

HYPACK®



HYDROGRAPHIC SURVEY SOFTWARE

HYPACK®

Hydrographic Survey Software Summary and Screen Samples

HYPACK, Inc. 56 Bradley St., Middletown, CT 06455 USA; www.hypack.com

HYPACK, Inc., 56 Bradley St., Middletown, CT 06457 USA; www.hypack.com; sales@hypack.com; Tel: 860-635-1500 (USA)

HYPACK®

HYPACK® is a Windows™-based software package used primarily for hydrographic surveying and data processing.

It is optimized to run under:

- Windows 2000™
- Windows XP™

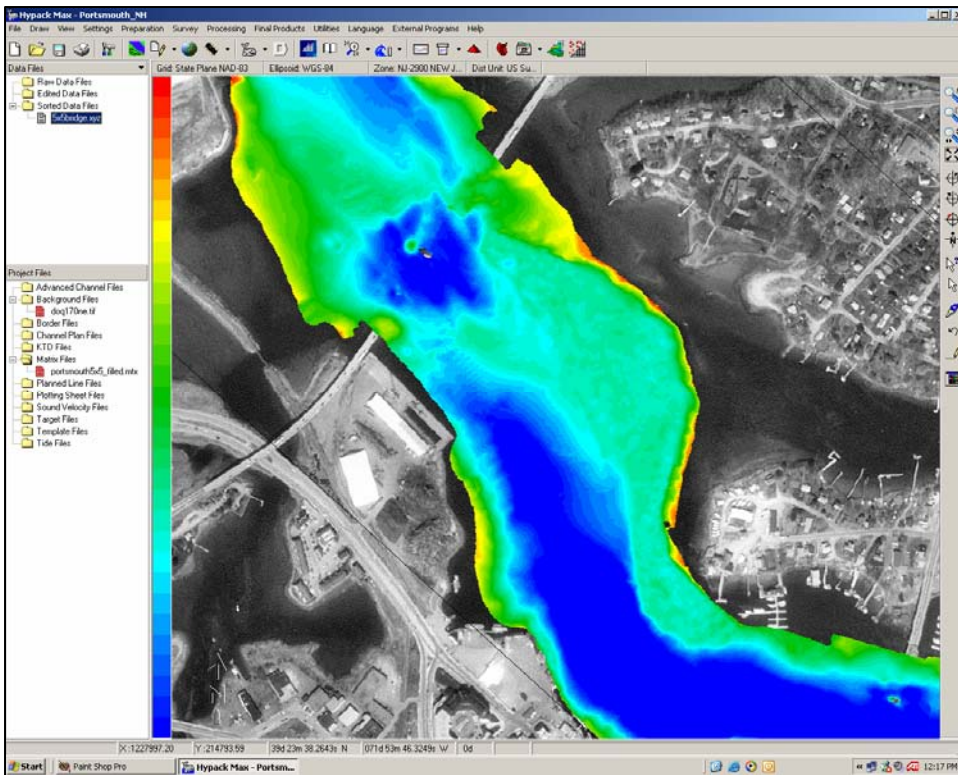
HYPACK® performs all of the tasks necessary to complete your survey from beginning to end.

- Geodetic Parameters
- Planned Line Design
- Equipment Configuration
- Data Collection supporting over 200 sensors
- Data Processing
- Tides and Sound Velocity
- Sounding Reduction
- Export to DXF/DGN
- Plotting of Smooth Sheets
- Volumes by Section
- Volumes by Surface Model
- Contouring to DXF
- 3D Visualization
- Side Scan Collection and Processing
- ACDP Collection and Display

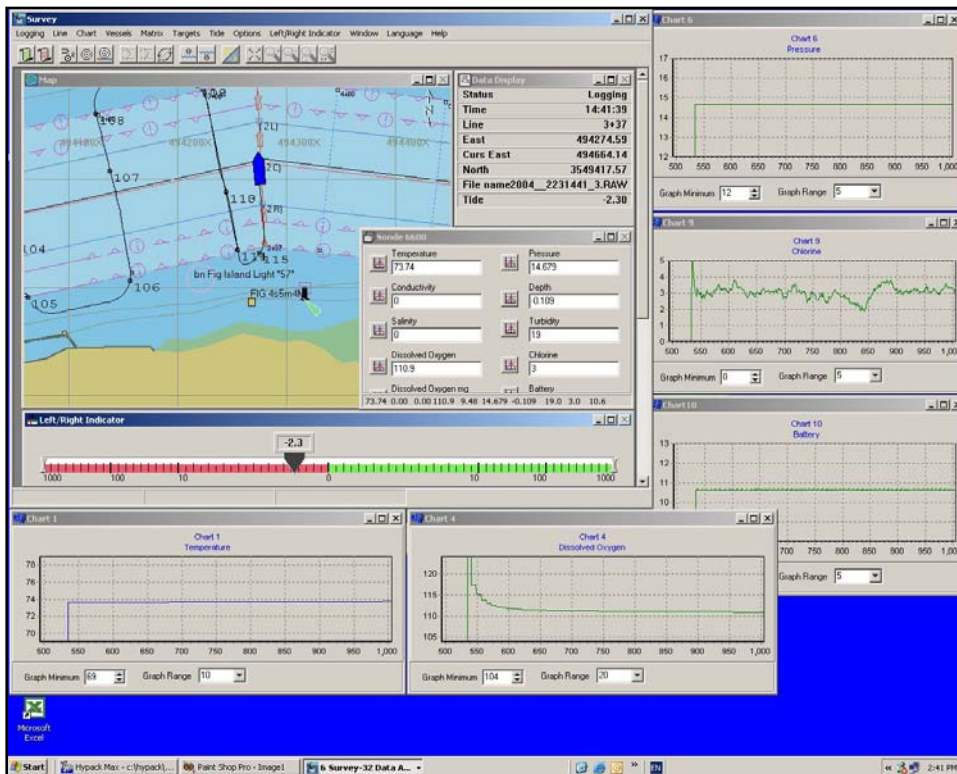
The optional HYSWEEP® module allows for the configuration, calibration, collection and processing of multibeam and multiple transducer sonar systems.

The DREDGEPACK® version allows you to maximize the efficiency of your dredge operations by tracking and maintaining a history of where the cutting tool has passed and how deep it was.

HYPACK®, HYSWEEP® and DREDGEPACK® are all developed by HYPACK, Inc.



HYPACK® screen with GeoTIFF background and multibeam sounding matrix.
[Data courtesy USACE New England District]



The SURVEY program of HYPACK® collecting data from the YSI Sonde 6600.

