206-526-6864;
Katie.Reser@noaa.gov.

The Rocky Reef Shallow Water Multibeam Sonar Survey



for the

Oregon Department of Fish and Wildlife
By

Seavisual Consulting Inc.
P.O. Box 1056
Ashland, OR 97520

A. Project

Title: Rocky Reef Shallow Water Multibeam Sonar Survey

Contractor: Seavisual Consulting Inc.
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Date of Survey: September 29 – October 6, 2003

The objective of the Rocky Reef Shallow Water Multibeam Sonar Survey was to provide the Oregon Department of Fish and Wildlife with a detailed bathymetric data set to assist in evaluating and characterizing nearshore reef habitat. To accomplish this objective, Seavisual Consulting Inc. (SCI) collected over 80 million soundings with state-of-the-art multibeam sonar technology to map 32 square kilometers of nearshore reef.

Following a mobilization on September 29 through October 1, 2003, over 416 km of lines were surveyed in the period of October 2 – 6, 2003 to complete the project. Weather and seastate conditions permitted continuous data collection efforts during this period. The favorable conditions allowed SCI to cover the majority of the projected survey area. A small section of shallow water (Figure 1) was not surveyed due the presence of dense kelp.

B. Area Surveyed

The survey area is located in the nearshore region of the Oregon coast between the Salmon River and Depoe Bay (Figures 1 and 2). The survey is divided into a north and south area encompassing 24.6 km^2 and 7 km^2 respectively. Depth ranges from 10 to 50 meters with gently sloping areas interspersed with rocky reefs. Small areas of dense kelp exist at the inshore limits of the each survey area and one such area prevented data acquisition.

The south area was surveyed on October 2nd and 3rd, 2003 and the north area was surveyed from October 4th through October 7th.

C. Survey Vessels

The vessel utilized for the project was the Charter Vessel Tacklebuster based in Depoe Bay, Oregon and piloted by owner/operator Jeurgen Turner. All sonar and sound velocity data acquisition was accomplished aboard the Tacklebuster. Vessel specifications are as follows.

Length: 43’ 0”
Beam: 14’ 3”
Draft: 4’
Gross Tonnage: 27 tons
Power: Twin 320 HP Cat Diesels
Registration O.N. 590-036

Depoe Bay is one of the most unique and difficult harbors on the Oregon coast. To safely and efficiently complete this project required the skill and two decades of experience of the vessel skipper. Without his capabilities, this project would have been very difficult to complete.

D. Automated Data Acquisition and Processing

Coastal Oceanographics Hypack Max version 2.12 for Windows software running on a Pentium 333 MHz laptop PC, was used to collect all sensor data and provide vessel guidance

during field operations. The data acquisition system (DAS) computer acquires all multibeam system data (Seabat, MRU, DGPS, and Gyrocompass) through a multiport Quatech QSP100 PCMCIA card. All sensor data is time-tagged and stored on hard disk during surveying while simultaneously providing real-time vessel guidance along predetermined survey lines. Approximate sounding depths are displayed on an area map to assure full coverage of the multibeam system. Latitudes and longitudes received from the DGPS system are converted to the local survey datum in real-time.

Coastal Oceanographics Hysweep multibeam sonar processing software was used to edit, filter, and resolve all sonar system data into project horizontal coordinate and vertical datum soundings. Hysweep is a complete multibeam package allowing the automated and manual editing of all sonar, vessel motion and attitude, and positioning sensors. Additionally, with Hypack Max 2.12, tides and sound velocity data can be applied to correct and resolve multibeam soundings.

Quality Control

A. Sounding Equipment

Multibeam Sonar

The Reson Seabat 8101 multibeam sonar was used to obtain bathymetric soundings of Siletz Reef. The Seabat, operating at 240 kHz, transmits a 170 x 15-degree acoustic beam. On return, the acoustic beam is resolved into 101, 1.5 degree x 1.5-degree acoustic soundings. The 150-degree beam casts a bottom footprint of 7.4 times the water depth in depths of less than 70 meters. Typical hydrographic surveys make use of the wide swath of the 8101 to efficiently survey large areas. The Rocky Reef project however, required not only full coverage of the survey area, but in addition, required the detection and resolution of relatively small (2m) bottom features. These requirements excluded the use of certain outer portions of the full sonar swath. The larger acoustic beam footprints produced from the outer beams, although capable of detecting, could not fully resolve such small features.

The Seabat 8101 Sonar system consists of the transducer head, an onboard processor, and a video monitor. The transducer is deployed on a fixed mount over the starboard side of the vessel. The mount is firmly fixed in position during data collection such that all motion sensors, located at different points on the vessel, reflect the true motion of the sonar. An interactive mouse utilizes the video monitor to adjust system settings such as gain, power, and range. During data collection, the video monitor displays the acoustic signal being collected along with each digitized beam.

Seabat data rates vary depending on the depth of measurement and baud rate of the serial line to the data acquisition computer. During this survey, the system was producing between 6 and 7 swaths/second providing 600 to 700 soundings/second. The range resolution of each beam is 1.25 cm.

Singlebeam Sonar

The Odom Hydrographic Hydrotrac Singlebeam echosounder was utilized for multibeam calibrations. The Hydrotrac, operating at 200 kHz and equipped with a 3 degree transducer, was mounted at the same draft as the Seabat. All digital data from the Hydrotrac was time-tagged and recorded by the data acquisition system running Hypack Max. Sounding data is also recorded on the Hydrotrac's analog printer.

B. Corrections to Soundings

Speed of Sound Measurements

Sound velocity profiles of the water column were recording with a Seabird SBE-19 CTD (Conductivity, Temperature, Depth). The SBE-19 is a self contained measurement device with on-board memory that calculates sound velocity (SV) from the measured values of C, T, and D. SV is calculated using the Chen-Millero equations. The profiler, recording at 2 Hz, is lowered at a rate of approximately 1 meter/sec. The resulting data set represents SVs recorded approximately every .5 meters of water column.

Sound velocity profiles were obtained at various times and places during surveying. Profiles were obtained at sites encompassing the area chosen for that day's survey. When, in the course of one day, surveying extended to areas not within the area defined by previous SV profiles, additional casts were obtained.

Each profile was repeated as a check on instrument operations. The data was downloaded at the end of the day for use in sound velocity and ray path bending corrections of the Seabat sonar data.

Static Draft

The static draft was measured dockside with the Seabat sensor in normal survey position. The draft is measured from the waterline to the manufacturers recommended transducer center point. This measurement, 0.82 meters, was added to the sonar files in post processing.

Dynamic Draft (settlement and squat)

The combined effect of settlement and squat was determined for a range of survey speeds. The dynamic draft was determined by acquiring soundings over a known point at speeds ranging from 4 to 7.5 knots. The corrected soundings were examined to determine any measurable changes in draft due to vessel speed.

Heave, Pitch, and Roll and Yaw Sensors

A TSS DMS05 motion sensor was used to monitor and measure sonar roll (rotation port and starboard), pitch (rotation fore and aft), and heave (vertical displacement) during data collection. The DMS05 is interfaced to both the Differential Global Positioning System (DGPS) and the SG Brown Meridian gyrocompass to reduce heave error during vessel turns and speed changes. The sensor provides data at a rate of up to 32 Hz at 9600 baud transmit. Manufacture specifications of accuracy are as follows.

Roll , Pitch;
- Range: +/- 50 degrees
- Accuracy: +/- .03 to .05 degrees

Heave:
- Range: +/- 99m
- Accuracy: 5 cm or 5%, whichever is greater

The SG Brown Meridian gyrocompass was used to monitor vessel and sonar yaw (rotation about the Z-axis) during sonar data collection. A gyrocompass is utilized during high resolution acoustic surveys due to it's accuracy (.5 degree) and it's immunity to varying magnetic fields. The SG Brown Meridian updates at a rate of 2 Hz. The DMS05 and Meridian gyrocompass data are time-tagged and recorded by the DAS computer. During processing, time series of each measurement are inspected for data gaps, spikes, or trends that indicate possible errors in measurement. After inspection or editing, the vessel orientation data are applied to the sonar ranges to determine sounding depths.

Tide Measurement

A temporary tide level recording station was established in the Depoe Bay boat basin. Levels were run from NOS tidal bench marks NO 6 1973(4.883 m MLLW) and PORT MON NO 5(3.945 m MLLW) to a piling adjacent to the survey vessel berth. A self-recording Valeport VTM710 Tide gage recorded water level at 10 minute intervals during all sonar data acquisition operations. Each day prior to and after surveying, water level was visually recorded and compared to the digital display of the VTM710. The tide data was downloaded daily and inspected for data gaps or bad measurements.

C. Hydrographic Position Control

Sonar positioning was determined with a Trimble AG132 Differential Global Positioning System (DGPS) with US Coast Guard (USCG) Beacon receiver. The nearest USCG Beacon broadcast station is located at Ft. Stevens, Oregon. The Horizontal Datum for the project is Universal Transverse Mercator (UTM), North American Datum 1983(NAD83), Zone 10, Meters. A local NGS monument, REEF, (44° 48' 36.20913"N, 124° 03' 43.54587"W WGS84) was used as a position checkpoint at the beginning of the survey. From REEF, a temporary horizontal control point was established on a piling adjacent to the survey vessel berth. Subsequent daily position checks utilized this temporary horizontal control point.

Seven or more satellites were visible throughout data collection and HDOP values remained below 2.0 during the project. Position checks, performed prior to surveying each day, confirmed sub-meter accuracy.

D. Statistics

- Lineal Kilometers of sounding lines: 417 km
- Square kilometers of 100% coverage: 32
- Number of velocity casts: 11
- Data file characteristics:

CD	*Data*	*Format*	*Description*
1	Raw	XTF	Attached File Listing
2	Edited Soundings	ASCII E,N,Z	2 m gridded, Median value retained Ungridded, Cleaned and Edited

E. Miscellaneous

The following discussion is presented to describe any methods or conditions that may be significant to end users of the bathymetric data resulting from the Rocky Reef Shallow Water Multibeam Survey.

Data Acquisition Systems

Initially the project intended to have two data acquisition systems running in parallel. Hypack Max 2.12 was installed primarily to provide real-time navigation guidance and a Navisoft system was installed to acquire all MBS data and output raw data files in XTF format (project requirement). The Navisoft system malfunctioned at the beginning of surveying and was never functional. Hypack became the sole MBS data acquisition system. A third party Hypack to XTF format converter was used to convert Hypack RAW data files into XTF format. Prior to implementing this change, extensive testing of the Hypack-to-XTF converter confirmed it's operation.

Vessel Motion Sensor

The Siletz Reef Survey utilized a TSS DMS05 MRU for measuring the vessel heave,

pitch, and roll. When the DMS05 is installed, a dominant wave period is selected to assure the bandwidth filters accurately calculate and time-tag vertical displacement. SCI's experience on the Oregon coast has shown that on vessels such as the Tacklebuster, a filter choice of short or medium seastate most accurately reflects the prevailing seastate. Unfortunately, the primary wave periods existing during the survey were longer than the upper limit of the MRU. This resulted in the heave measurement being slightly out of phase with the seas. The error is seen as an undulation along track of the sea bottom and can be as large as 0.5 meters. Although this error is within the project's accuracy requirements, it is described to assure users of the data do not misinterpret bottom conditions resulting from this error.

Line Orientation and Sea Conditions

Previous surveys by SCI in the nearshore region of the Oregon coast have been conducted with primary survey lines oriented in the cross-shelf direction. Although not usually the most efficient method, this orientation allows the vessel to avoid excessive roll motion in typical sea conditions (wave orientation).

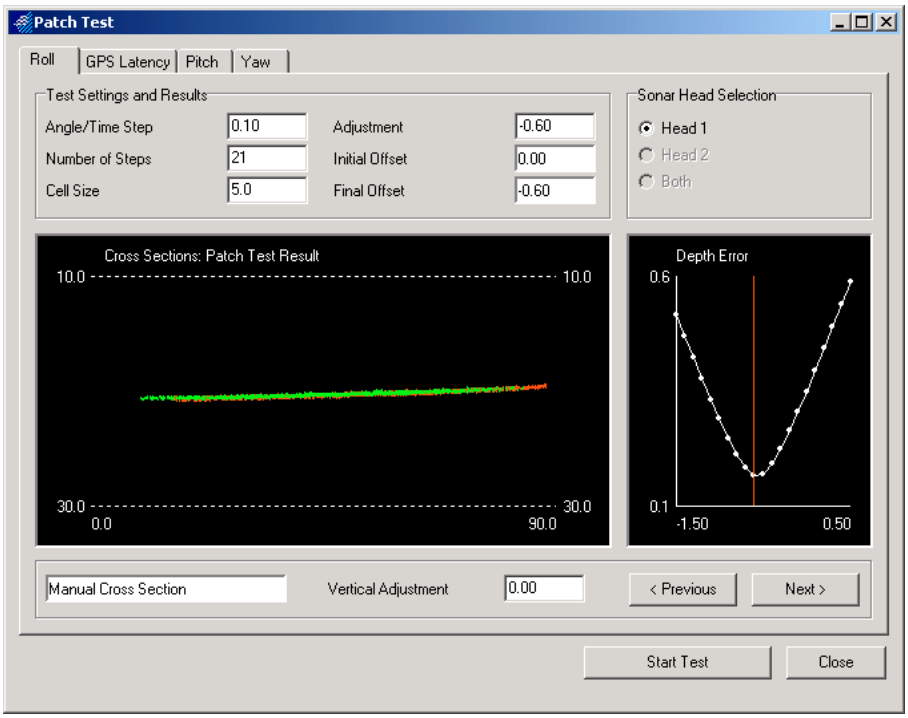
The first two days of surveying mapped the southern section of the project and all lines were run in the cross-shelf direction. Dominant wave direction changed from southerly on October 2nd to westerly on October 3rd. Seas were more wind driven on the 2nd, changing to longer period swell on the 3rd. The northern section of the project was surveyed from October 4th through October 6th using lines parallel to shore. This orientation was chosen due to avoid significant loss of time during turning. The westerly swell dominated seas continued from October 4th through the 5th. An approaching storm developed significant southwesterly seas on the final day of surveying, October 6th.

Crosslines

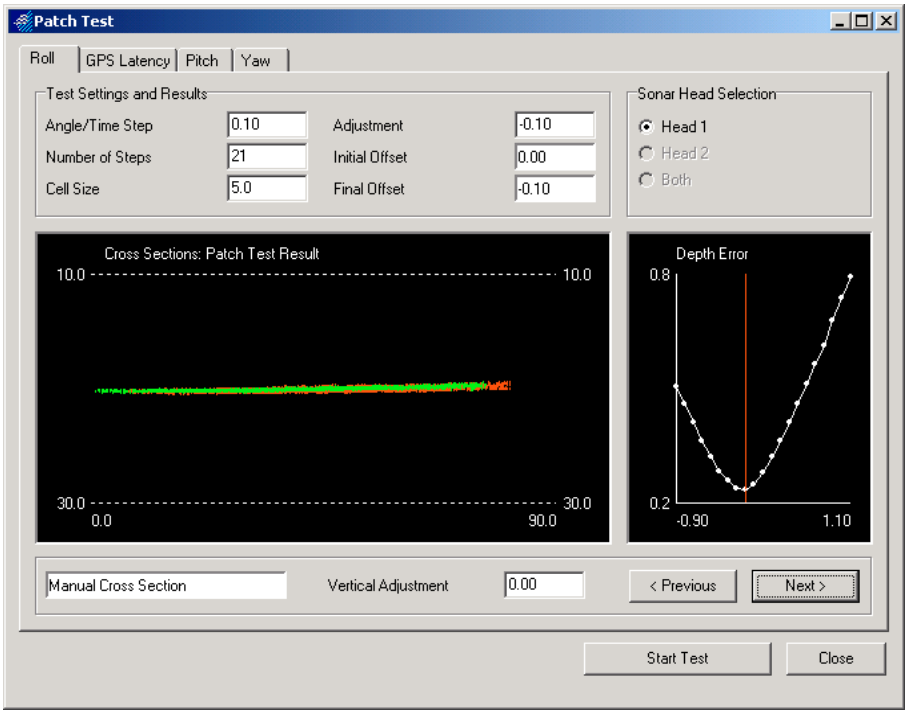
The project requirements included a minimum of 5% of all lines be crosslines at angles from 45^0 to 90^0 to mainscheme survey lines. This was accomplished in the south survey area with a north-south line through the center of the southern survey area. In the north area, a series of east-west lines was planned to satisfy this requirement. The decision was made to complete all mainscheme lines prior to surveying crosslines in the North area. Unfortunately, seastate and weather degraded on October 6th. These ocean conditions continued to degrade and project time constraints prevented further data acquisition therefore no crosslines were accomplished in the North survey area.

Appendix A. Calibration Data

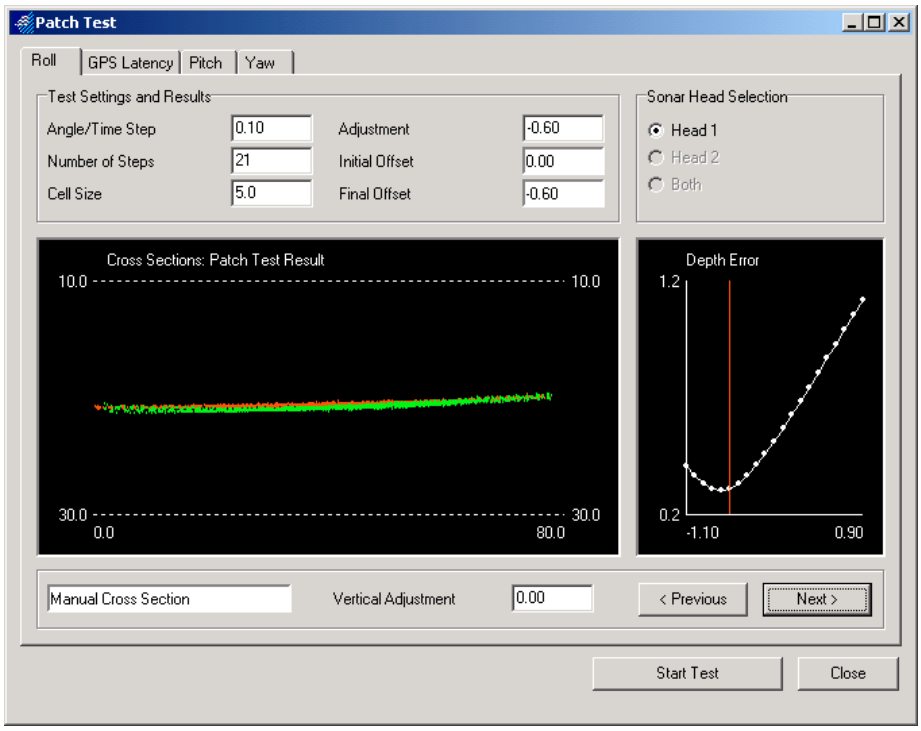
Alignment and Patch Tests



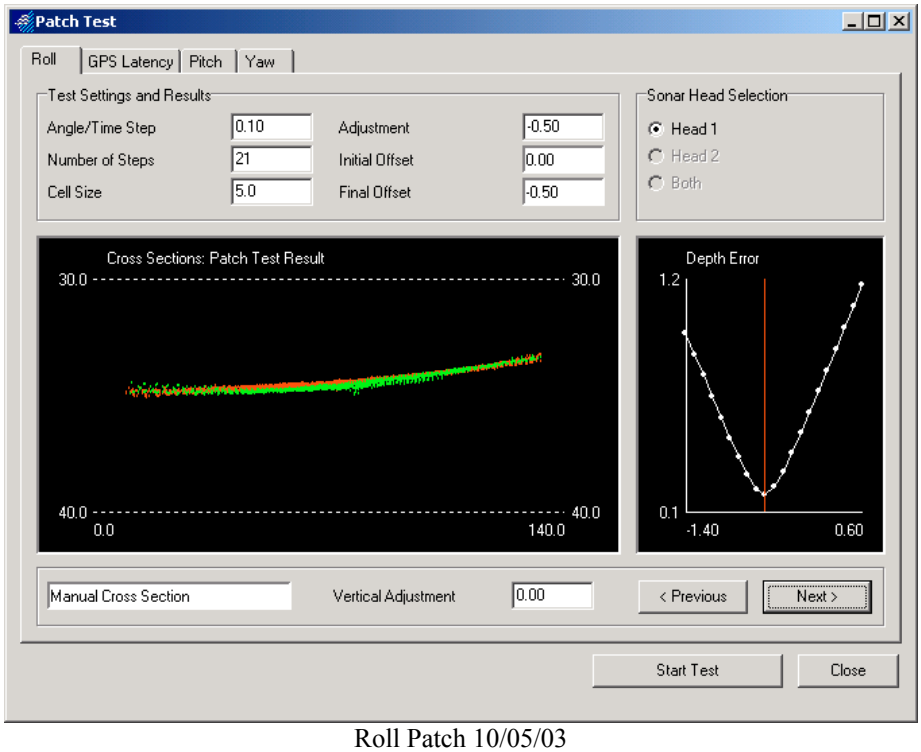
Roll Patch 10/02/03



Roll Patch 10/03/03

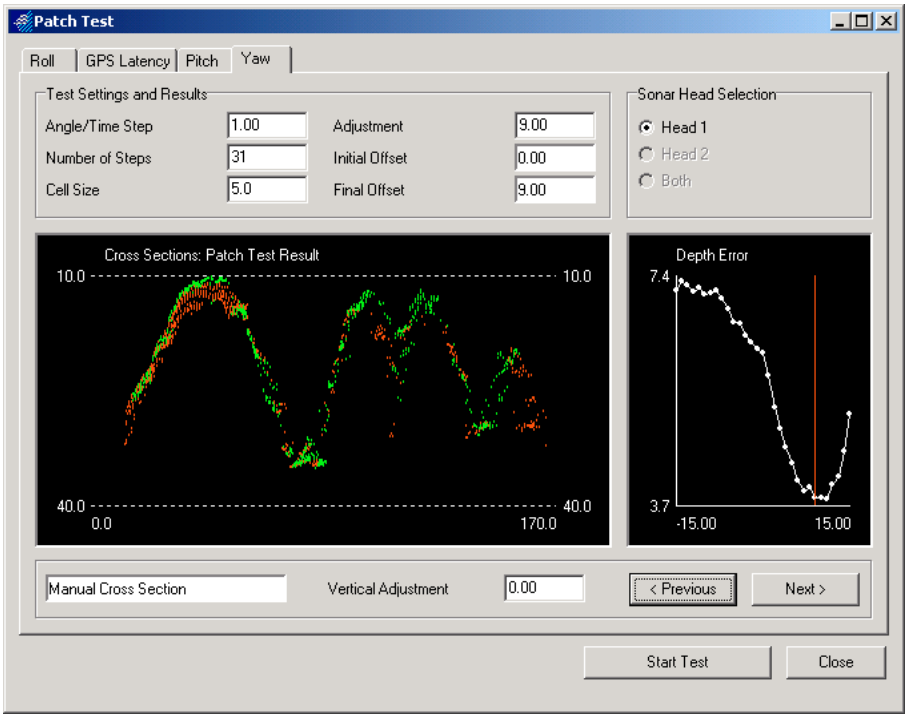


Roll Patch 10/04/03



Roll Patch 10/05/03

Roll Patch 10/06/03



Yaw Patch

Appendix B. Data Processing Routine

Processing of data from the survey followed multibeam procedures described in steps 1-7 below. The following lists these steps with comments pertaining to this data set;

1. Sensor Alignment and Calibration Adjustments

- *As discussed previously, although an initial Patch test was conducted on October 2, 2003 the critical roll offset calibration was repeated daily to account for slight variations in the re-placement of the sonar mount and motion sensor. Results from each calibration were applied to that survey day's results.*

2. Inspection and editing of vessel motion and position data
    - *Satellite coverage and position qualities (HDOP) were dependable throughout the survey. Either seven (7) or eight (8) satellites were visible and HDOP values of less than 2 were typical.*
3. Developing tide and sound velocity profile data files
    - *Vertical profiles of sound velocity showed a mild gradient in the upper 5 to 15 meters throughout the survey area. SV was uniform below this layer., thereafter remaining constant with depth.*
    - *Tides monitored at Depoe Bay were used to correct sounding data to MLLW.*
4. Merging motion, position, and tide data with Seabat sounding data along a common time base
5. Editing sounding data manually and/or automatically
    - *Fully resolved soundings were edited both manually and automatically to eliminate spikes and bad returns. The dominant cause of bad data was excessive vessel motion. Heavy seas on October 3rd and 7th resulted in high roll angles that negatively affected the accuracy of the outer beams of the sonar .*

- *Automatic spike filters eliminated 2m or greater jumps in point-to-point soundings. Maximum and minimum depth filters were varied depending on area covered but were typically set to –5 m (minimum). Other automated filters included;*
- *Quality Index of 3*
- *Beam angle of 60 degrees or less. In certain shallow areas, soundings at higher beam angles (up to 65 degrees) were utilized.*

6. Thinning edited data to desired density
    - *Data was thinned to one sounding per 2m x 2m grid. The median value of soundings in the grid square was retained along with the grid square's center point northing and easting. (Note: If no soundings are in a particular grid square, no data is created for that square.)*
7. Creating a Digital Terrain Model(DTM) for contour and 3D drawing creation

- *The 2 m gridded sounding data was used to develop a DTM and bathymetric contour map in TerraModel V9.7 as a final data quality check .*

Appendix C. Sound Velocity Profiles

Figures 1 and 2 display location.

Sea-Bird	SBE19	Data	File:					
FileName	=	C:\Program	Files\Sea-Bird\SEATERM\siletz1002001.hex					
Software	Version	1.1						
Temperatu	SN	=	1290					
Conductivit	SN	=	1290					
System	UpLoad	Time	=	Oct	2	2003	18:27:37	
0.251	1492.09							
0.913	1488.95							
1.629	1487.87							
2.159	1487.51							
2.583	1487.35							
3.007	1487.24							
3.723	1486.75							
4.438	1486.16							
5.26	1485.48							
6.135	1484.61							
6.877	1484.14							
7.566	1483.99							
8.229	1483.8							
8.892	1483.51							
9.502	1483.33							
10.35	1483.23							
11.172	1483.21							
11.915	1483.24							
12.658	1483.23							
13.294	1483.16							
13.904	1483.11							
14.541	1483.07							
15.177	1483							
15.92	1482.91							
16.61	1482.91							
17.273	1482.91							
17.724	1482.93							
18.201	1482.89							
18.758	1482.88							
19.448	1482.86							
20.191	1482.86							
20.934	1482.84							
21.597	1482.81							
22.261	1482.81							
22.845	1482.81							
23.482	1482.84							
24.012	1482.84							
24.596	1482.86							
25.18	1482.86							
25.817	1482.94							
26.082	1482.94							
26.056	1482.94							
25.791	1482.94							
25.499	1482.95							
25.18	1482.91							

CTD 10/02/03

Sea-Bird SBE19 Data File:
FileName = C:\Program Files\Sea-Bird\SEATERM\siletz1003003.hex
Software Version 1.1
Temperatu SN = 1290
Conductivit SN = 1290
System UpLoad Time = Oct 3 2003 18:21:07

0.012	1488.47
0.171	1487.68
0.357	1487.2
0.569	1486.98
1.019	1486.5
1.735	1486.04
2.636	1485.65
3.431	1485.27
3.935	1485.2
4.412	1485.01
4.942	1484.82
5.737	1484.53
6.559	1484.28
7.275	1484.18
7.778	1484.14
8.282	1484.07
8.892	1484.05
9.714	1484.04
10.377	1484.09
10.934	1484.11
11.464	1484.08
12.074	1484.07
12.764	1483.97
13.188	1484.17
12.976	1484.04
12.233	1484.07

CTD 10/03/03A

Sea-Bird SBE19 Data File:
FileName = C:\Program Files\Sea-Bird\SEATERM\siletz1003004.hex
Software Version 1.1
Temperature SN = 1290
Conductivity SN = 1290
System UpLoad Time = Oct 3 2003 18:21:14

0.145	1489.51
0.436	1488.42
0.675	1487.84
0.966	1487.27
1.496	1486.7
2.026	1486.17
2.689	1485.55
3.351	1485.18
3.908	1485.07
4.544	1484.88
5.207	1484.77
6.002	1484.72
6.851	1484.67
7.593	1484.61
8.468	1484.54
9.29	1484.51
10.244	1484.54
11.146	1484.41
12.021	1483.92
12.817	1483.17
13.559	1482.66
14.381	1482.39
15.283	1482.07
16.159	1481.72
16.954	1481.5
17.671	1481.33
18.281	1481.27
18.891	1481.17
19.687	1481.07
20.563	1481.03
21.412	1481.06
21.942	1481.06
22.473	1481
23.137	1480.89
23.8	1480.82
24.57	1480.8
25.207	1480.78
25.844	1480.78
26.481	1480.77
27.171	1480.77
27.834	1480.78
28.418	1480.82
28.763	1480.85
28.817	1480.83
28.551	1480.81

CTD10/03/03B

Sea-Bird SBE19 Data File:
FileName = C:\Program Files\Sea-Bird\SEATERM\siletz1003005.hex
Software Version 1.1
Temperatu SN = 1290
Conductivit SN = 1290
System UpLoad Time = Oct 3 2003 18:21:21

0.039	1491.96
0.145	1491.66
0.33	1491.04
0.622	1490.21
0.966	1489.55
1.443	1488.89
2.079	1488.28
2.768	1487.8
3.643	1487.3
4.412	1486.91
5.207	1486.68
5.949	1486.58
6.824	1486.48
7.672	1486.35
8.653	1486.17
9.475	1486.07
10.271	1485.9
11.04	1485.55
11.835	1485.1
12.737	1484.63
13.559	1484.32
14.488	1483.96
15.257	1483.67
16.053	1483.41
16.769	1483.17
17.485	1482.97
18.254	1482.71
19.05	1482.5
19.926	1482.32
20.828	1482.09
21.65	1481.92
22.473	1481.83
23.137	1481.75
23.906	1481.59
24.676	1481.33
25.445	1481.06
26.242	1480.92
26.958	1480.88
27.675	1480.88
28.153	1481.06
28.392	1481.05
28.578	1481.02
28.684	1480.98

CTD10/03/03C

Sea-Bird SBE19 Data File:
FileName = C:\Program Files\Sea-Bird\SEATERM\siletz1004006.hex
Software Version 1.1
Temperatu SN = 1290
Conductivit SN = 1290
System UpLoad Time = Oct 4 2003 18:18:41
October 4, 2003

0.145	1488.92
0.145	1488.6
0.357	1488.28
0.834	1487.97
1.496	1487.89
2.238	1487.91
3.007	1487.91
3.882	1487.83
4.73	1487.78
5.578	1487.75
6.559	1487.7
7.354	1487.59
8.15	1487.51
8.919	1487.43
9.634	1487.39
10.536	1487.37
11.358	1487.34
12.127	1487.25
12.817	1487.14
13.559	1487.03
14.275	1486.95
15.151	1486.88
16.079	1486.47
16.954	1485.96
17.75	1485.45
18.626	1484.83
19.395	1484.06
20.271	1483.43
21.04	1483.07
21.863	1482.86
22.792	1482.83
23.535	1482.86
24.331	1482.89
25.074	1482.89
25.844	1482.83
26.587	1482.71
27.33	1482.6
28.02	1482.55
28.631	1482.51
29.241	1482.59
29.401	1482.5
29.215	1482.6
29.135	1482.58
29.215	1482.56

CTD 10/04/03A

Sea-Bird SBE19 Data File:
FileName = C:\Program Files\Sea-Bird\SEATERM\siletz1004007.hex
Software Version 1.1
Temperatu SN = 1290
Conductivit SN = 1290
System UpLoad Time = Oct 4 2003 18:18:50

0.065	1489.47
0.145	1489.02
0.304	1489.15
0.516	1489.02
0.675	1488.48
1.099	1488.33
1.682	1488.24
2.45	1488.01
3.166	1487.61
3.935	1487.08
4.624	1486.66
5.446	1486.44
6.241	1486.37
7.116	1486.35
7.964	1486.36
8.68	1486.38
9.316	1486.4
10.006	1486.39
10.748	1486.41
11.57	1486.43
12.313	1486.42
13.108	1486.33
13.878	1486.1
14.567	1485.94
15.363	1485.7
16.132	1485.41
16.875	1484.94
17.644	1484.4
18.467	1484.12
19.263	1483.92
20.058	1483.64
20.801	1483.35
21.518	1483.15
22.208	1483
22.977	1482.88
23.827	1482.77
24.623	1482.73
25.392	1482.72
26.082	1482.73
26.746	1482.79
27.091	1482.82
27.171	1482.86
27.224	1482.9
27.277	1482.93

CTD 10/04/03B

Sea-Bird SBE19 Data File:
FileName = C:\Program Files\Sea-Bird\SEATERM\siletz1005008.hex
Software Version 1.1
Temperatu SN = 1290
Conductivit SN = 1290
System UpLoad Time = Oct 5 2003 18:26:28

0.092	1489.25
0.198	1488.31
0.198	1487.97
0.224	1487.7
0.622	1487.56
1.39	1487.52
2.212	1487.5
2.98	1487.49
3.855	1487.44
4.915	1487.4
5.896	1487.37
6.877	1487.36
7.699	1487.35
8.521	1487.35
9.237	1487.34
10.191	1487.31
11.04	1487.29
12.074	1487.3
12.976	1487.34
13.851	1487.36
14.673	1487.38
15.363	1487.12
15.973	1486.52
16.716	1485.81
17.432	1485.18
18.148	1484.89
19.077	1484.67
20.032	1484.44
20.961	1484.3
21.863	1484.23
22.792	1484.2
23.561	1484.17
24.251	1484.08
24.862	1483.94
25.552	1483.82
26.348	1483.7
27.065	1483.57
27.728	1483.26
28.286	1482.87
28.923	1482.68
29.294	1482.7
29.427	1482.72
29.374	1482.7
29.294	1482.79
29.427	1482.62

CTD10/05/03

Sea-Bird SBE19 Data File:
FileName = C:\Program Files\Sea-Bird\SEATERM\siletz1006.hex
Software Version 1.1
Temperatu SN = 1290
Conductivit SN = 1290
System UpLoad Time = Oct 8 2003 2:34:16

0.542	1488.15
1.152	1488.02
1.894	1487.92
2.715	1487.85
3.564	1487.75
4.412	1487.46
5.233	1486.97
5.976	1486.47
6.824	1486.05
7.646	1485.72
8.468	1485.48
9.263	1485.26
10.085	1484.98
10.934	1484.61
11.729	1484.29
12.472	1484.13
13.188	1484.03
13.904	1483.93
14.62	1483.89
15.416	1483.89
16.159	1483.87
16.928	1483.89
17.644	1483.88
18.387	1483.88
19.236	1483.87
20.165	1483.87
20.987	1483.89
21.757	1483.89
22.5	1483.88
23.269	1483.88
24.039	1483.87
24.755	1483.88
25.445	1483.88
26.109	1483.89
26.613	1483.91
27.118	1483.89
27.595	1483.88
28.02	1483.94
28.153	1483.85
28.047	1483.85

CTD 10/06/03

Appendix D. DGPS Verification Data

The Differential Global Positioning System utilized the USCG Beacon from Ft. Stevens, Oregon (46^0 12' 17.577"N, 123^0 57' 21.8862"W WGS84) for differential corrections.

National Geodetic Survey Control Monument(Used to set Temporary Checkpoint)
REEF (44^o 48' 36.20913"N, 124^o 03' 43.54587"W WGS84)
Local Checkpoint
Piling (44^0 48' 31.92951"N, 124^0 03' 36.99767"W WGS84)

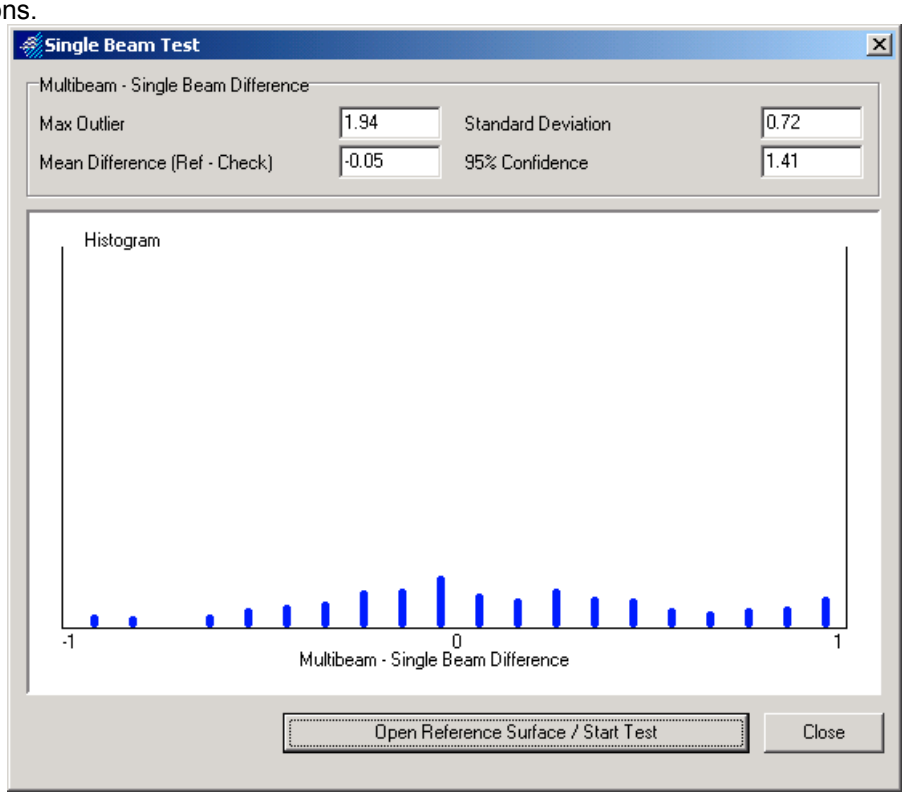
Daily Horizontal Position Check in results:

Date	*Checkpoint Distance(m)*
10/02/03	*0.6*
10/03/03	*0.9*
10/04/03	*0.5*
10/05/03	*0.6*
10/06/03	*0.3*

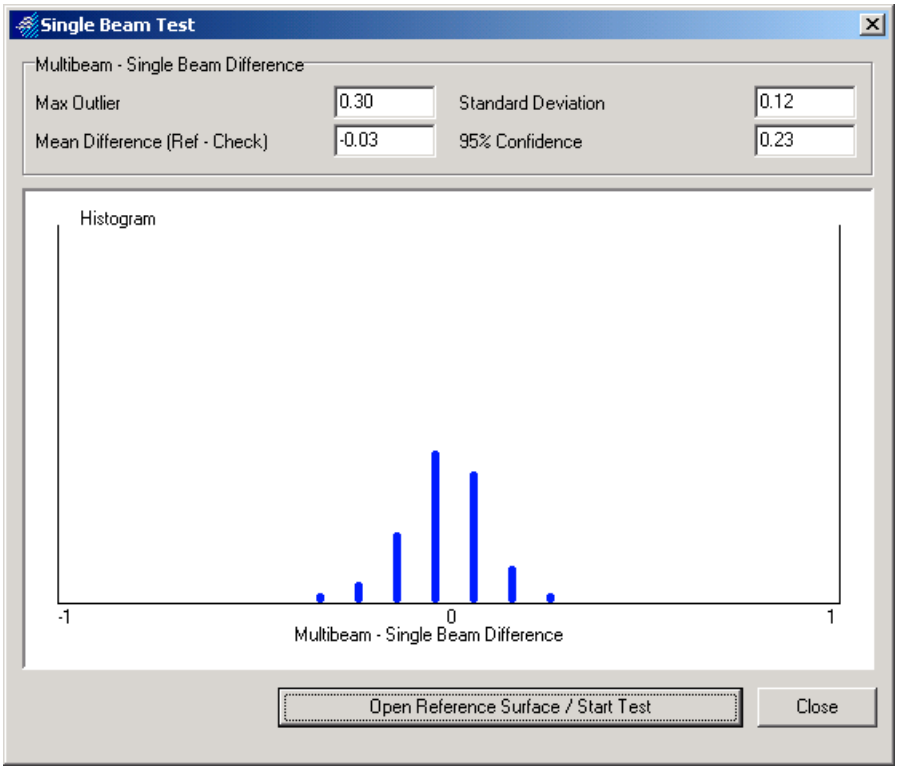
Appendix E. Multibeam System Accuracy Test and Check

Depth Confidence Check

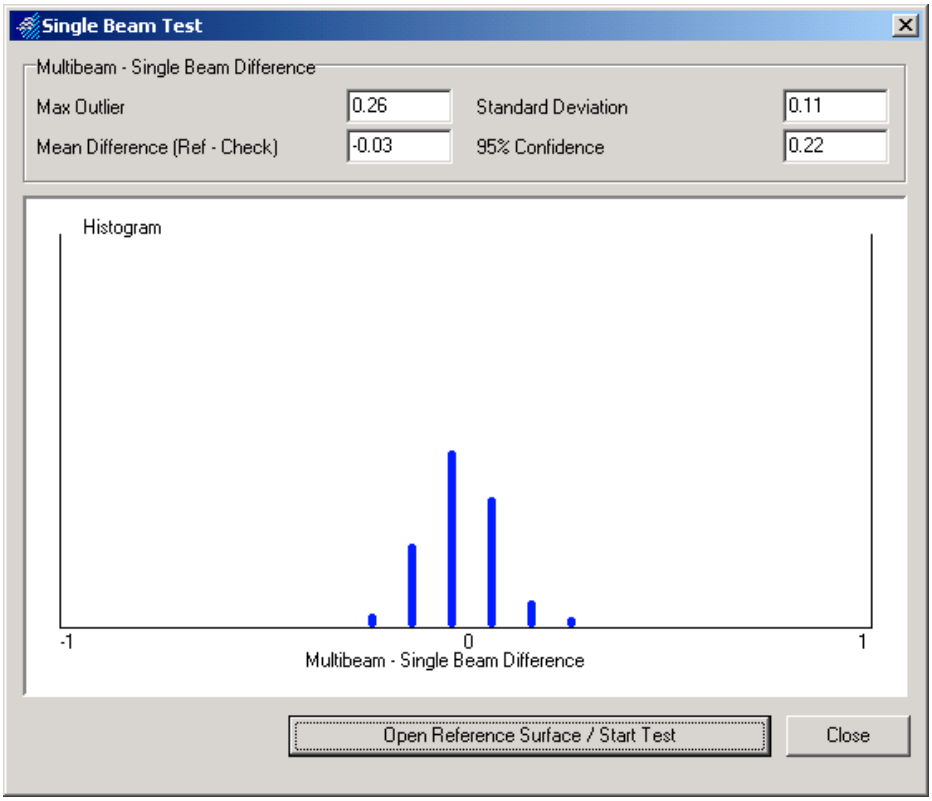
The following graphs display the results of daily single beam vs near-nadir multibeam comparisons.