Hypack - Geodetic parameters

File Options Help

Predefined
Grids: State Plane NAD-83
Zone: CT-0600 CONNECTICUT

Distance unit: US Survey Foot
Depth unit: same as horizontal
Elevation Mode (Z-axis positive going up): ☐

Projection: Lambert Conformal Conic
Central Meridian: 072d45'00.0000"W
Reference latitude: 40d50'00.0000"N
Scale factor: 1.0000000000
North Parallel: 41d52'00.0000"N
South Parallel: 41d12'00.0000"N
False Easting (X): 1000000.0000
False Northing (Y): 500000.0000

Ellipsoid: WGS-84
Semi-major axis: 6378137.000
Flattening (1/f): 298.257223563

Datum transformation parameters
Delta X: 0.00 Delta Y: 0.00 Delta Z: 0.00
Delta X: 0.000000 Delta Y: 0.000000 Delta Z: 0.000000
Delta Scale: 0.000000 Calculate
Datum shift file: ... X

Geoid Model: ... X
Orthometric height correction: 0.00
Local Grid Adjustment: ☐ Local Grid
Chart datum level above geoid: 0.00

OK Cancel

The GEODETIC PARAMETERS program allows you to quickly specify the geodesy for each survey project.

Geodesy

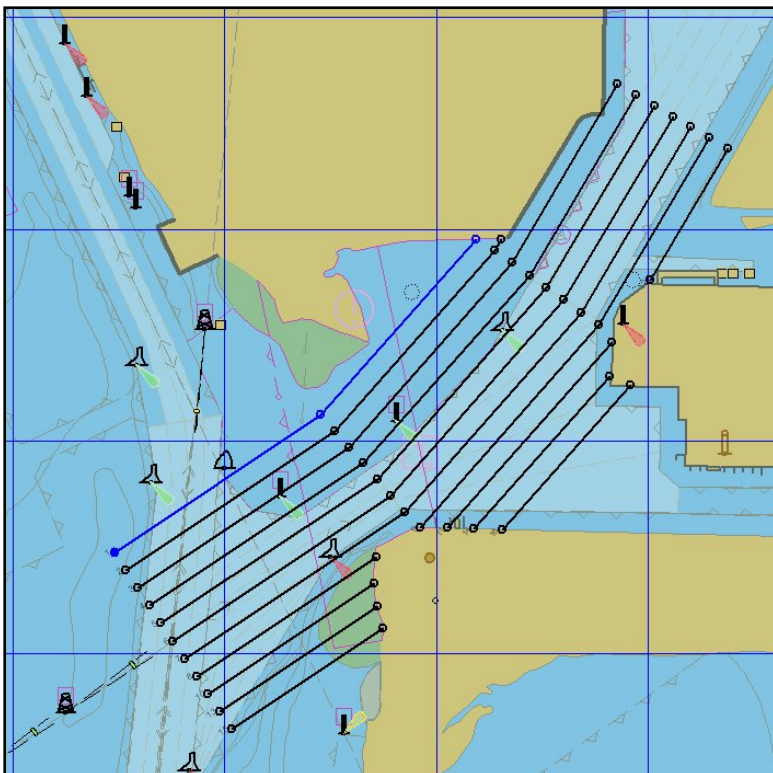
HYPACK® allows you to quickly configure your geodetic parameters for each project.

- National grids are pre-defined and available from a list.
- National datum transformation models are available for the USA, UK and France.
- Users can determine a 3 or 7-parameter transformation based on local test points.
- All standard projections used in hydrographic surveying are available.
- Users can also configure their parameters to utilize GPS on a local survey grid.
- Entire projects can be converted from an old to a new geodetic basis.

Planned Lines

You can quickly create planned lines for your survey.

- Manually enter X-Y or Lat-Long waypoints for your planned lines.
- Use the cursor to set waypoints.
- Create offsets from one of several methods.
- Import planned lines created in your CAD/GIS package (*.DXF).
- Generate 3-D planned lines that contain your channel toe-point and top-of-bank info.
- Clip planned lines to your exact area, using a HYPACK Border file.
- Planned lines can have:
 - o 2 or more segments
 - o Straight or curved segments



GEODETIC PARAMETERS program from HYPACK®.

CHANNEL DESIGN

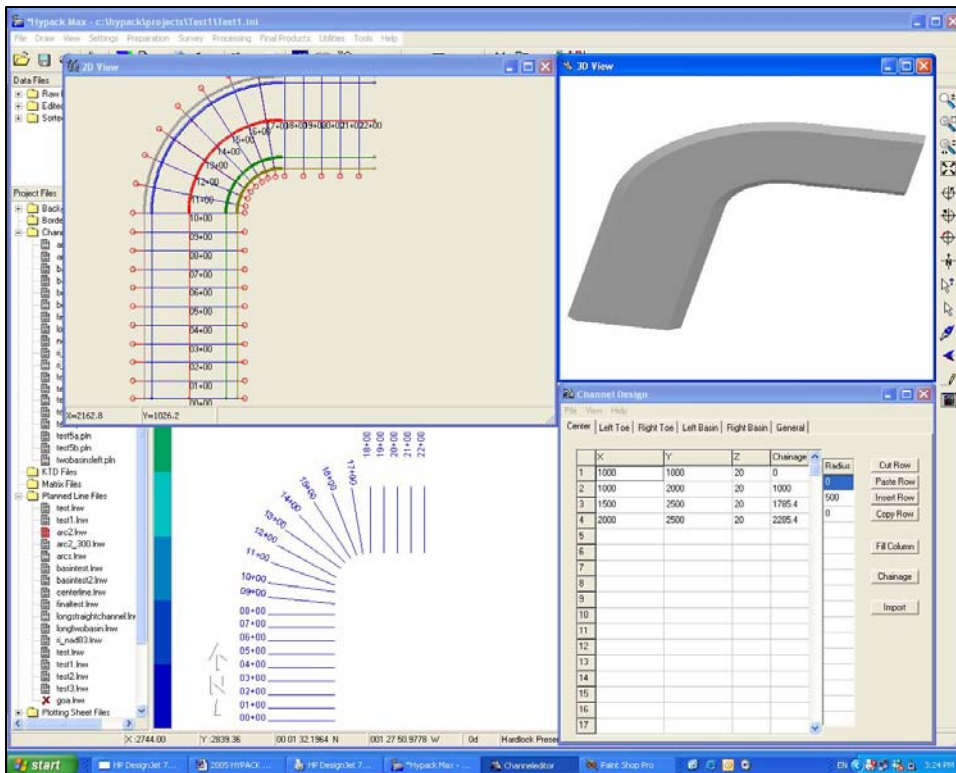
CHANNEL DESIGN is a special HYPACK® program that allows you to create planned lines by entering the channel geometry.

By entering info for:

- Left toe line and side slope.
- Centerline waypoints, chainage, and depth.
- Right toe line and side slopes.
- Turning basins.

...CHANNEL DESIGN can generate planned lines at user-defined intervals. Each line will contain the cross-sectional design profile at the section.

CHANNEL DESIGN has been recently upgraded to handle curved centerlines.



The CHANNEL DESIGN program creates 3-D planned lines with information on the channel centerline, toe lines and top of bank lines.