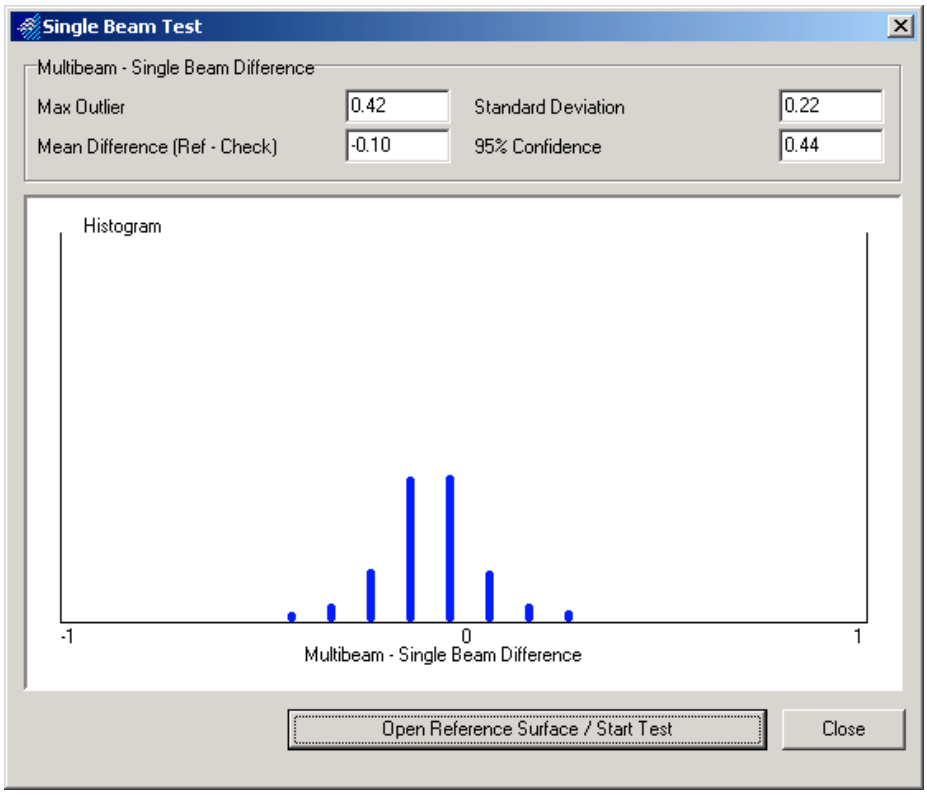
10/02/03



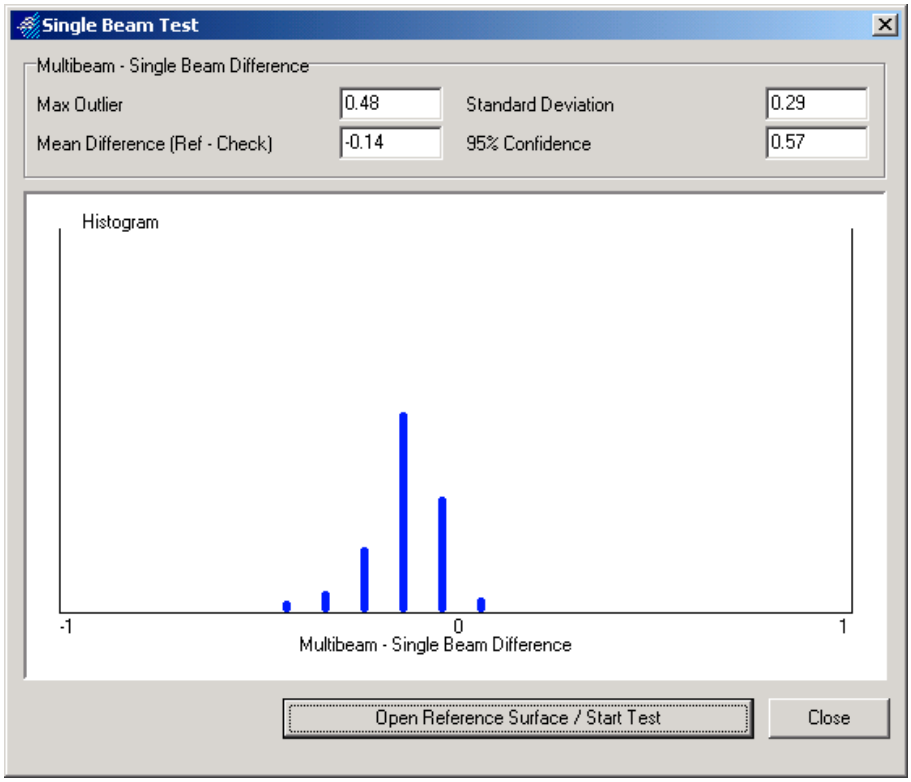
10/03/03



10/04/03

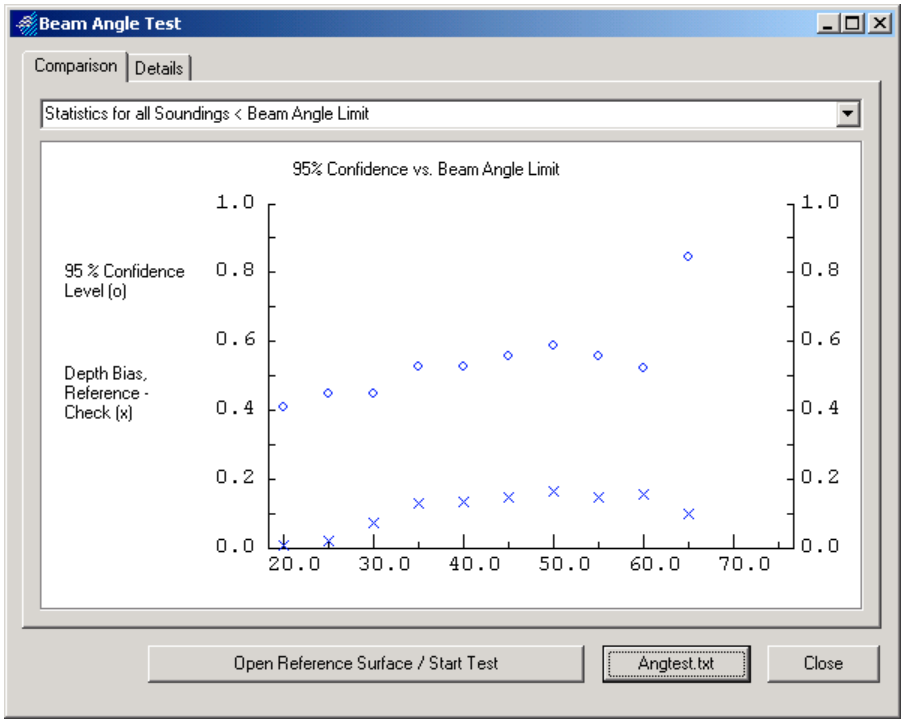


10/05/03

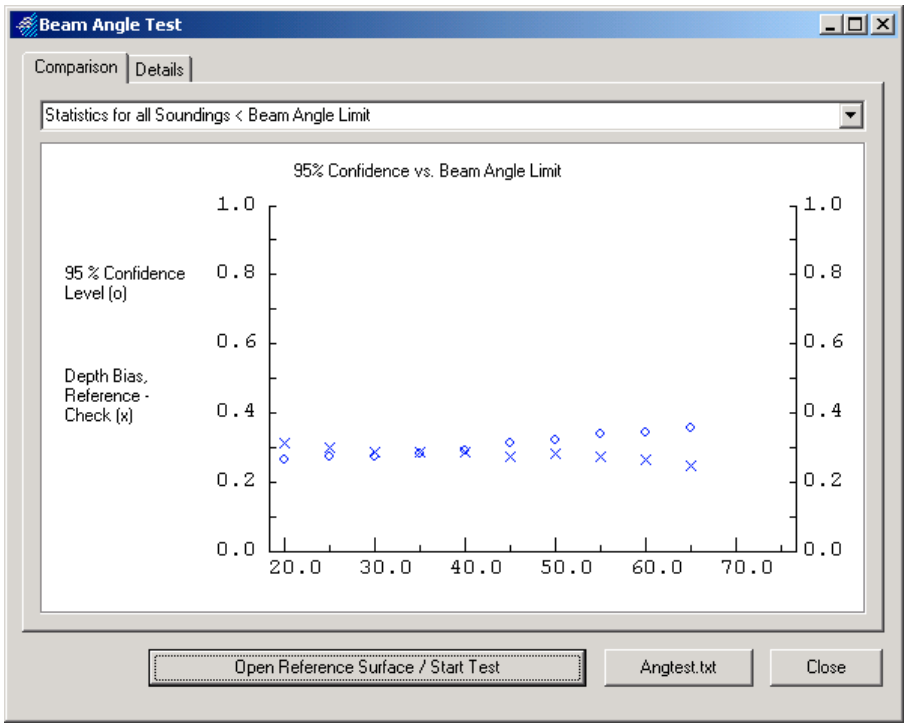


10/06/03

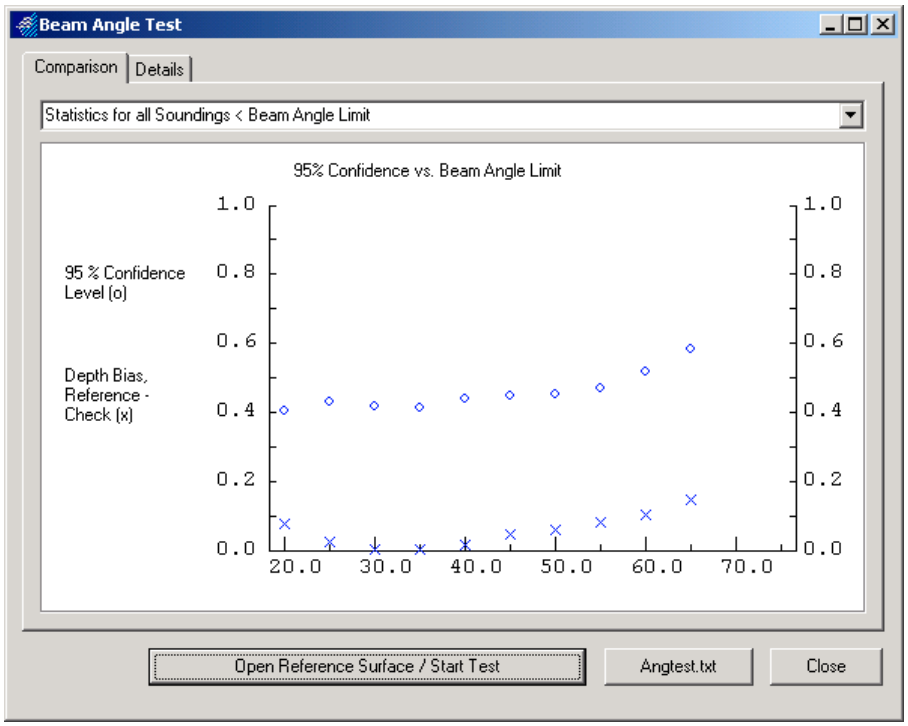
Mainshceme Nadir vs Crossline



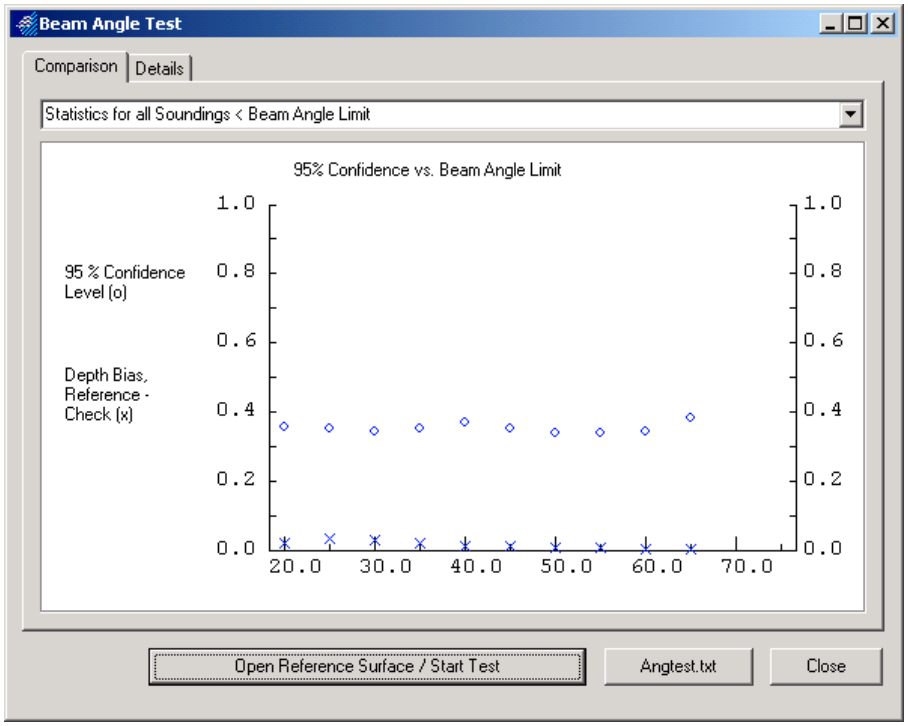
002_1714 vs Crossline



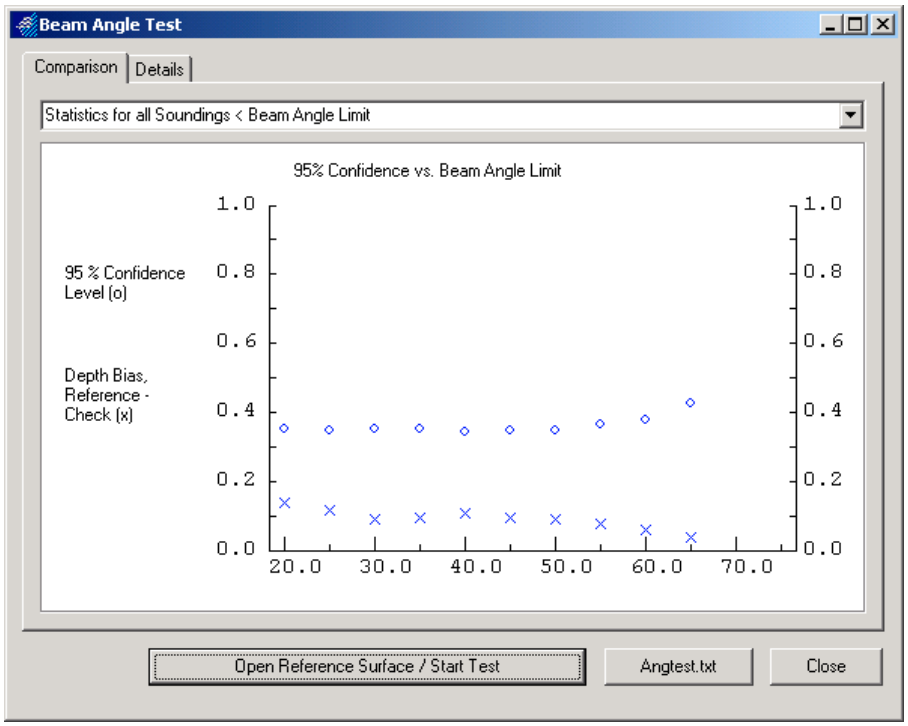
004_1652 vs Crossline



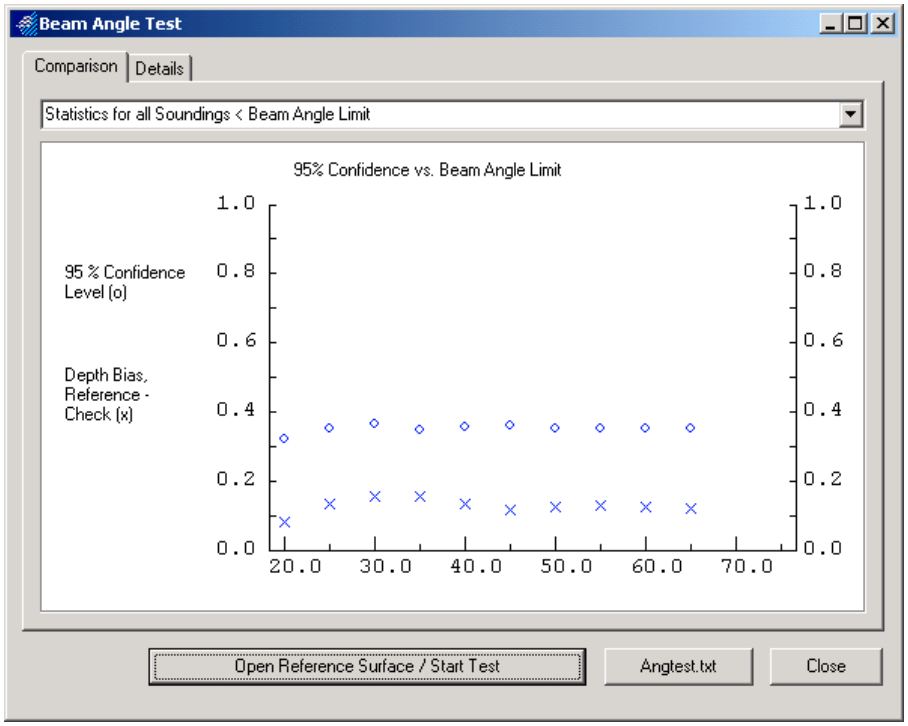
006_1631 vs Crossline



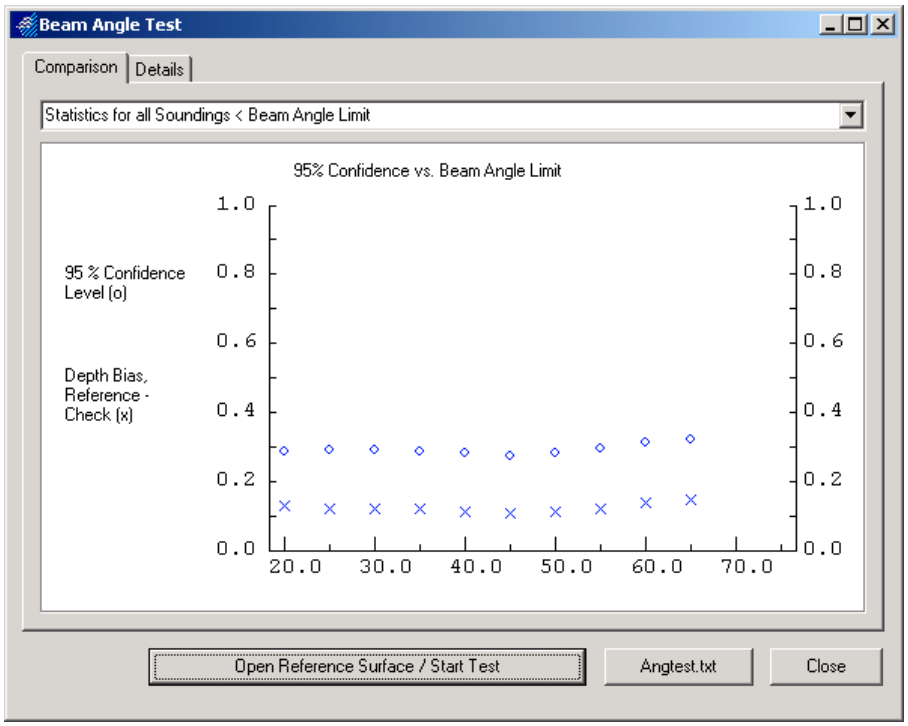
008_1610 vs Crossline



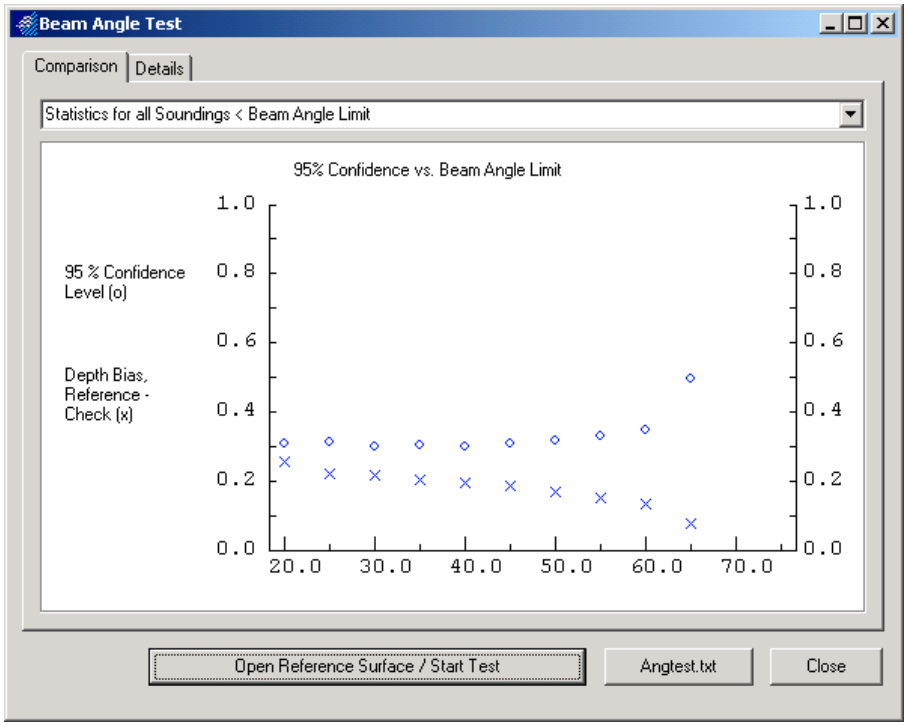
010_1550 vs Crossline



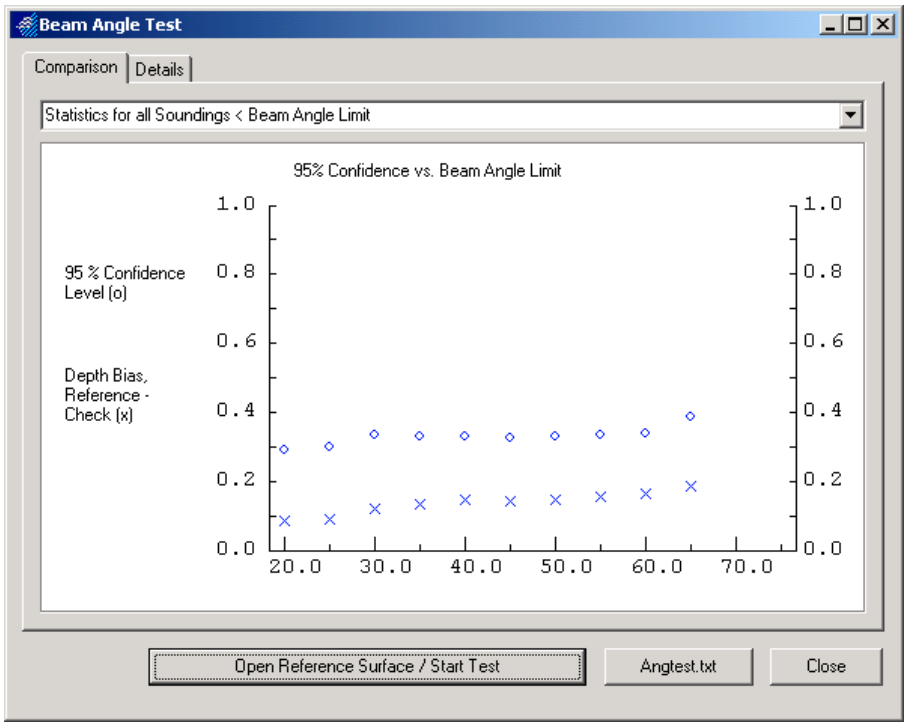
012_1530 vs Crossline



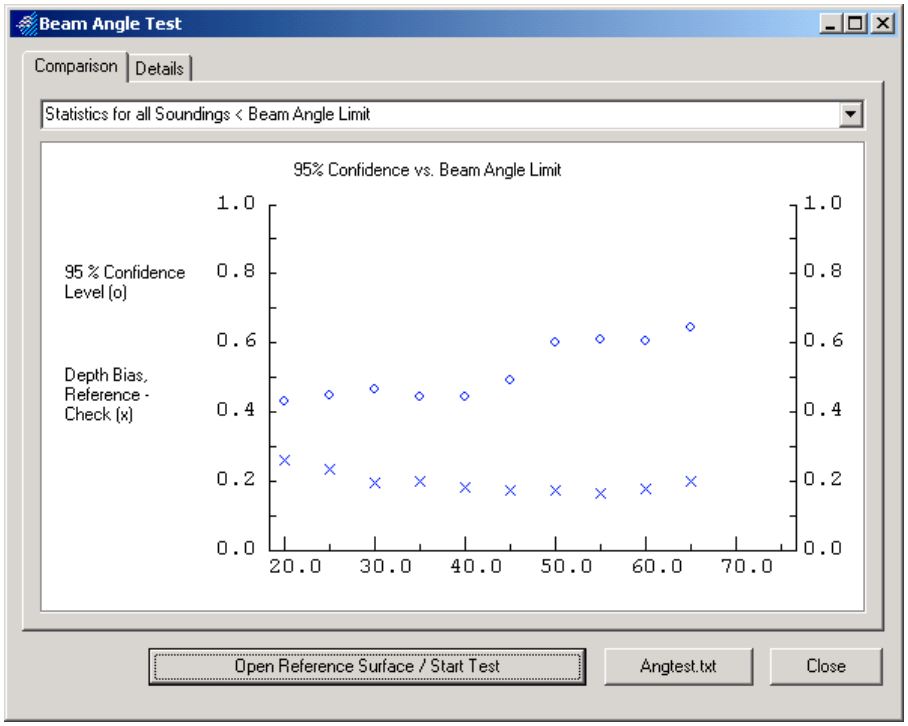
014_1402 vs Crossline



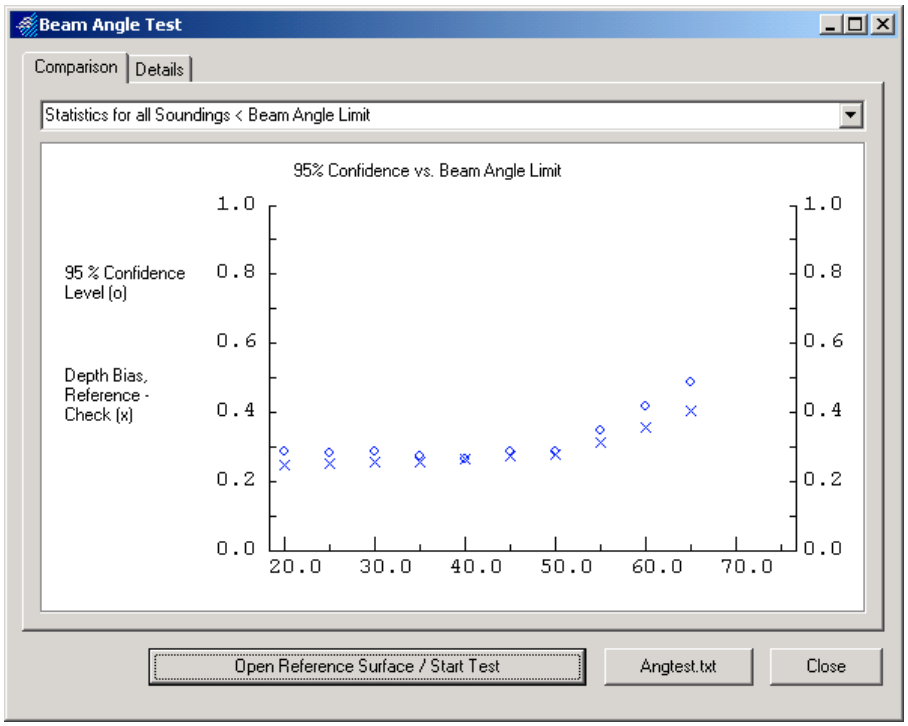
016_1342 vs Crossline



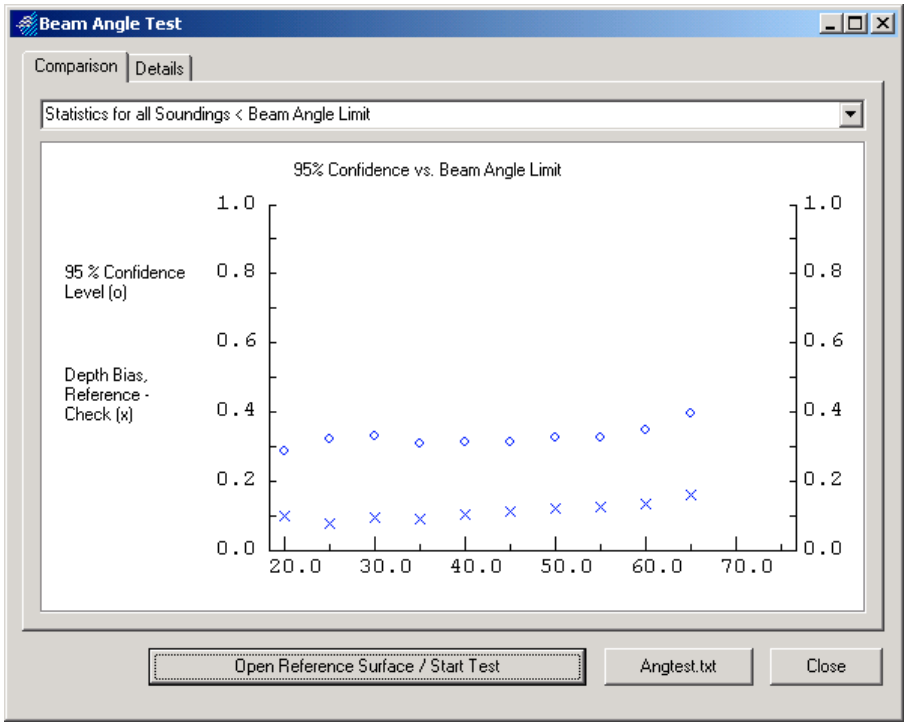
018_1322 vs Crossline



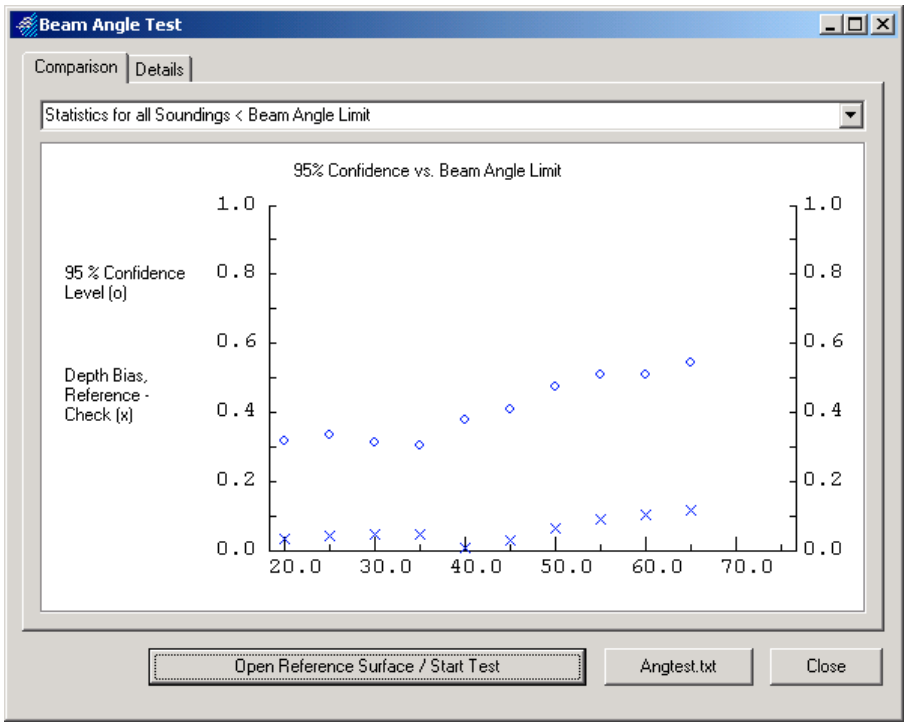
020_1305 vs Crossline



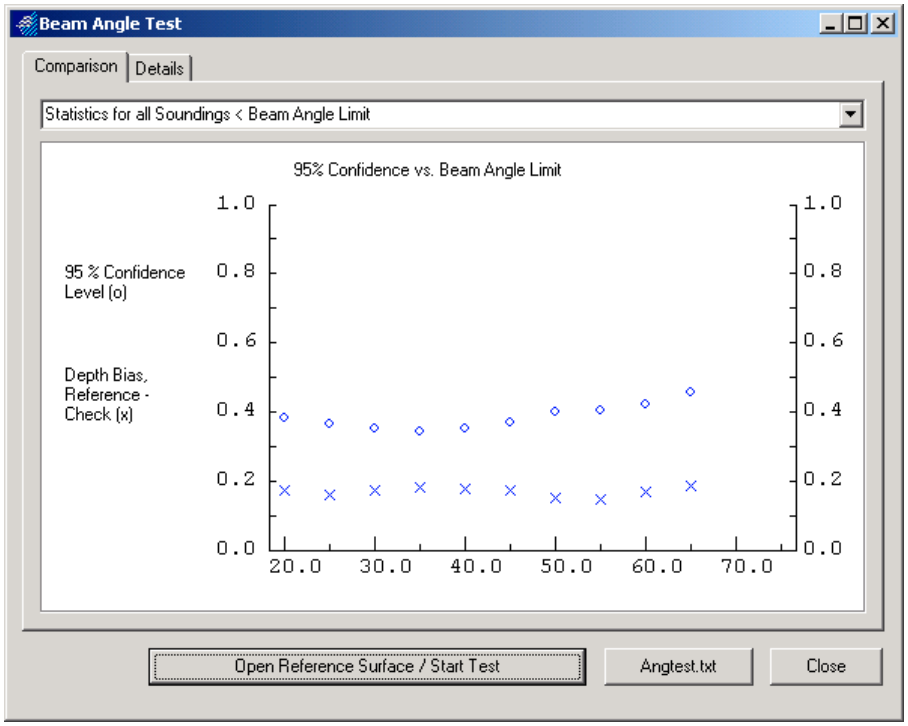
027_1243 vs Crossline



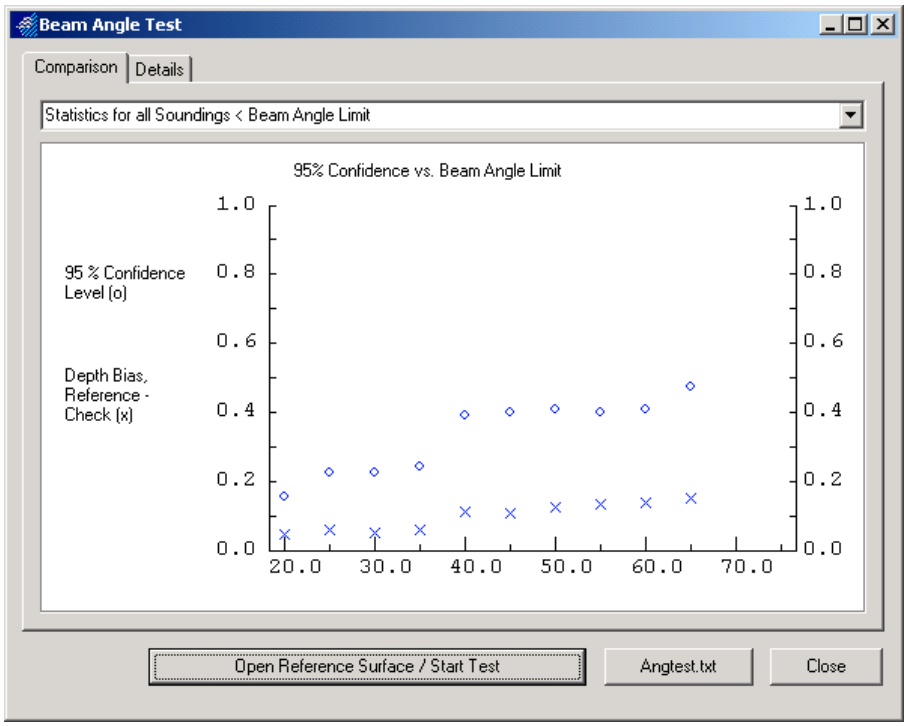
029_1226 Vs Crossline



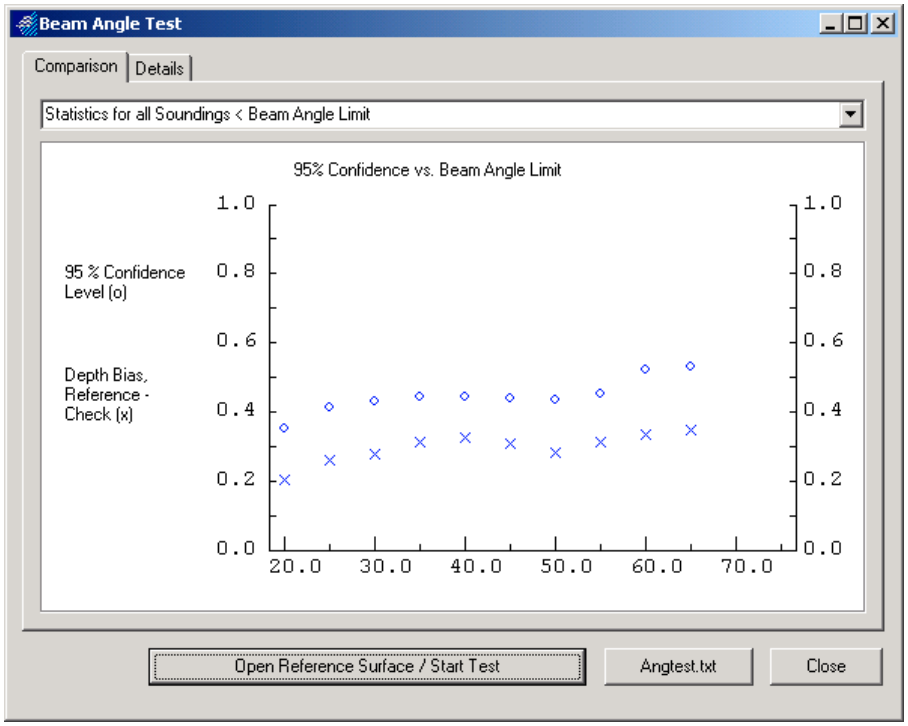
031_1724 Vs Crossline



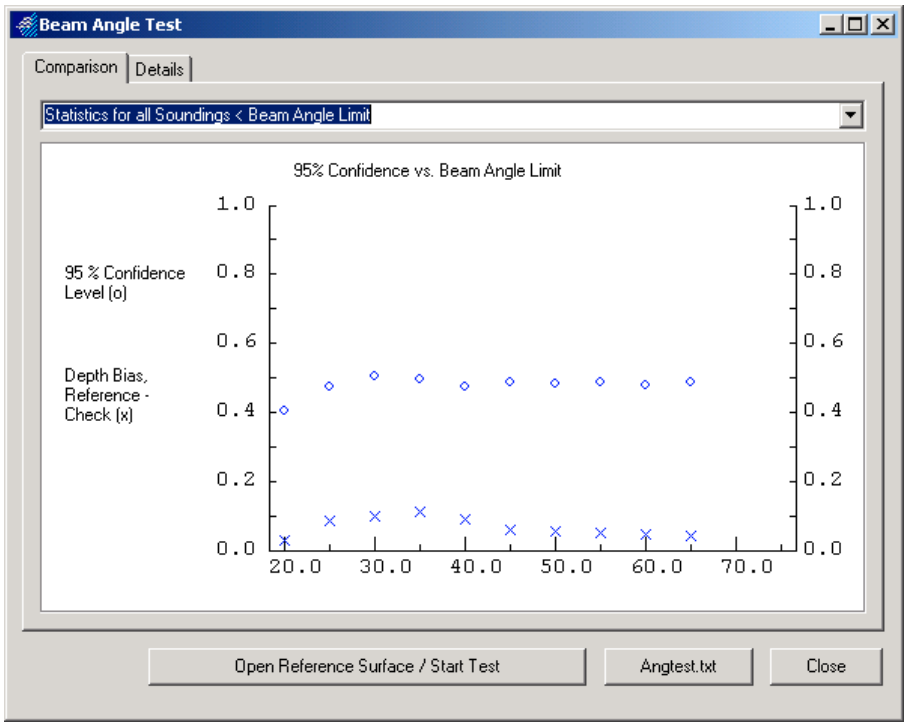
033_1706 Vs Crossline



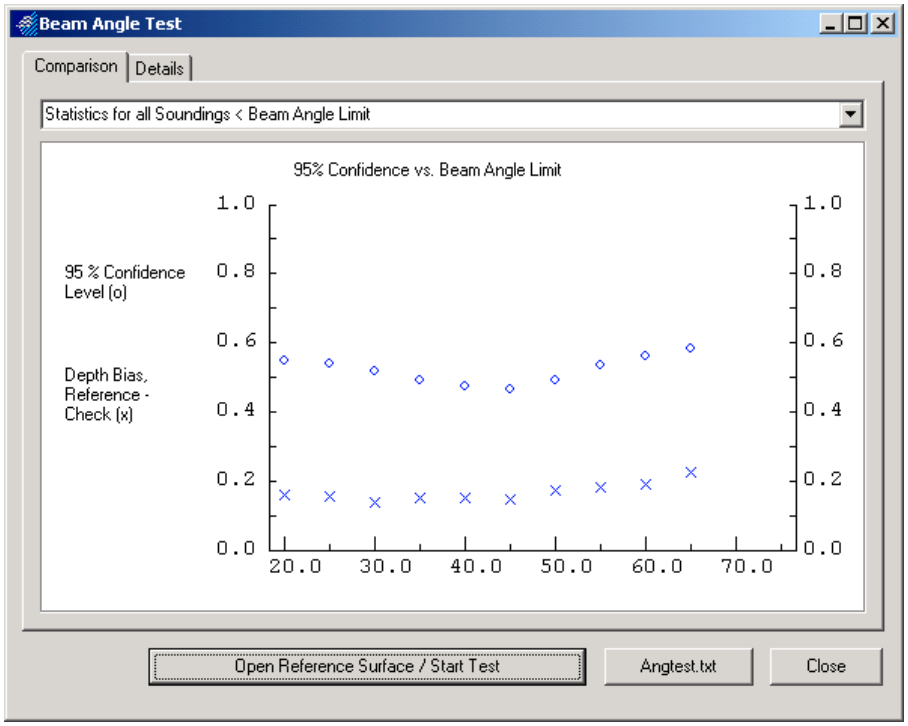
035_1647 Vs Crossline



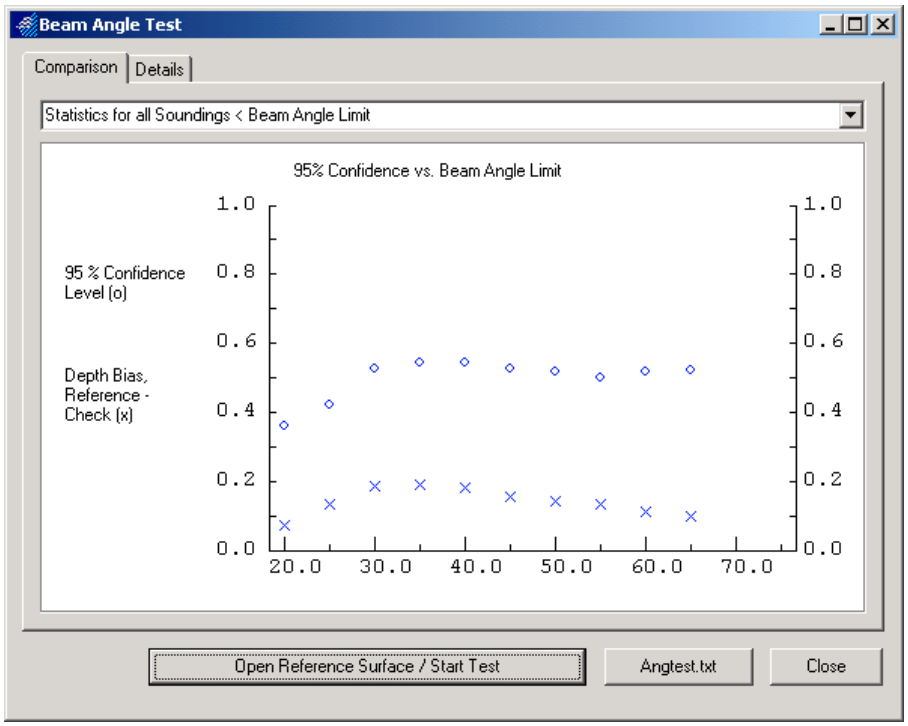
037_1629 vs Crossline



039_1611 vs Crossline