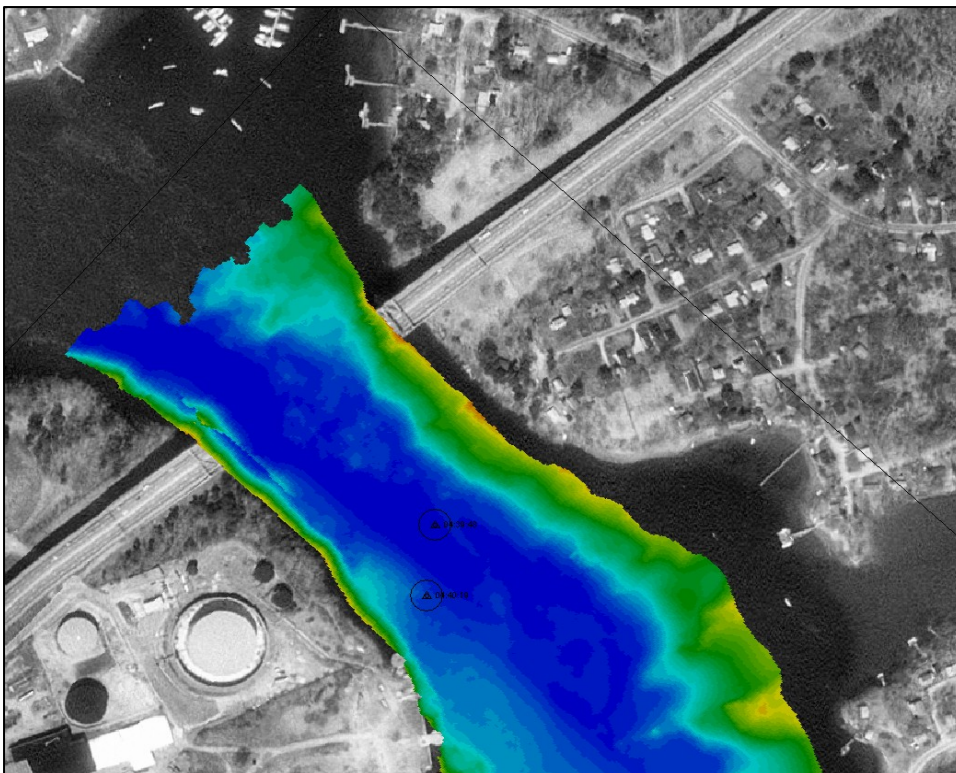
Matrix Files

A Matrix file (*.MTX) allows you to display real time bottom coverage and to quickly display the bottom depth info in a color scheme of your selection.

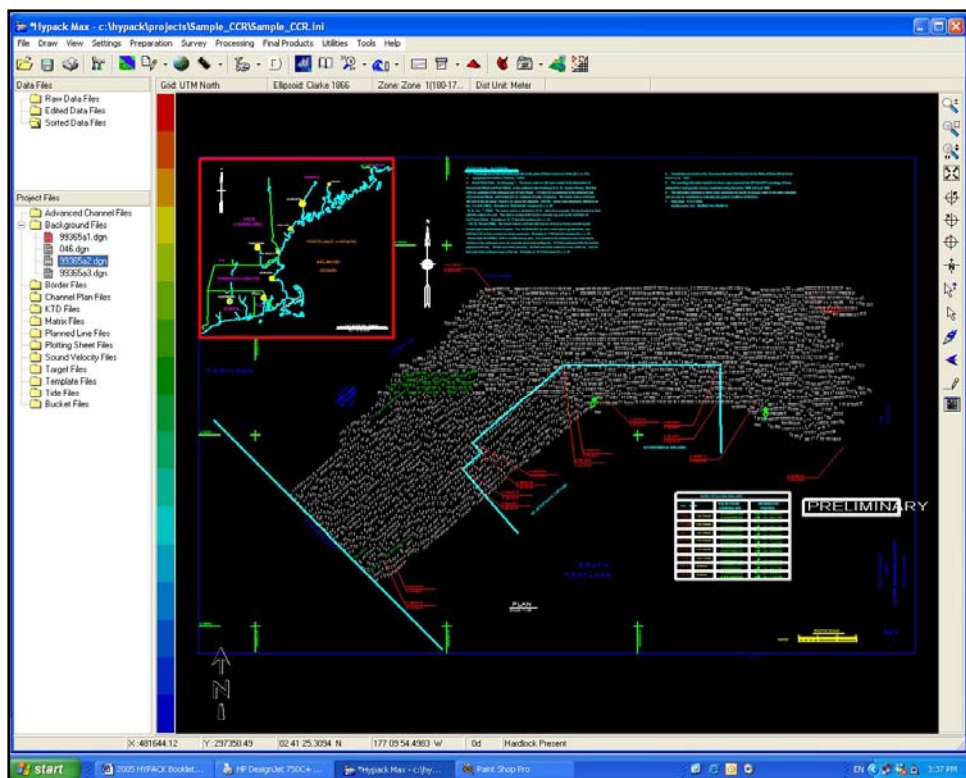
MTX files can be filled with pre-existing survey data or can be filled in real time with single beam, multiple transducer or multibeam sounding info.

In post-processing the MAPPER program allows you to select which depth is used to represent each 'cell' of the matrix:

- Minimum depth
- Maximum depth
- Depth closest to cell center
- Average depth
- Median depth
- Depth above or below strike value



A matrix file showing color-coded multibeam depth data superimposed over a GeoTIF.
[Data courtesy USACE New England District]



CAD/GIS Support

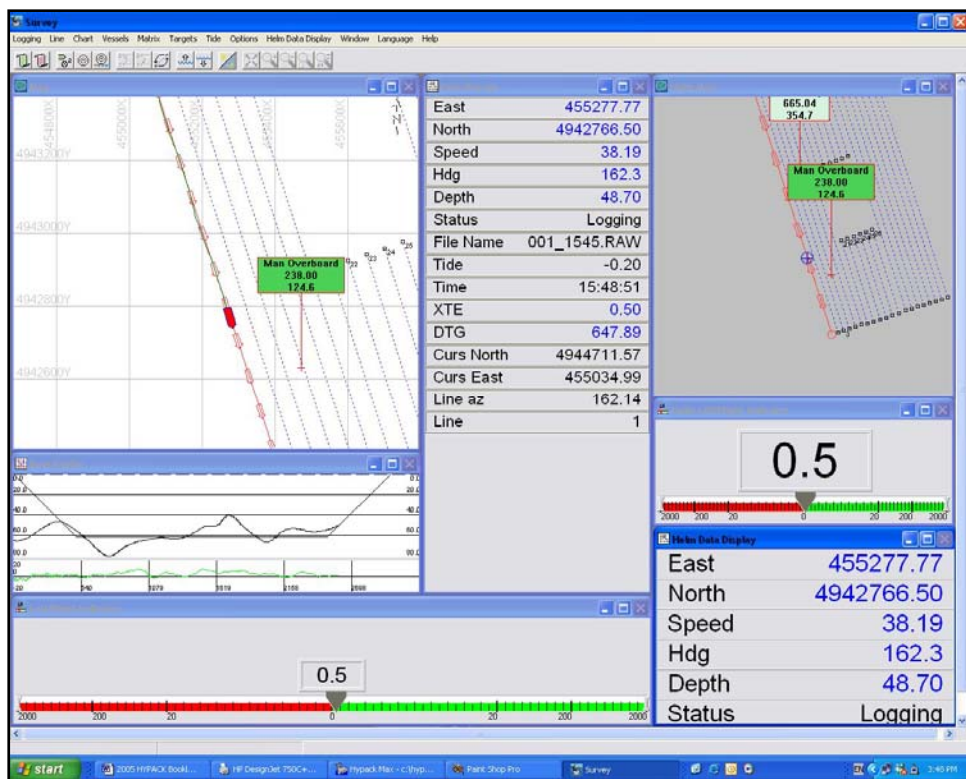
A majority of our clients want to be able to import their CAD/GIS information and display it in HYPACK® during survey design, data collection and generation of final products.

HYPACK® allows the display of several different background formats:

- DXF/DGN
- S-57/S-63
- OrthoTIF, GeoTIF
- BSB, UKHO ARCS
- Vector Product Format
- SHP from ArcInfo

HYPACK® also provides several tools to export data files and project files to both DXF and Microstation DGN.

One of HYPACK®'s strengths is in its import and export to CAD. The above screen capture shows a Microstation DGN file in MAX.



SURVEY

The SURVEY program of HYPACK® supports many kinds of devices.

- RTK, DGPS and GPS systems
- Range-Azimuth
- Range-Range
- USBL
- ROV Transponders
- Single beam and Dual Frequency echosounders
- Heave-Pitch-Roll sensors
- Gyros and magnetic compass
- Magnetometers
- Environmental sensors

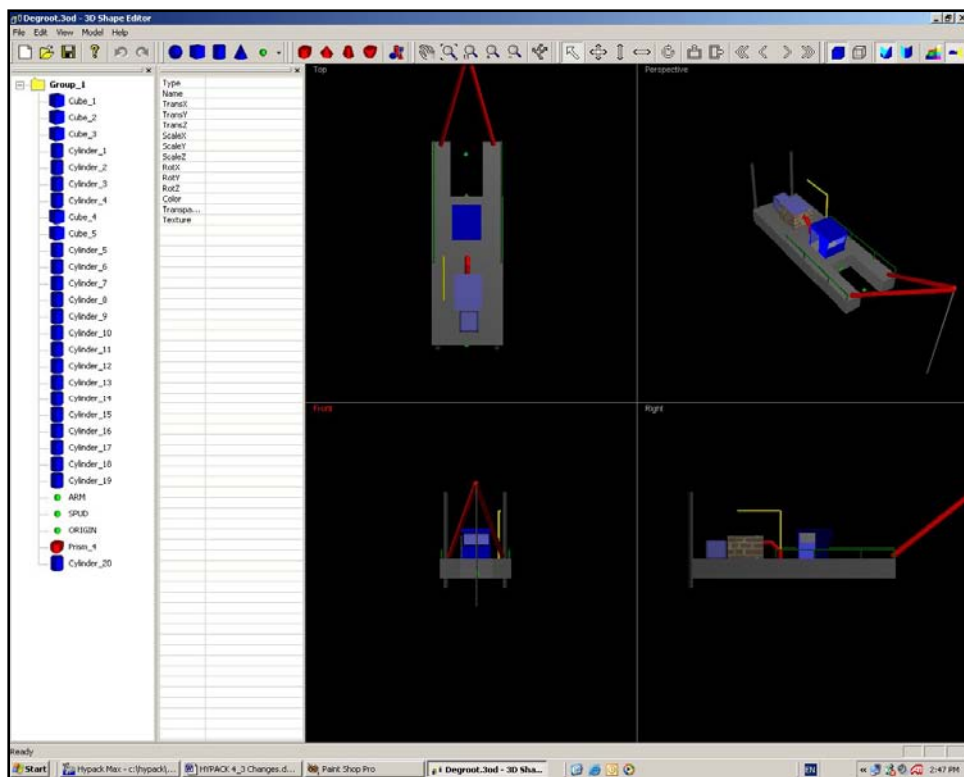
SURVEY provides windows for the Area Map, Data Display, Left-Right Indicator, Boat Profile and duplicate windows for the helm monitor.

HYPACK®'s SURVEY program was the first to support real time RTK TIDES.

The Shared Memory Area of SURVEY allows you to:

- Generate custom messages for other devices.
- Transmit survey info and

The SURVEY program showing standard windows with separate windows intended for the helmsman monitor



The 3D SHAPE EDITOR (3DSE) program allows you to create the exact shape of your vessel and display it in the 3DTV program.

Vessel Display

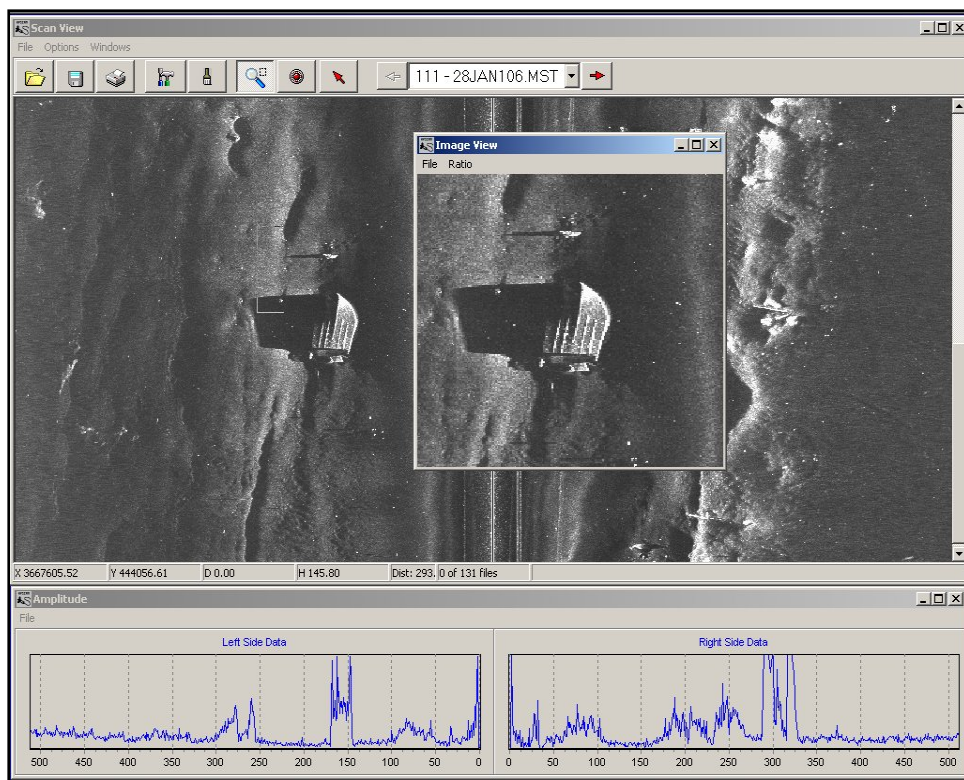
HYPACK® provides tools for the display of both 2-dimensional and 3-dimensional vessel shapes.