041_1554 vs Crossline



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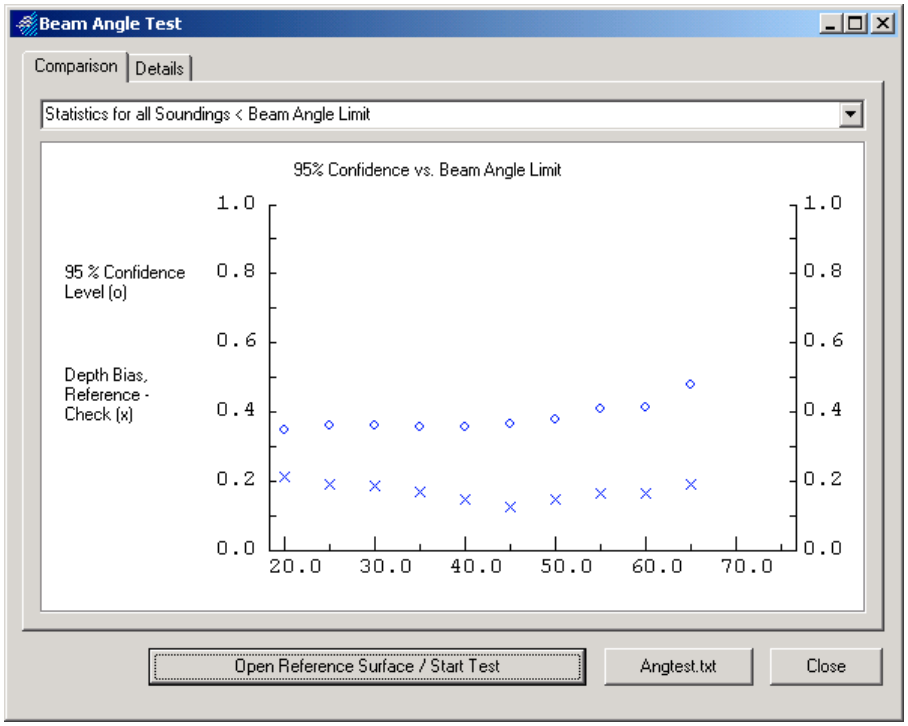
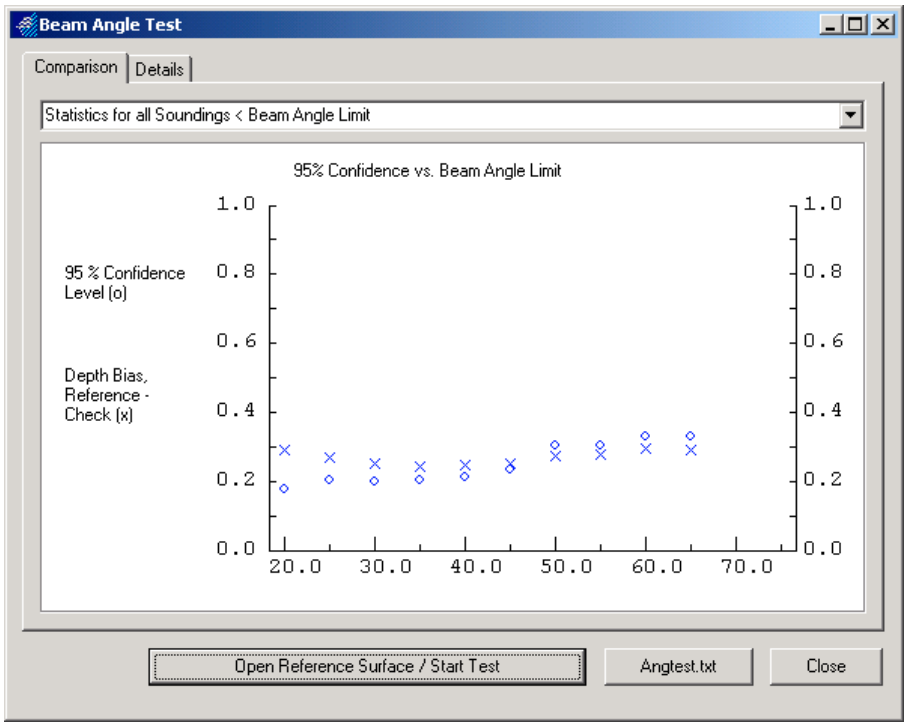
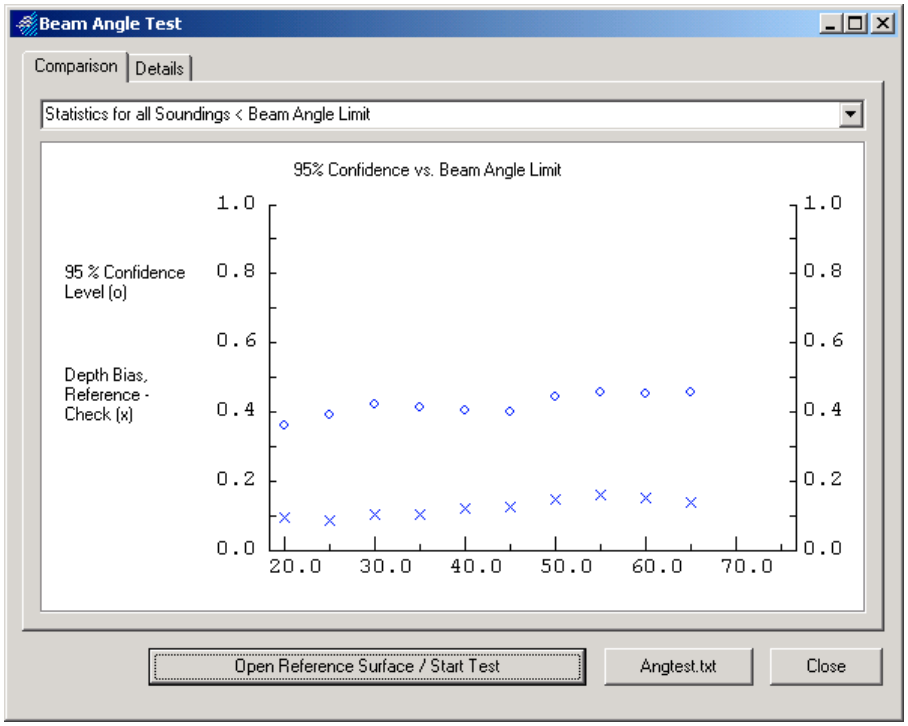


045_1521 vs Crossline



047_1158 vs Crossline



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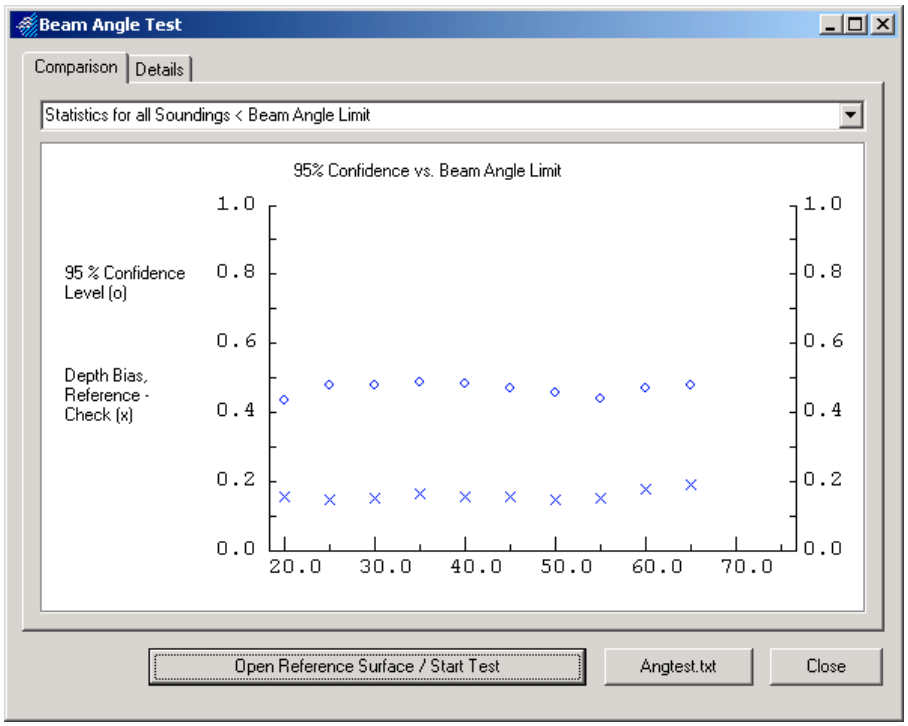

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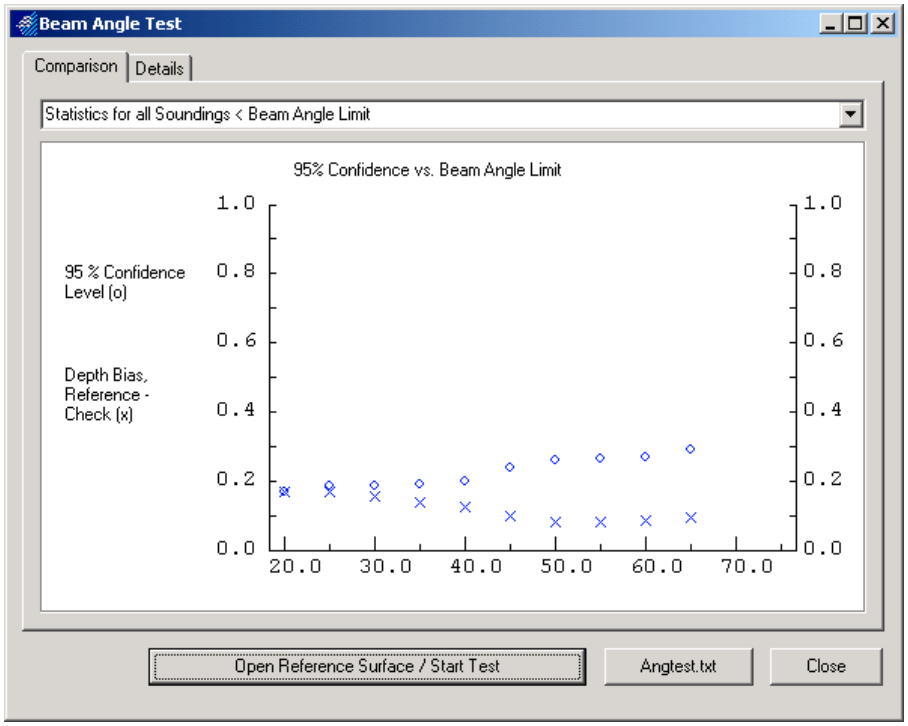
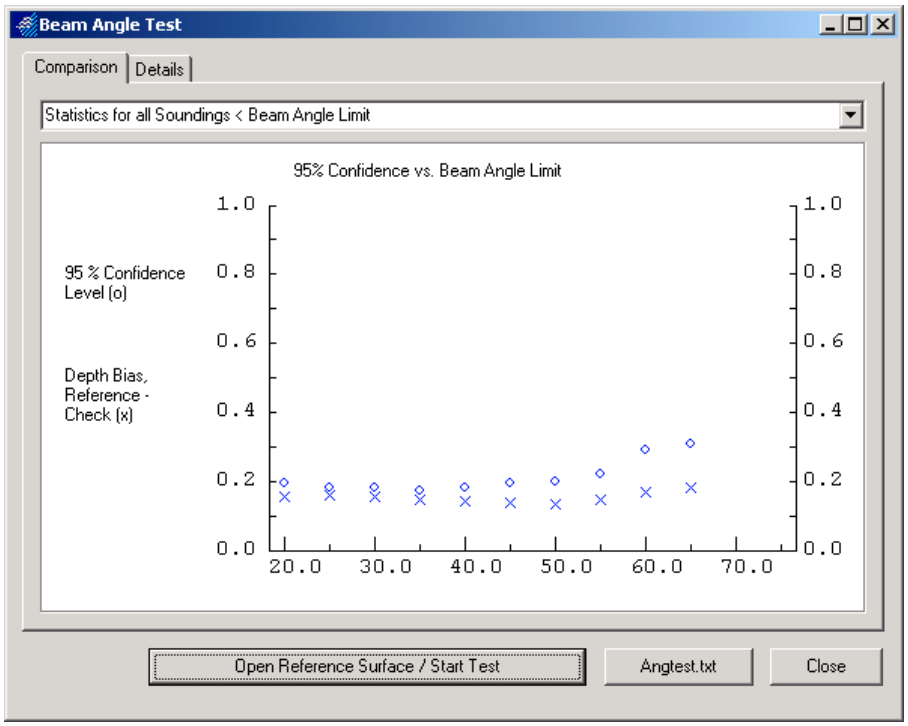


053_1124 vs Crossline



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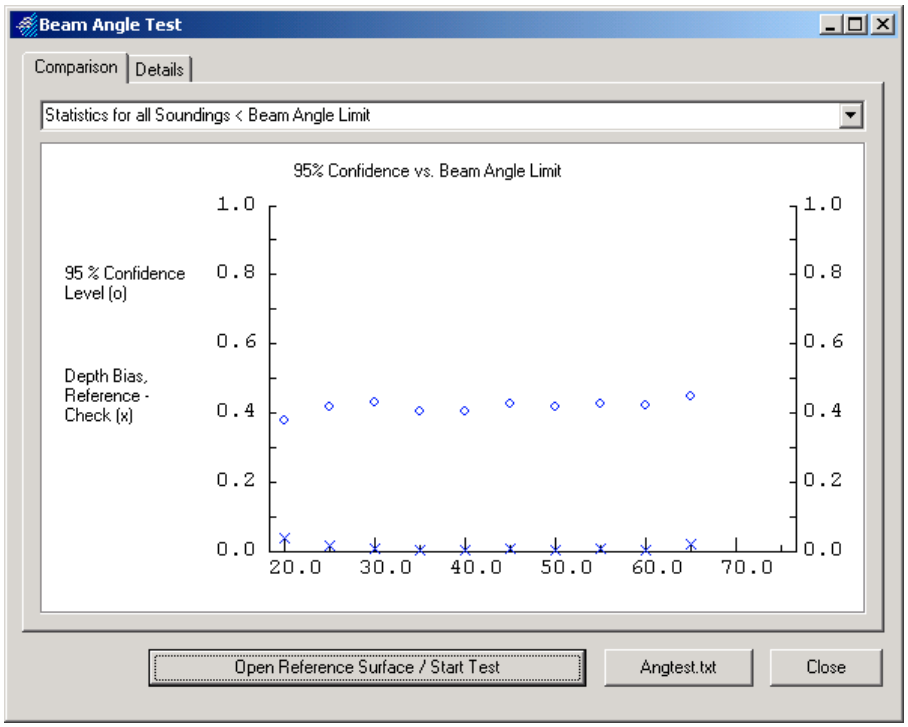
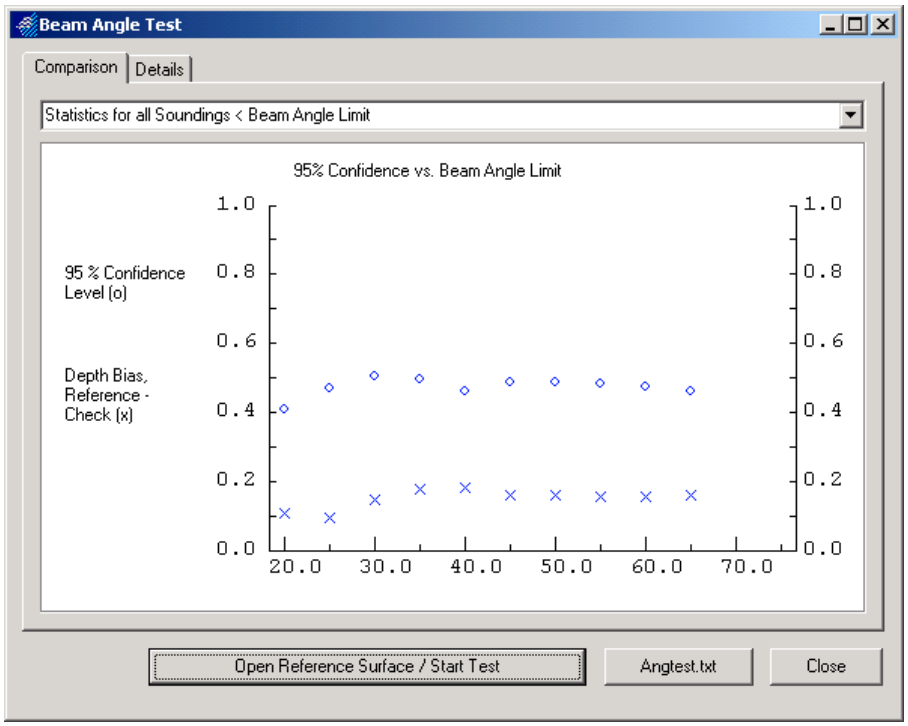
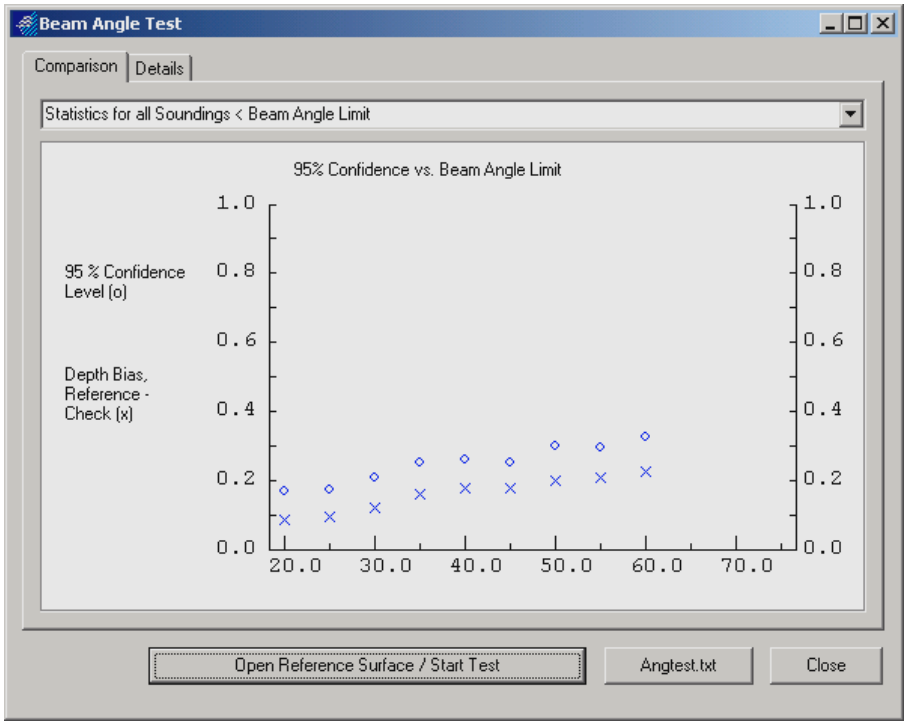


057_1059 vs Crossline

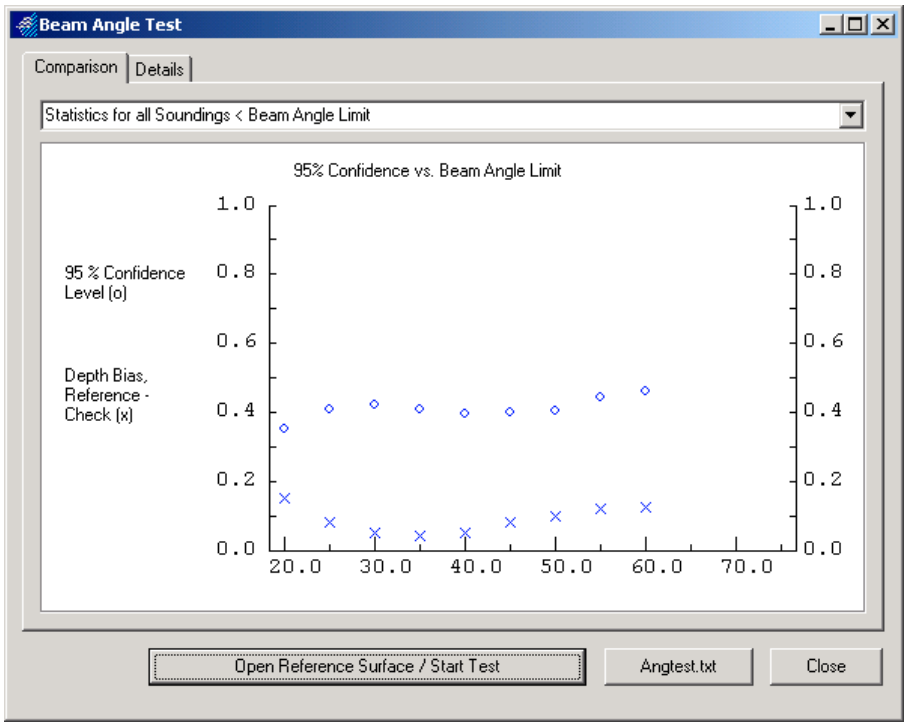


059_1047 vs Crossline

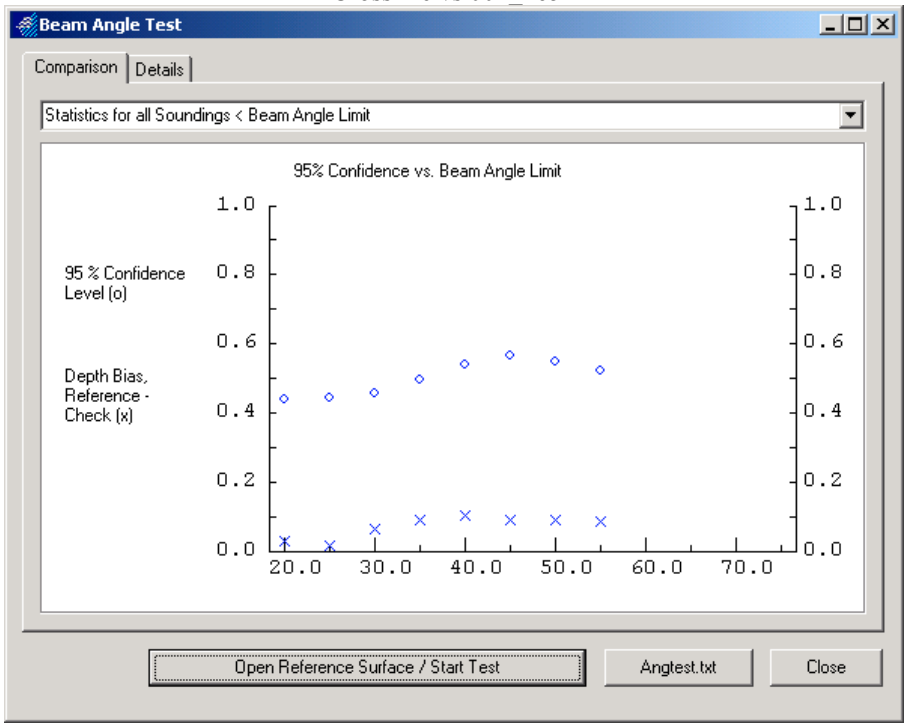
Crossline Nadir vs Mainscheme



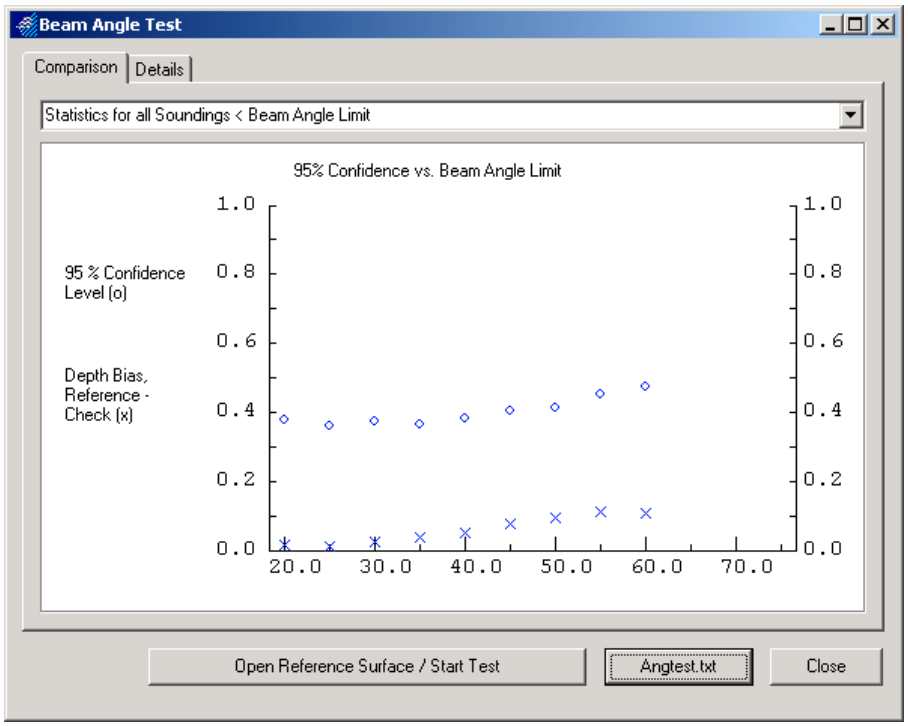
Crossline vs 002_1714



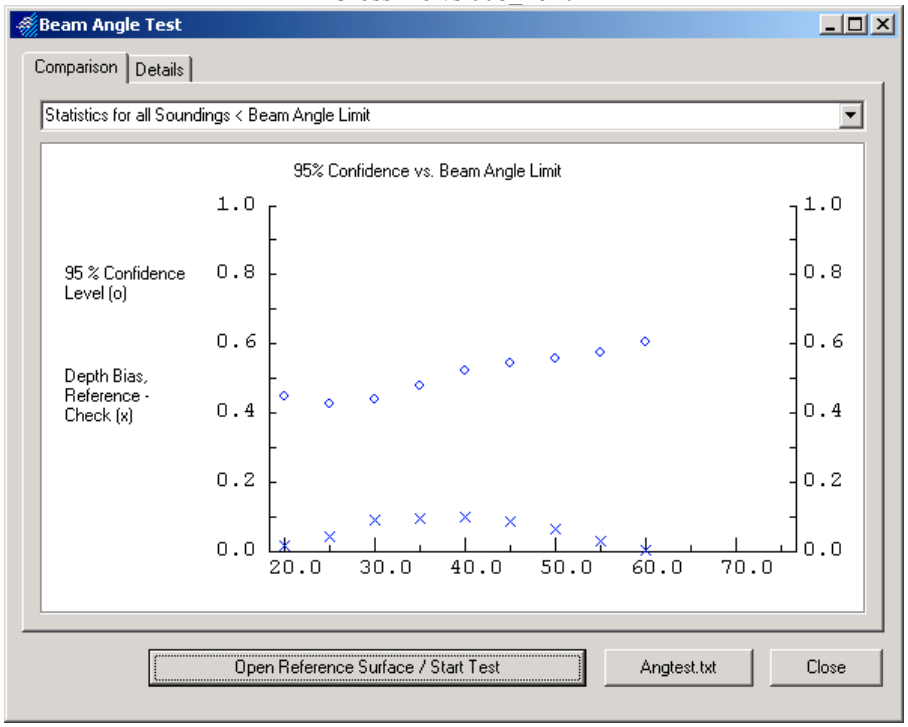
Crossline vs 004_1652



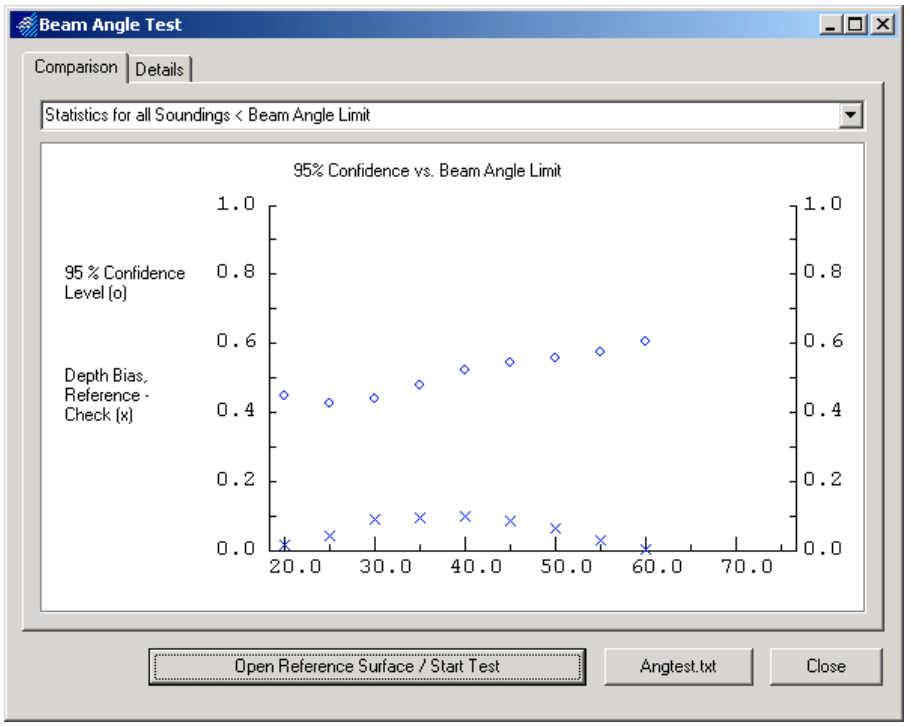
Crossline vs 006_1631



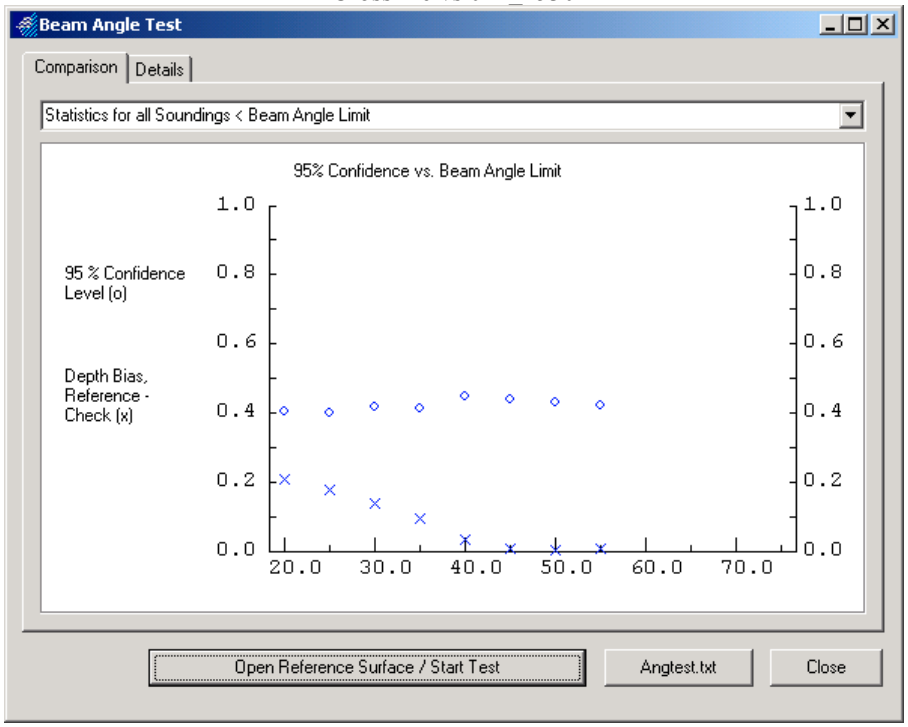
Crossline vs 008_1610



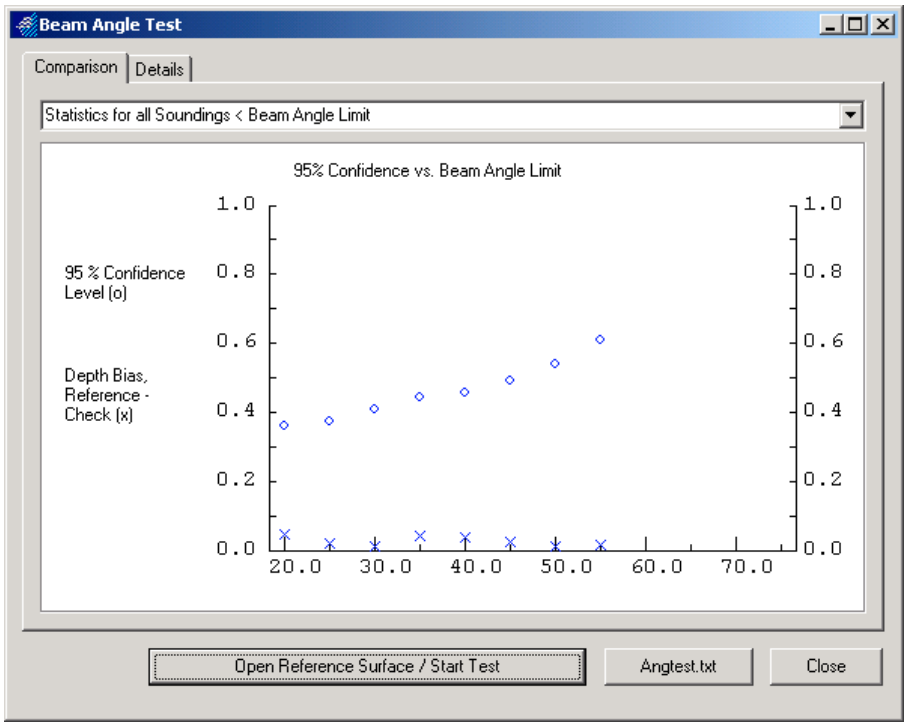
Crossline vs 010_1550



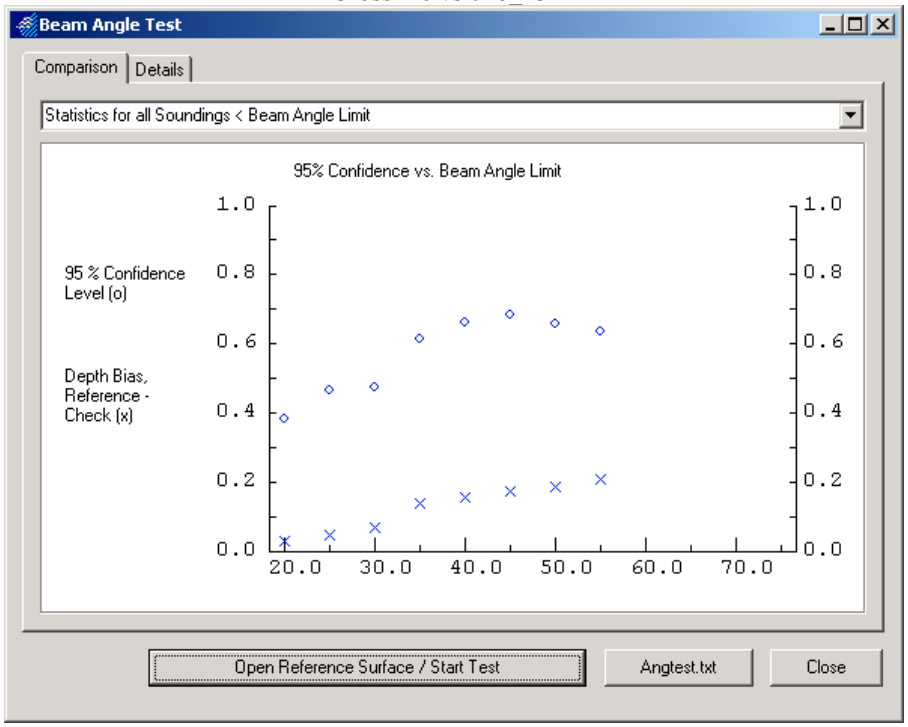
Crossline vs 012_1530



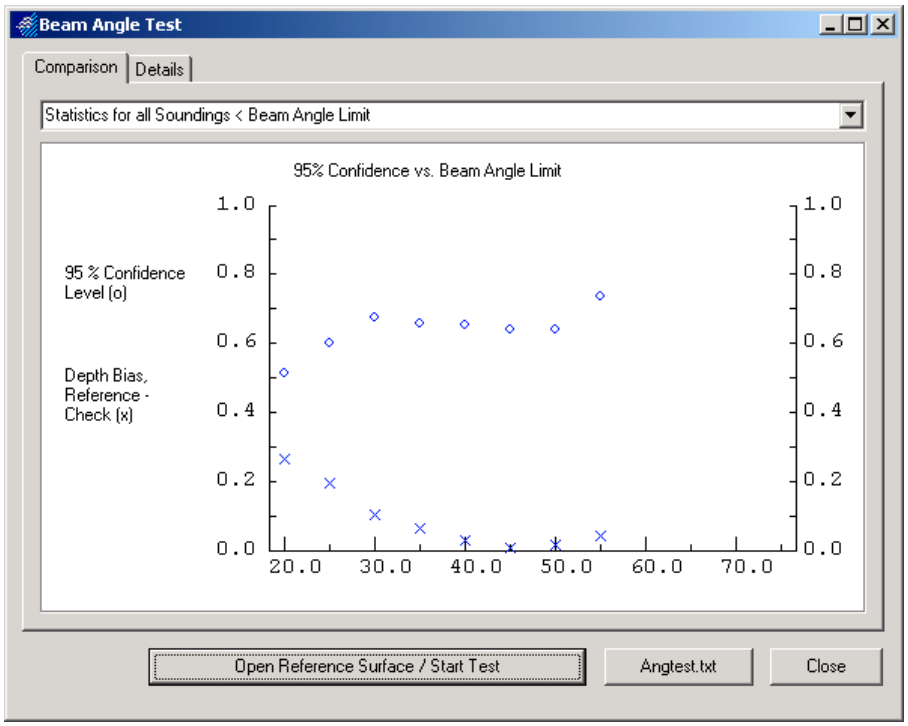
Crossline vs 014_1402



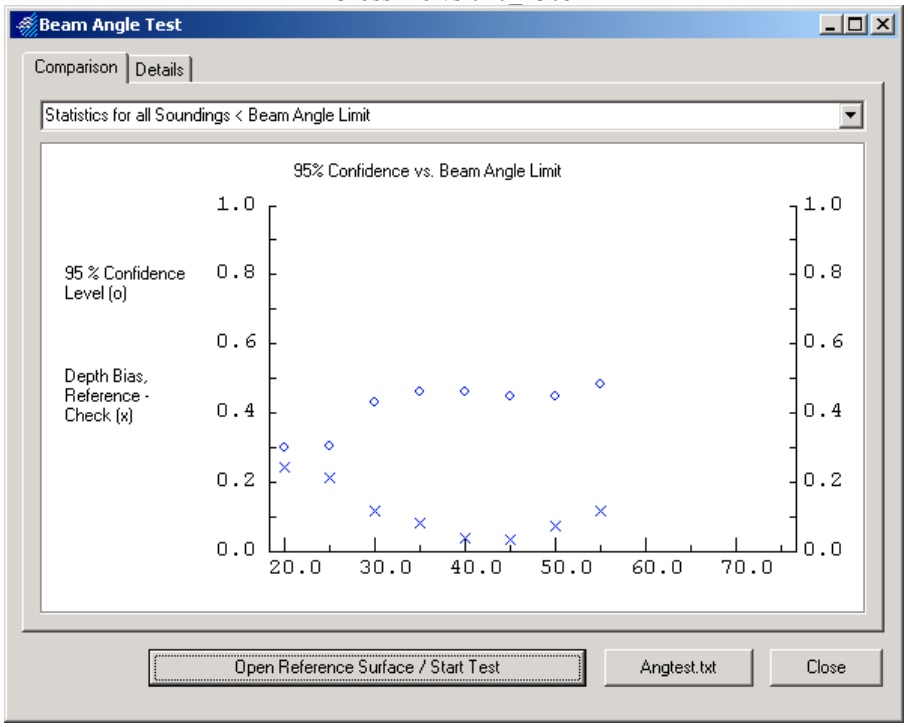
Crossline vs 016_1342



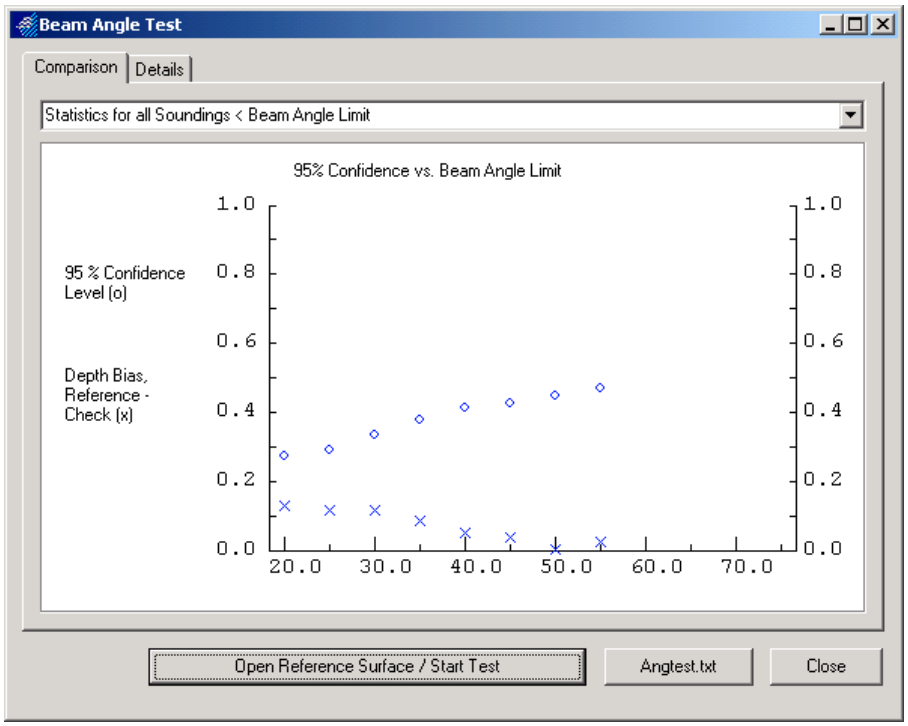
Crossline vs 018_1322