The BOAT SHAPE EDITOR is used to create 2-D shapes that are displayed in the plan view (Area Map) of SURVEY.

The 3D SHAPE EDITOR is used to create 3-D vessels that can be displayed in real time in the 3D TERRAIN VIEWER (3DTV) program.

The vessel perimeter and the location of all sensors are relative to a 'boat origin' established by the user.

This means you can have the exact perimeter of your vessel, dredge or work barge displayed in its exact location in real time.



Side scan data collected with Marine Sonics PCScan program displayed in the SIDE SCAN Mosaic program. [Data courtesy Marine Sonics]

SIDE SCAN

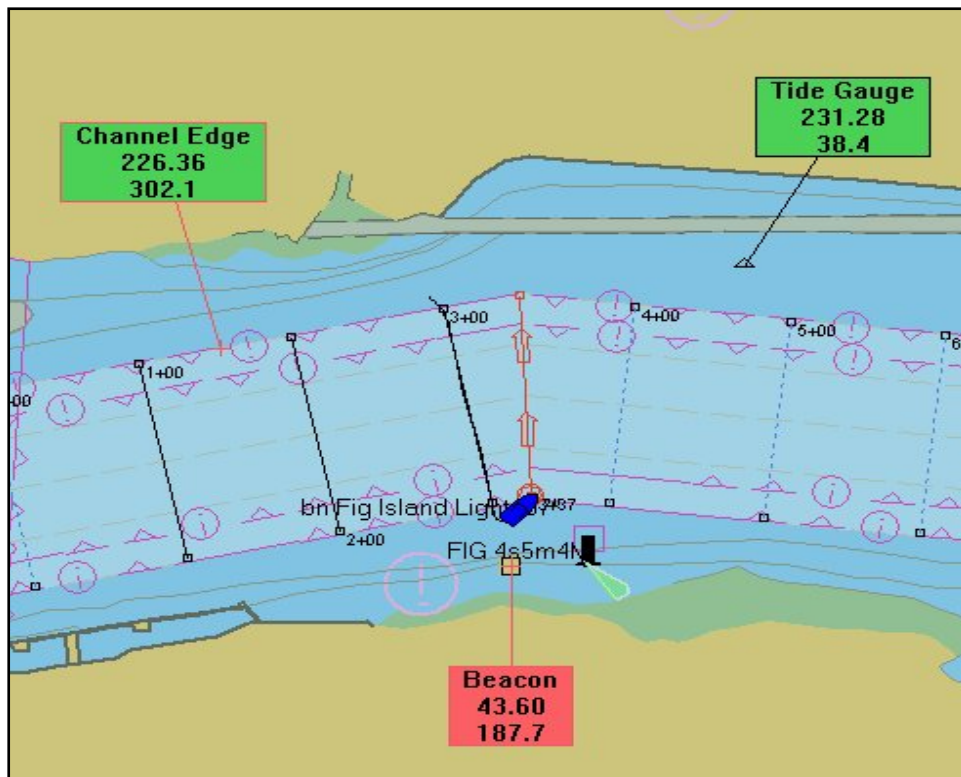
The collection and mosaicing of side scan data is now an integral part of HYPACK®.

The SIDE SCAN SURVEY program allows for the collection of digital and analog side scan data.

Target analysis can be performed in real time or in post-processing.

The SIDE SCAN MOSAIC program allows you to generate a mosaic from data collected in the HYPACK SURVEY program or from many XTF file formats. The resulting mosaic is saved to a GeoTIF format.

The SIDE SCAN routines can also process the backscatter intensity data from many multibeam systems to generate interesting mosaics.



The new 'alarm' style targets in SURVEY constantly show the distance and bearing from the boat to the target.

Targets

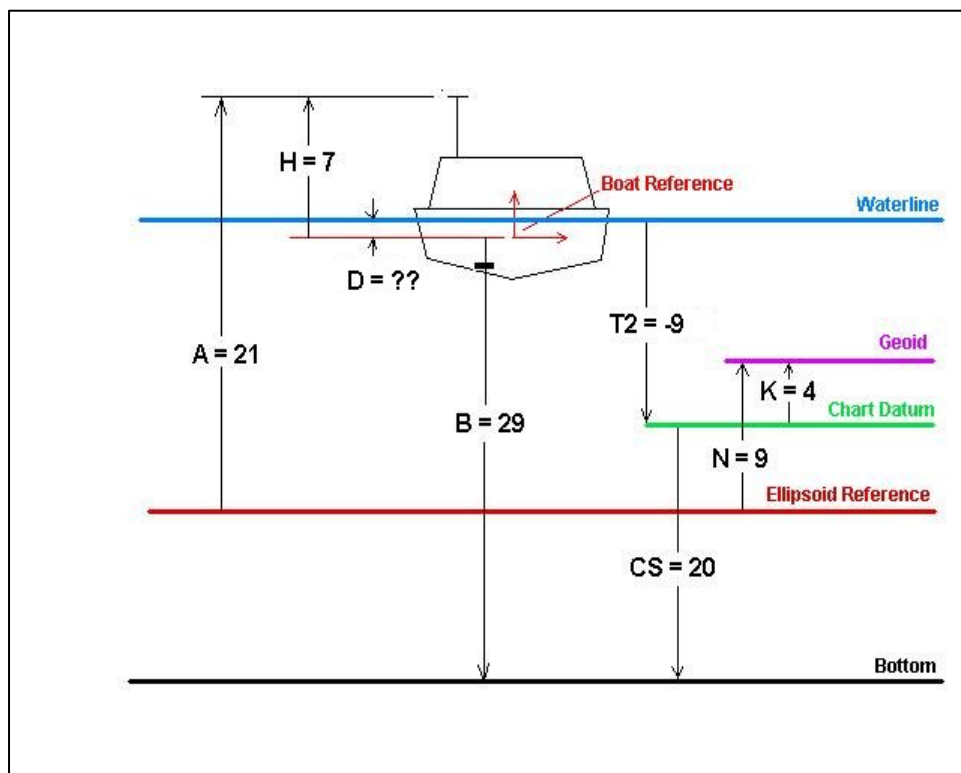
A target is an X-Y position of interest to the user. Targets can be used to mark aids to navigation or locations of bottom samples or any point of interest.

- Targets can be created in advance in the TARGET EDITOR.
- Targets can be marked in real time by hitting the F5 key in SURVEY. Targets can then be 'offset' based on a range and bearing.
- The new-style 'alarm' target provides a color-coded box that displays the name, distance-to-vessel and bearing-to-vessel info. The color of the alarm target changes color based on the distance to the vessel.

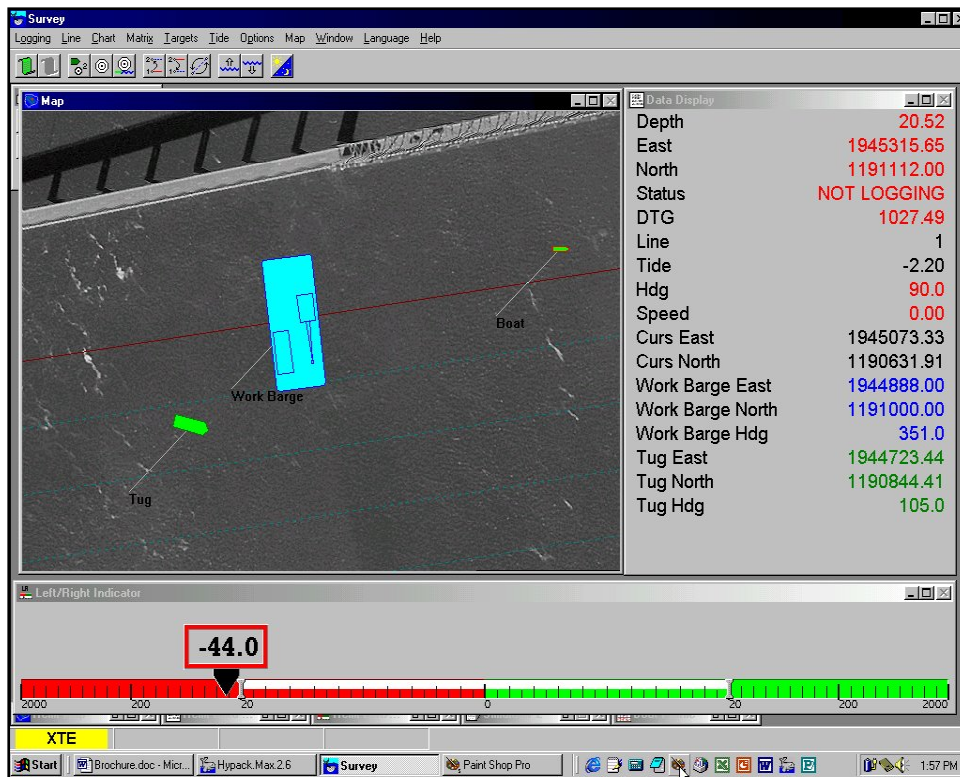
Water Level Corrections

HYPACK® has several ways to generate water level corrections:

- Telemetry tide gauges can be integrated directly into SURVEY.
- Users can manually enter corrections in SURVEY.
- Users can create a tide correction table during post-processing and apply those corrections.
- Users can generate predicted tide corrections based on high water and low water times and heights or by using harmonic constituents.
- HYPACK worked together with the US Army Corps of Engineers to pioneer the use of RTK GPS to determine real time water levels.



Using the elevation of the RTK antenna to determine the real time water-level correction is one of several tide correction methods available in HYPACK®.

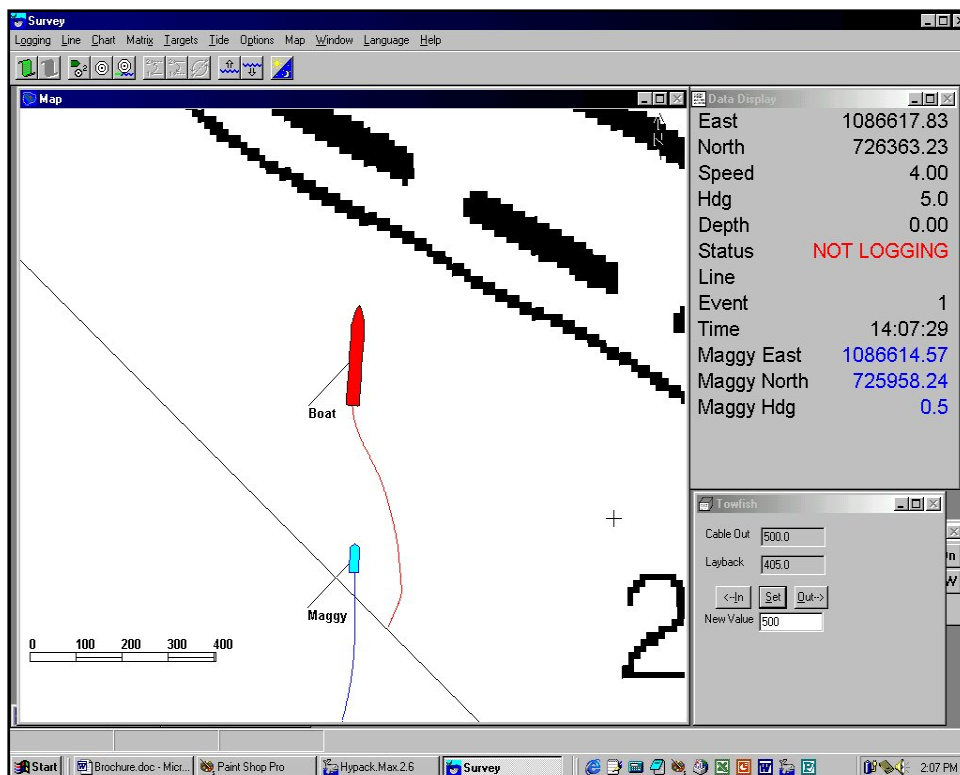


A work barge with two vessels in SURVEY.
[Background file courtesy USACE Rock Island]

Multiple Vessel Support

SURVEY can track up to eight separate vessels.

- Each vessel can be assigned its own shape and color attributes.
- Names of vessels can be attached to the shapes.
- Information from each vessel is available for display in the Data Display window of SURVEY.
- Info in the data display is color-coded to match the vessels color attribute.
- Any vessel can be designated the 'Main' vessel that is used to generate distance-to-go, cross-track-error and other navigation parameters.



A vessel with a towed magnetometer in SURVEY.

ROV & Towfish Support

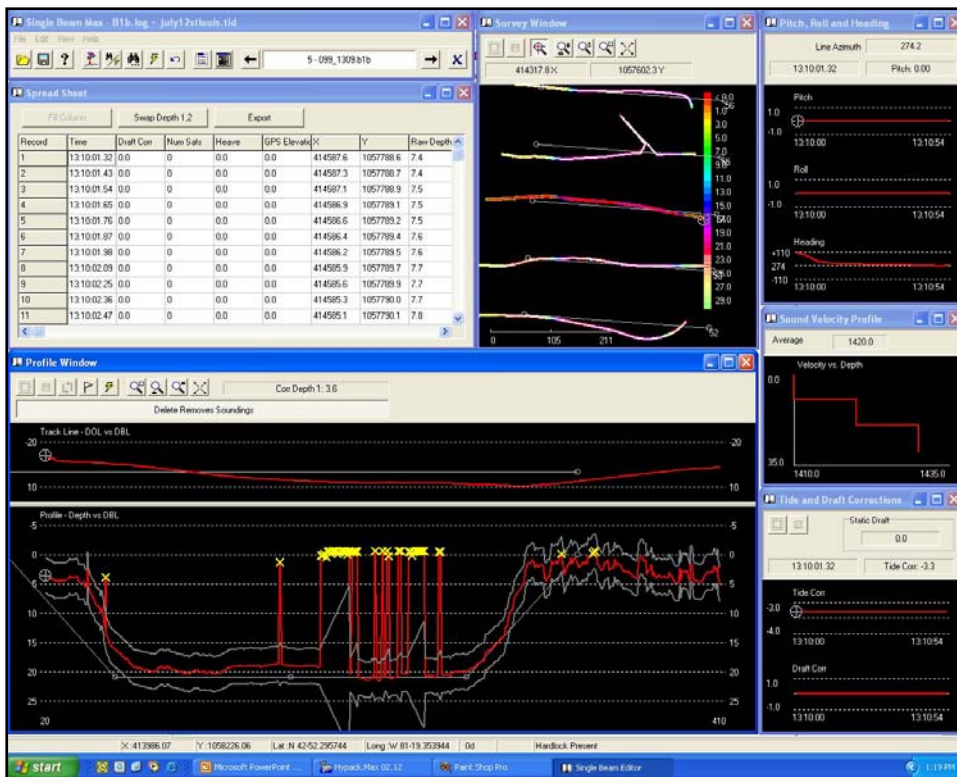
HYPACK®'s SURVEY program can simultaneously track, display and record the position and sensor information from your main vessel and towfish.