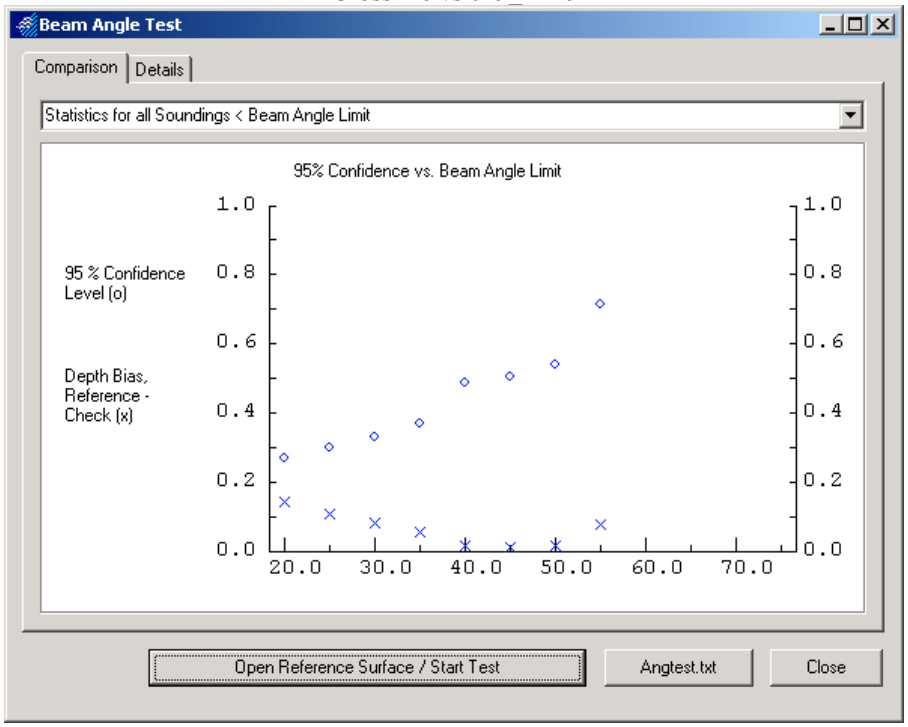
Crossline vs 020_1305



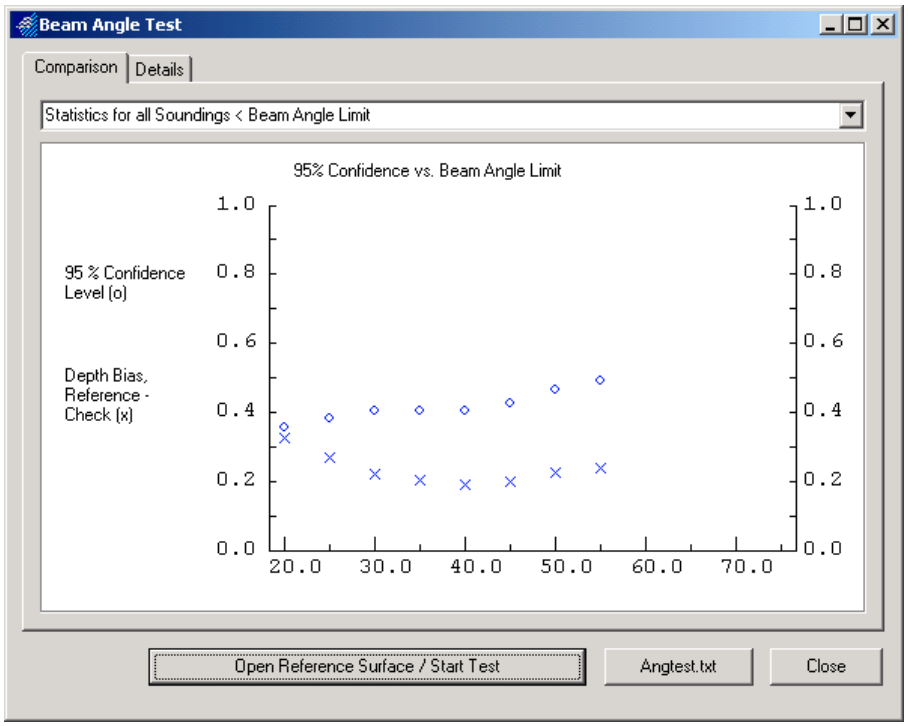
Crossline vs 027_1243



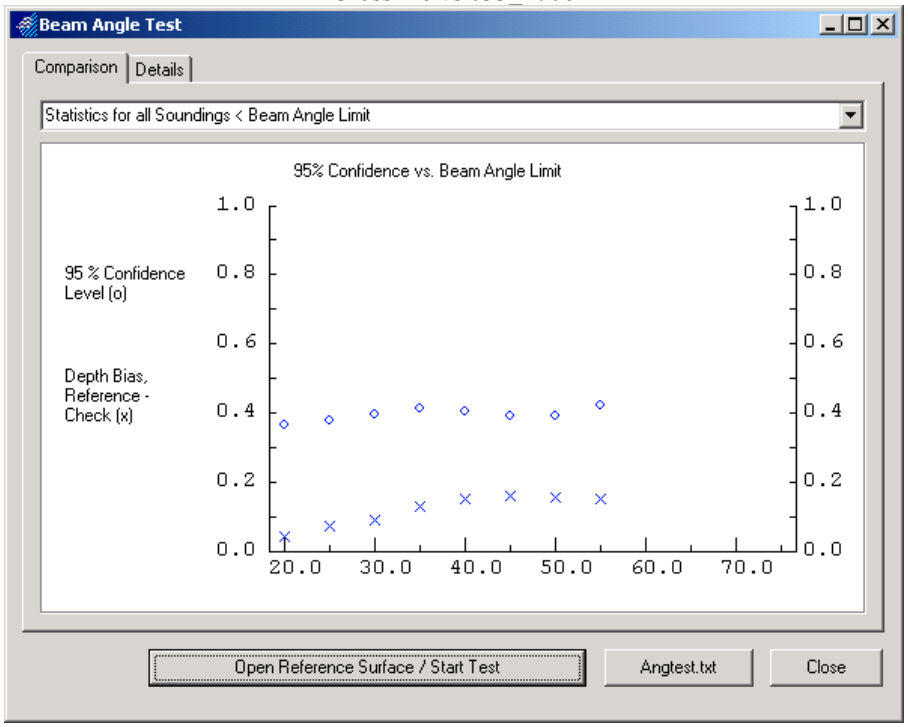
Crossline vs 029_1226



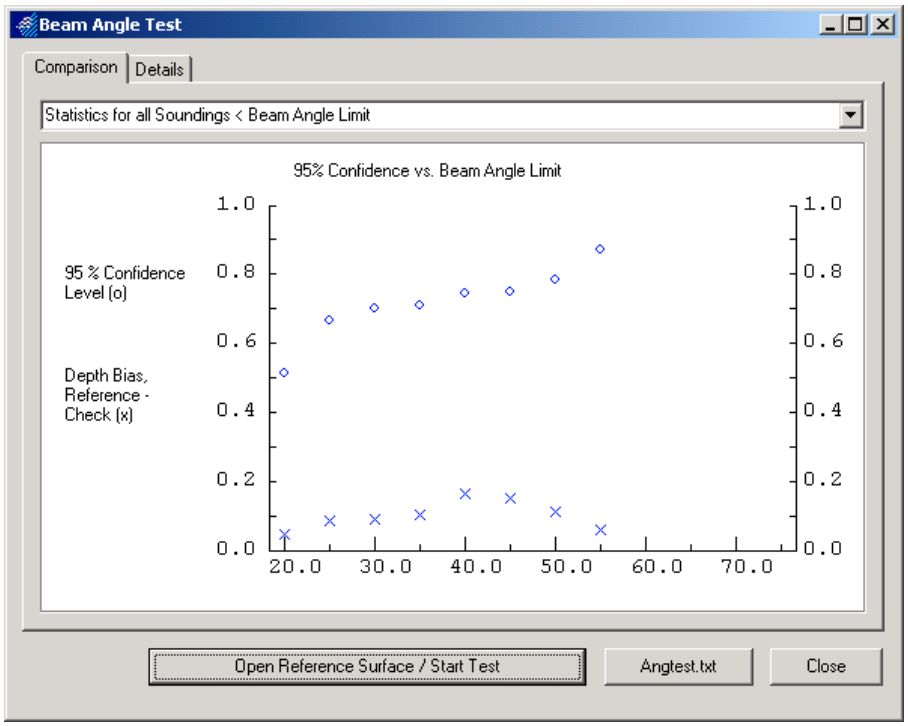
Crossline vs 031_1724



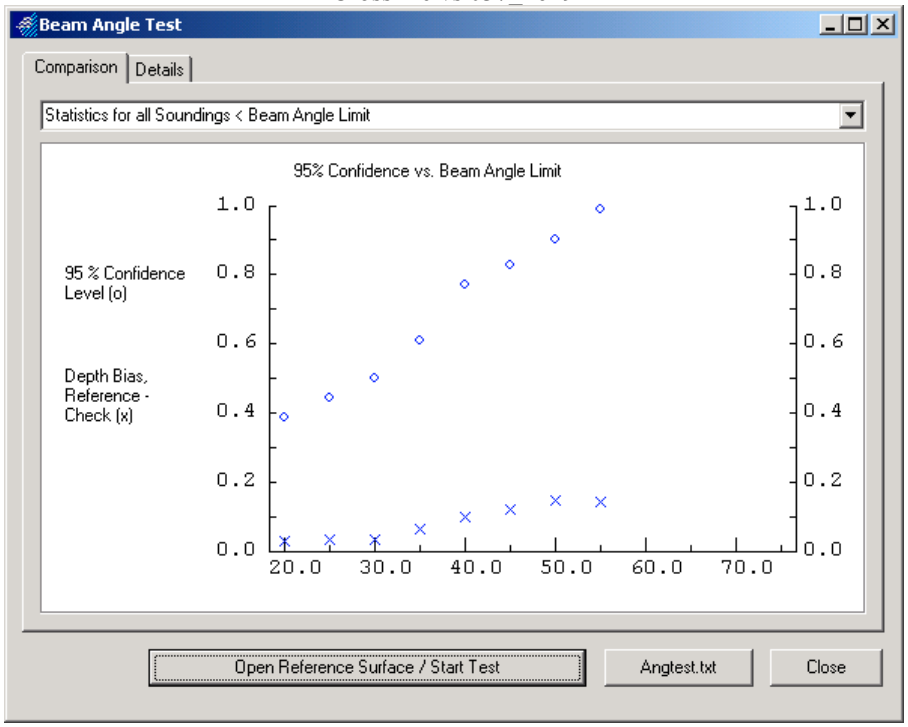
Crossline vs 033_1706



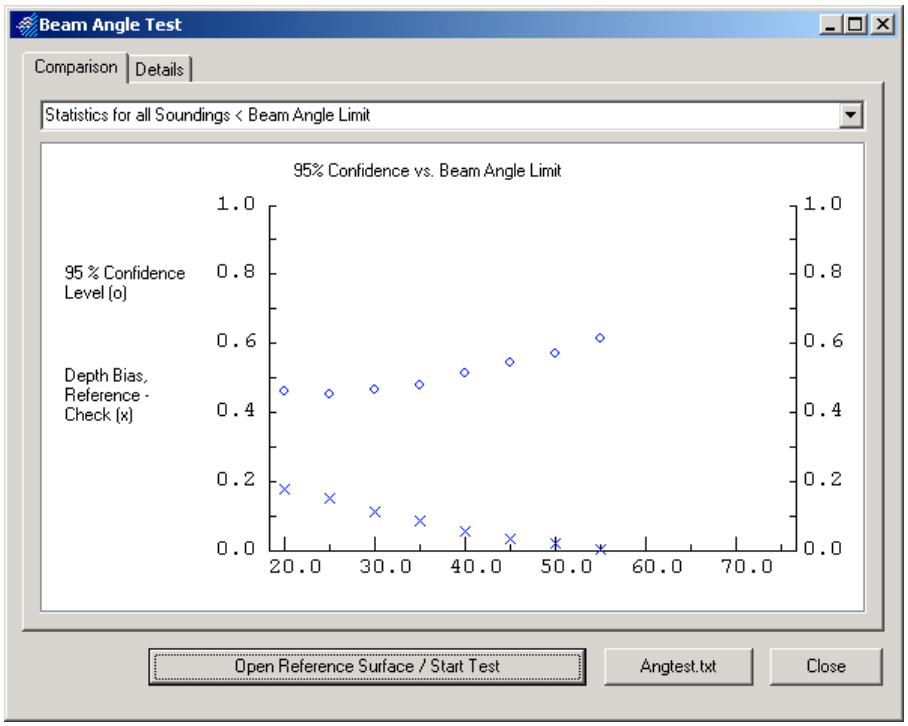
Crossline vs 035_1647



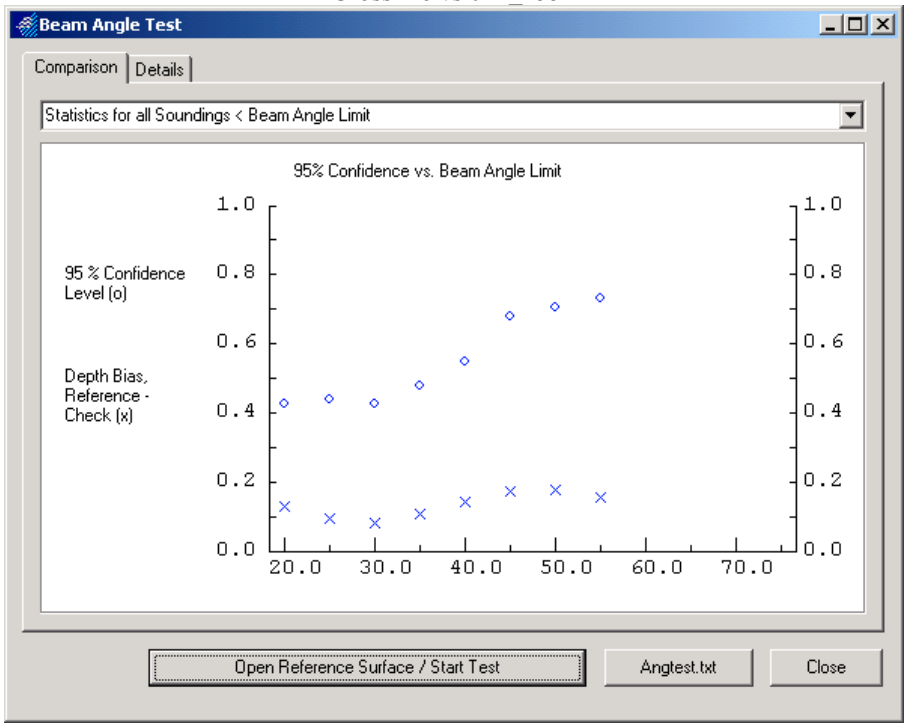
Crossline vs 037_1629



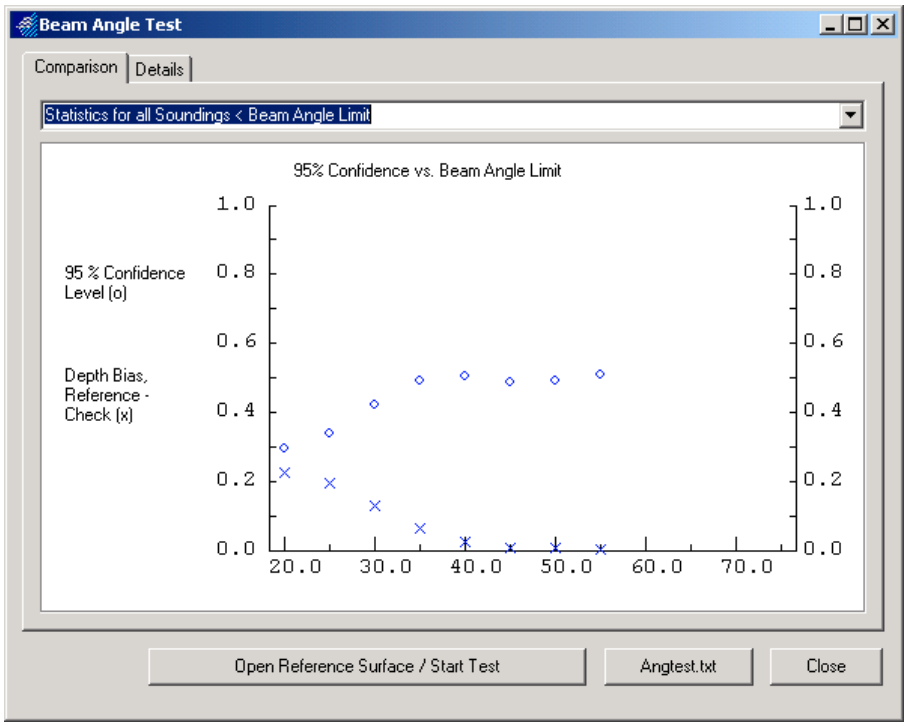
Crossline vs 039_1611



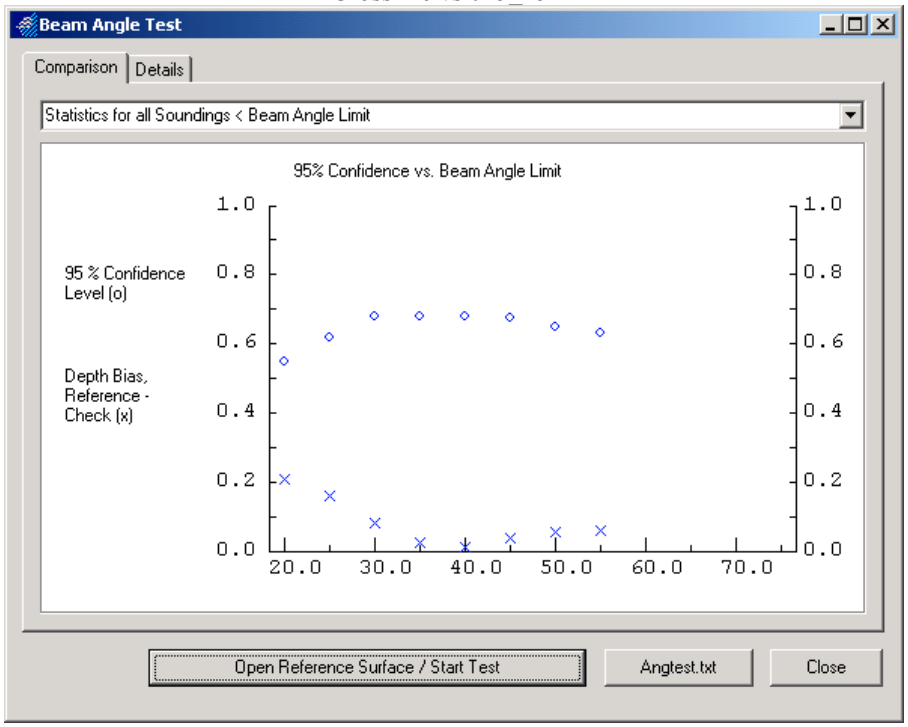
Crossline vs 041_1554



Crossline vs 043_1537



Crossline vs 045_1521



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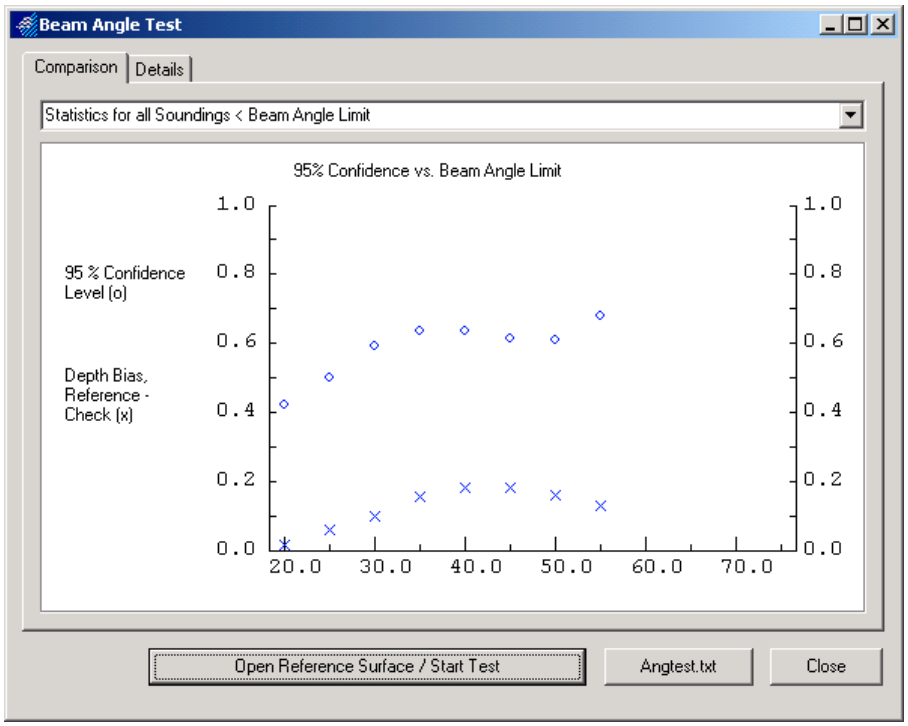

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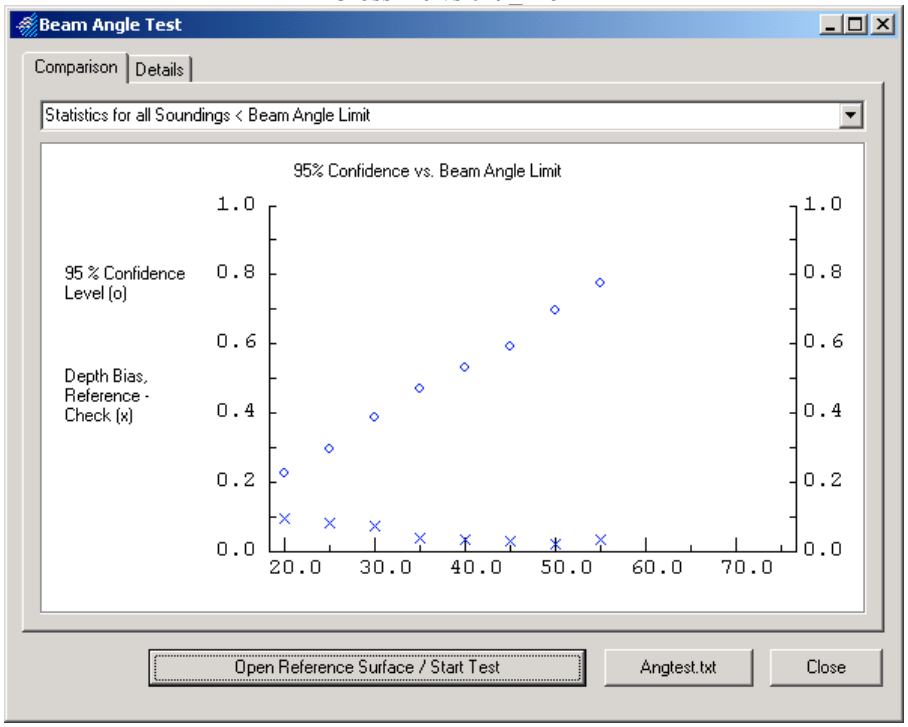

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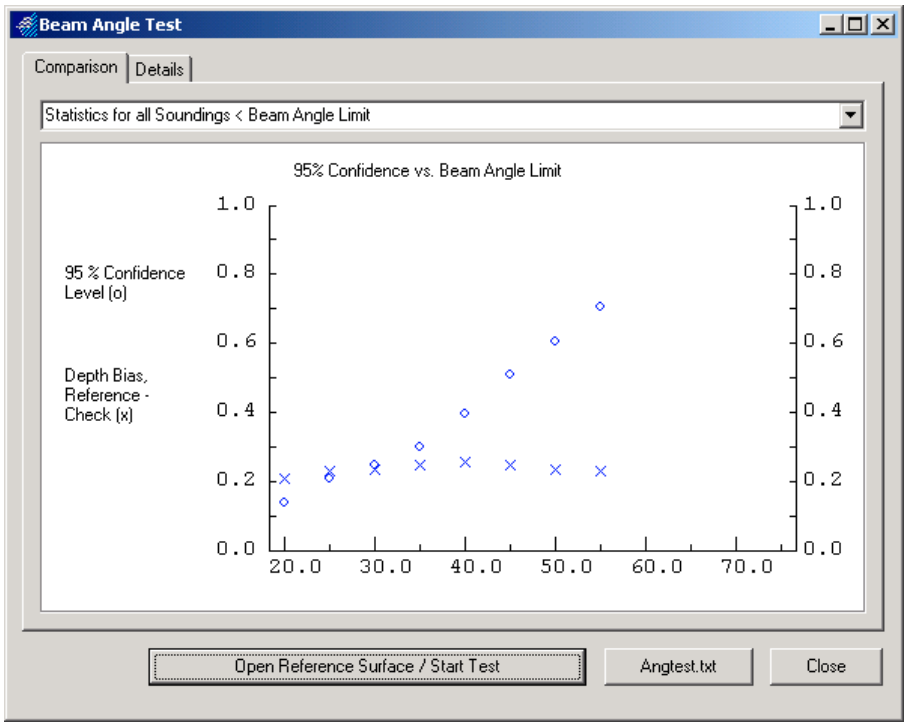

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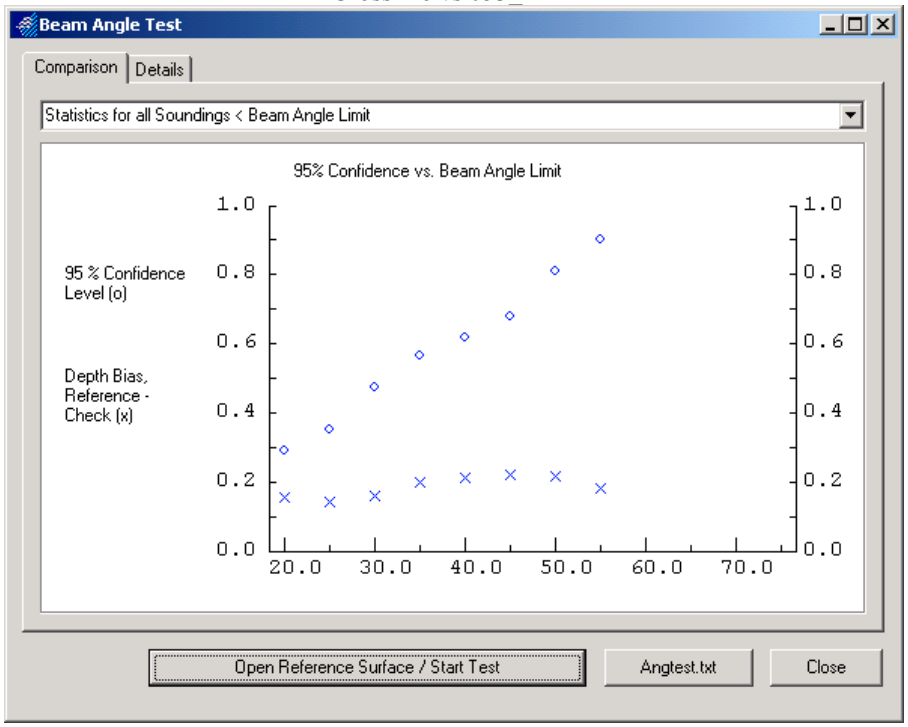

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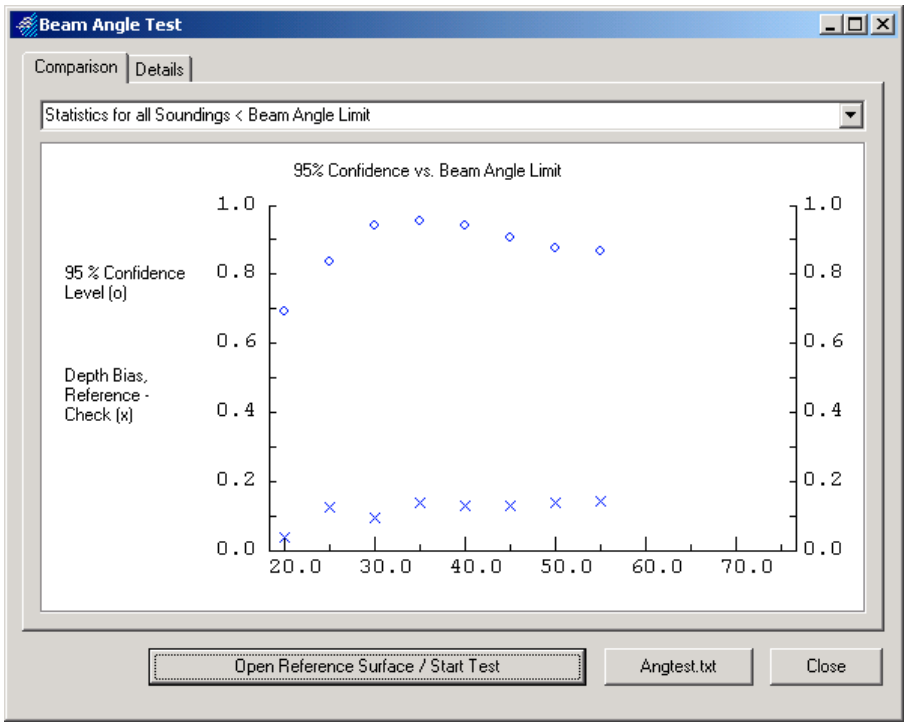

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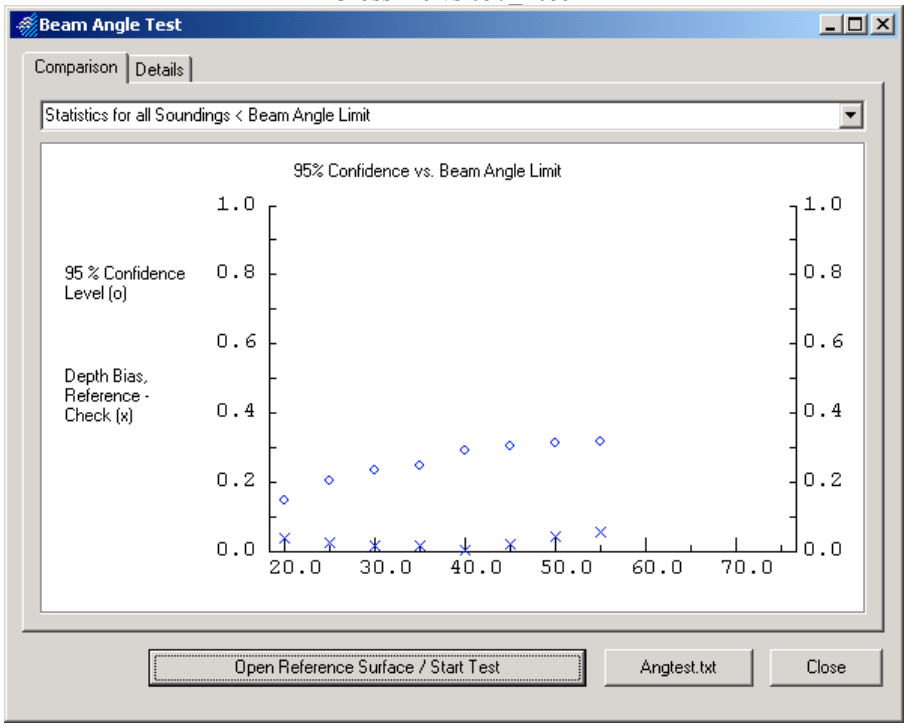

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Appendix F. Tide Notes

A Valeport VTM710 Tide gage recorded water level at 10 minute intervals during sonar data acquisition operations. The time basis was local (Pacific Standard Time). A temporary benchmark was established at the site of the tide gage after running levels from NOS benchmarks NO 6 1973(4.883 m MLLW) and PORT MON NO 5(3.945 m MLLW). During surveying water level was visually checked twice daily and compared to the digital display of the VTM710.

Surveying took place during the following times.

Date	Start Time	End Time
October 2	1430	1730
October 3	0730	1800
October 4	0715	1820
October 5	0740	1745
October 6	0805	1500

Appendix G. Automated Data Acquisition and Processing Software

The following software was utilized for acquisition and processing during the Rocky Reef Shallow Water Multibeam Sonar Survey.

Data Acquisition Software:	Coastal Oceanographics Hypack Max V2.12 2.7.31.24
	Coastal Oceanographics Hysweep V2.6.8.0
Data Processing Software:	Coastal Oceanographics Hypack Max V2.12 2.7.31.24
	Coastal Oceanographics MB Max V2.12.0.0

Appendix H. Certification Page

This page is presented to certify that the Rocky Reef Shallow Water Multibeam Survey was accomplished according to all accuracy and methodology requirements as prescribed by the Scope of Work.

_____ Hydrographer _____ Date

Figures

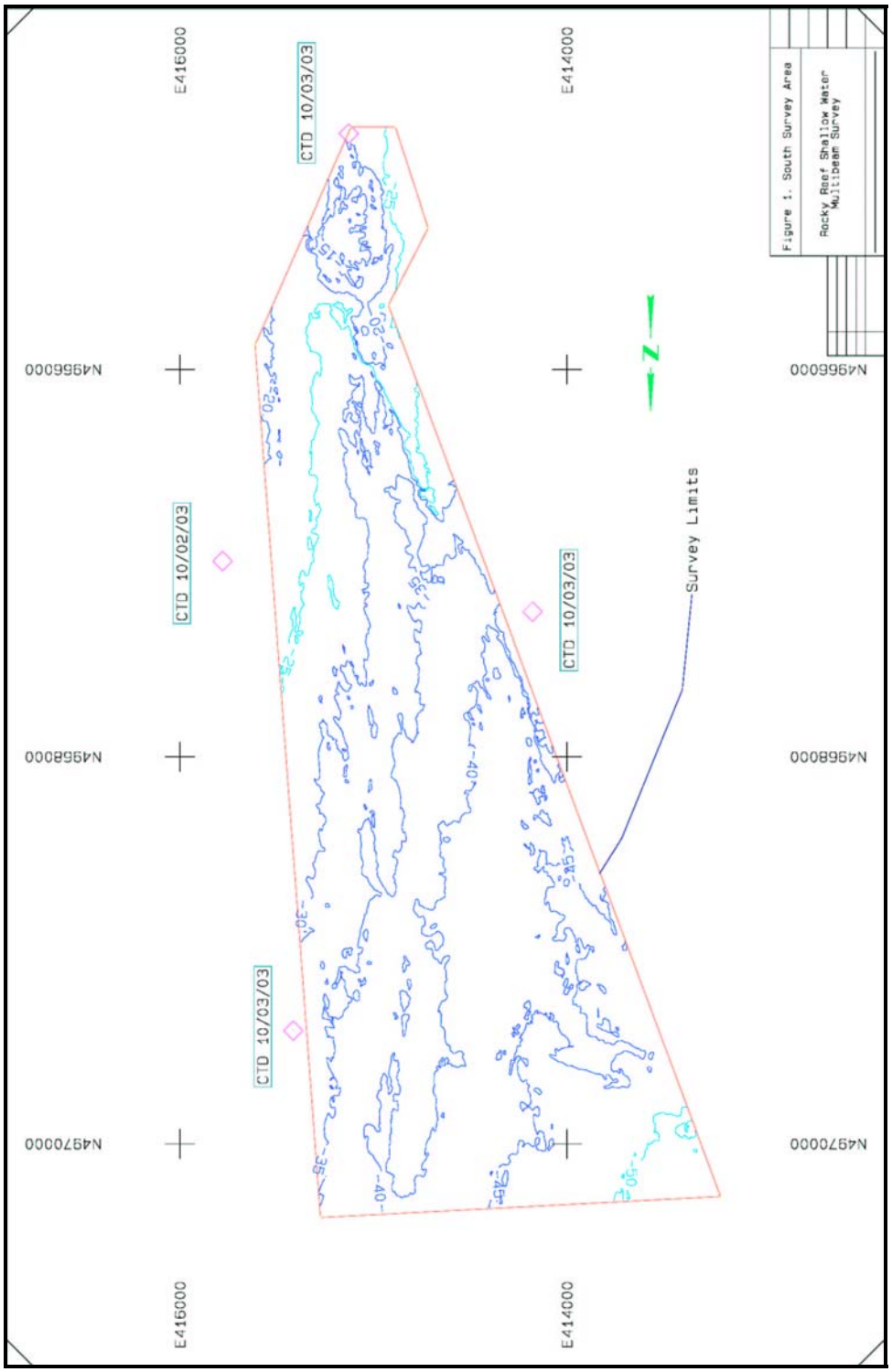
Figure 1. South Survey Area
Rocky Reef Shallow Water Multibeam Survey
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E414000
N4956000
N4958000
N4960000
N4970000
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CTD 10/02/03
CTD 10/03/03
CTD 10/03/03
Survey Limits
N

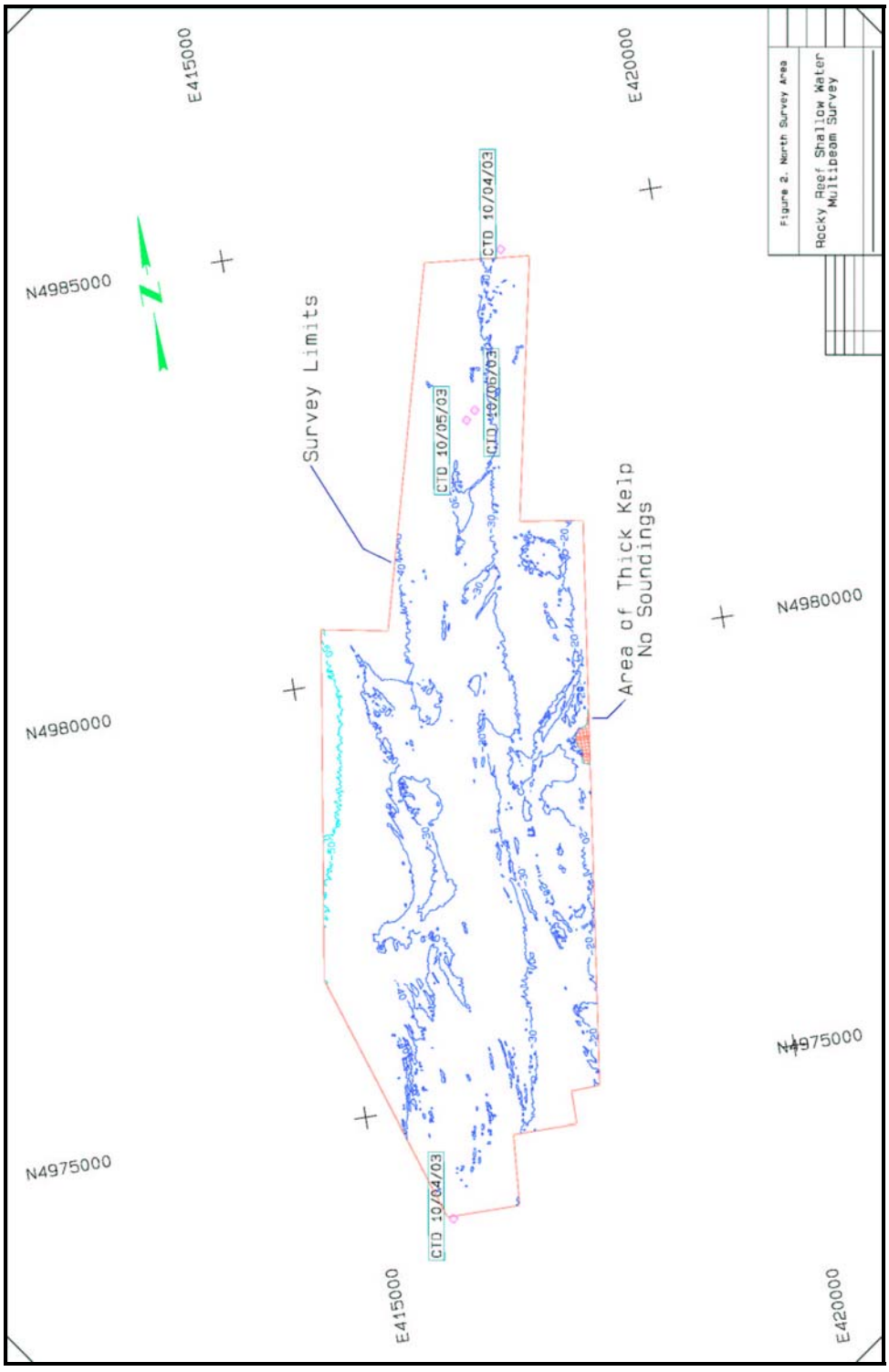
Figure 2. North Survey Area
Rocky Reef Shallow Water Multibeam Survey
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E420000
N4985000
N4980000
N4975000
Survey Limits
Area of Thick Kelp
No Soundings
CTD 10/04/03
CTD 10/05/03
CTD 10/05/03
CTD 10/04/03

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APPROVAL SHEET
W00119 – W00120

Cartography

The evaluated survey has been inspected with regard to delineation of the depth curves, development of critical depths, cartographic symbolization, and verification or disproval of charted data

Compiled by:

Katie Reser
Physical Scientist
Pacific Hydrographic Branch

Reviewed by:

Gary Nelson
Cartographer
Pacific Hydrographic Branch

Approval

I have reviewed the data, and reports. Data are suitable for nautical charting except where specifically recommended in this report.

David Neander
CDR, NOAA
Chief, Pacific Hydrographic Branch