- Acoustic systems such as Trackpoint, Trackpoint LXT and Nautronic ATS are supported.
- USBL systems have been integrated.
- For short tows, the user can apply a manual layback, based on the amount of cable.
- The towfish or ROV can be designated as the 'Main' vessel. This means that all navigation parameters (Cross track error, distance to go, etc.) are based on the fish or ROV position.

SINGLE BEAM EDITOR

The SBMAX program provides a powerful graphical interface for editing your single beam and dual frequency sounding data.

- Loads and displays and entire day's work in seconds.
- Applies water level corrections, standard or RTK Tides.
- Permits smoothing of track lines and RTK Tidal corrections.
- Displays depth profiles based on distance along line or time.
- Configurable spreadsheet shows all survey info for each data point and can be output to ASCII TXT.
- Automated filters quickly eliminate outliers.

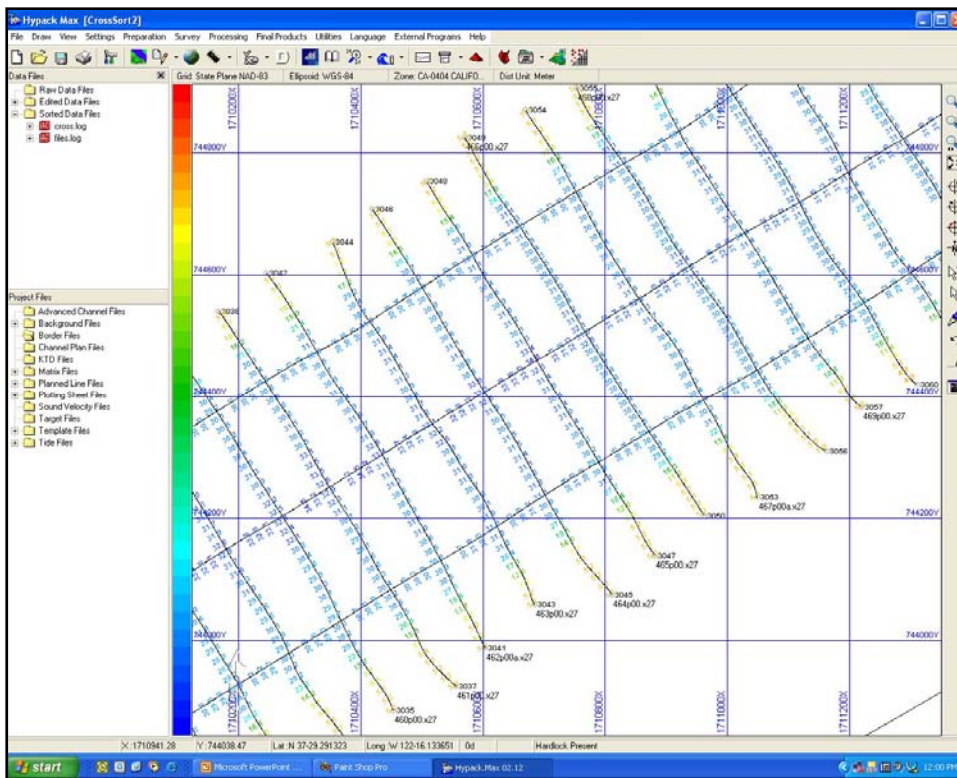


The SINGLE BEAM EDITOR allows you to quickly review, edit and save your single beam and dual frequency data.

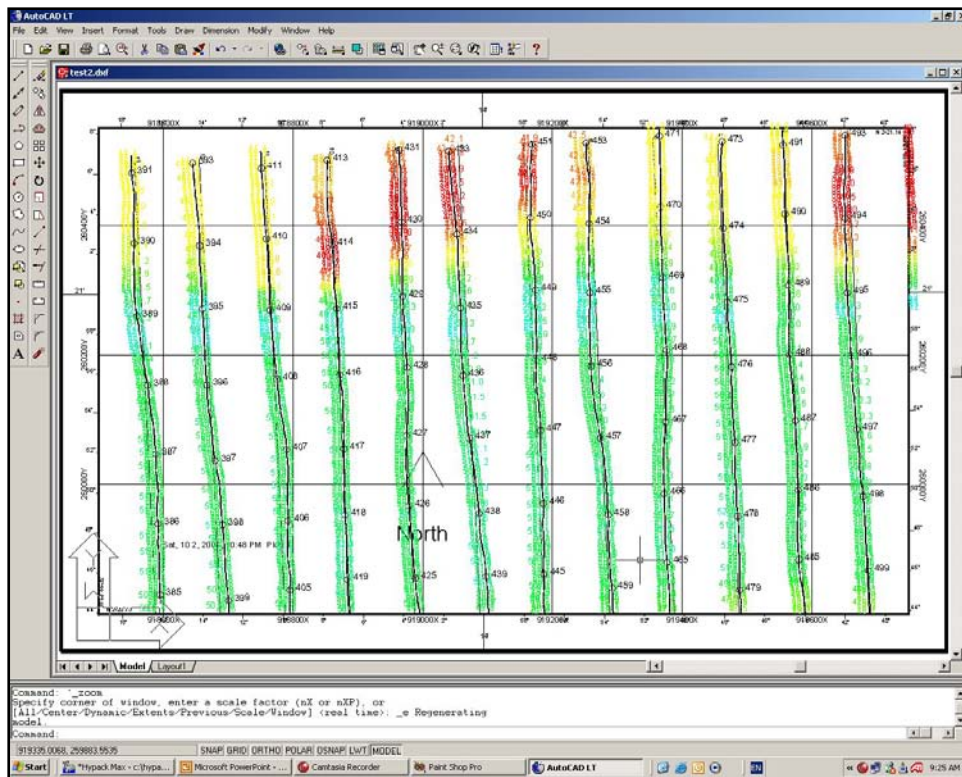
Sounding Selection Programs

HYPACK® contains several programs to help you reduce your final data set.

- SORT: Creates a cartographic data set that guarantees the minimum or maximum soundings will be saved.
- CROSS SORT: Selects soundings to prevent overwrites at where lines intersect.
- MAPPER: A binning program used to reduce multibeam data.
- SOUNDING REDUCTION: Creates a subset of XYZ data points that accurately models the original data set.



Sounding selection programs allow you to eliminate overwrites and to prepare your data set for plotting and export to CAD.



The EXPORT TO CAD program converts HYPACK data to DXF and DGN formats.
[Data courtesy USACE Jacksonville]

EXPORT TO CAD/GIS

HYPACK® has all the tools you will need to transfer your hydrographic survey data into AutoCAD, ArcInfo, Terramodel, Microstation and other CAD/GIS packages.

The EXPORT TO CAD program allows you to send the following items directly to DXF or DGN:

- Soundings
- Track lines
- Planned lines
- Projection grids and labels
- Matrix Files
- Channel Plan Files
- Border Files

The CROSS SECTION AND VOLUMES program also allows the user to export sections to DXF.

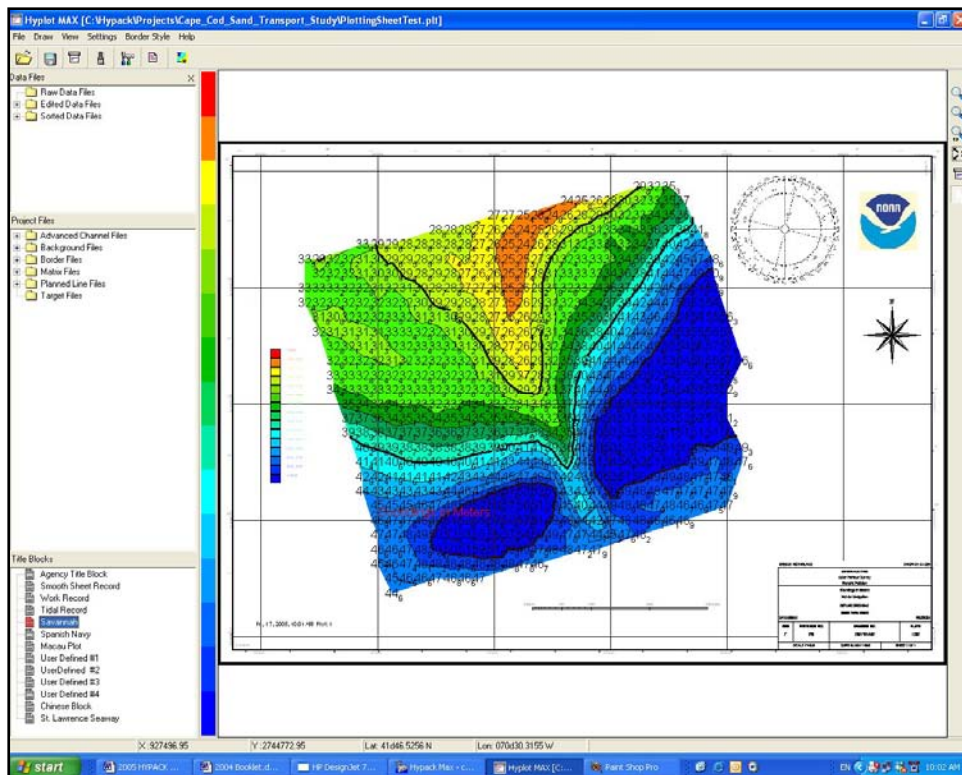
Plotting Smooth Sheets

HYPACK® has a powerful plotting program named HYLOT that outputs high-quality plots to any Windows™ printer-plotter.

Plotting sheet limits and scales are defined in the PLOTTING SHEET EDITOR.

HYLOT has some great features:

- A WYSIWYG display.
- Several border options including IHO.
- The ability to zoom in and preview your plot.
- Import of user supplied graphics (BMP and JPG).
- Compass roses, scale bars and default title blocks.
- Drag and drop to move plot features.
- Plotting of contour lines and solid fills.

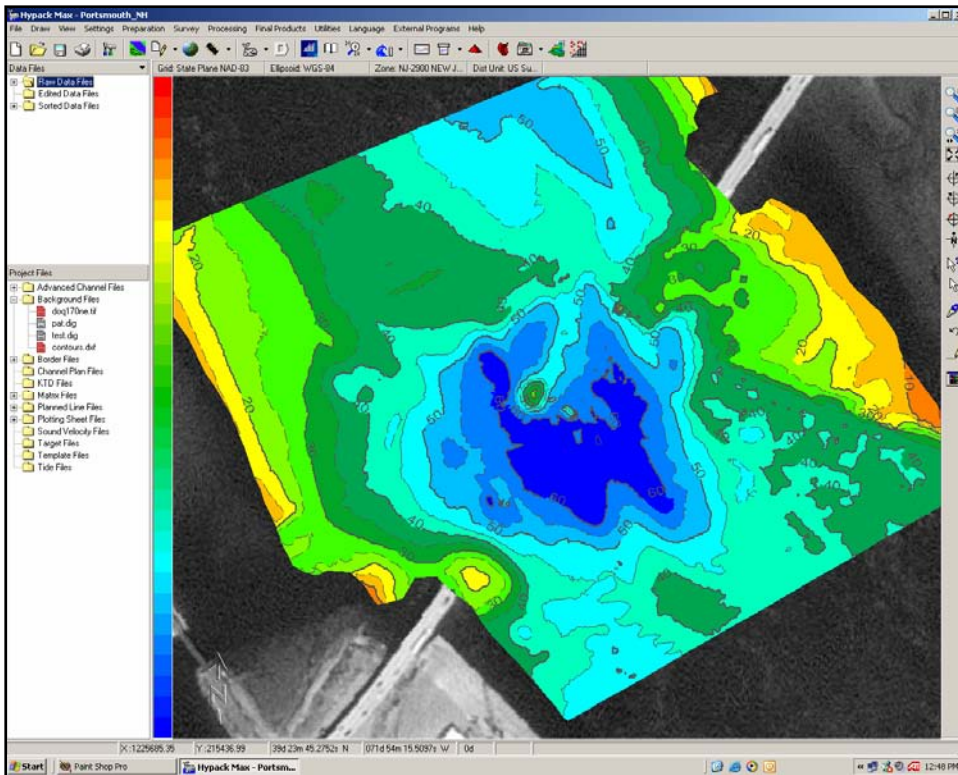


The HYLOT program is used to generate smooth sheets and can also export borders, compass roses, scale bars, soundings and other items directly to DXF.

CONTOURING

DXF Contours are generated in the TIN MODEL program of HYPACK®.

- Contours are saved to DXF format, allowing for easy import into your CAD/GIS application.
- Contours can be either lines, labeled lines, and/or solid color fills.
- The TIN MODEL program accepts any HYPACK® data file or data collected in any application, provided it is in an ASCII XYZ format.
- Users can control the line weight, style, color and labeling option for each contour line.

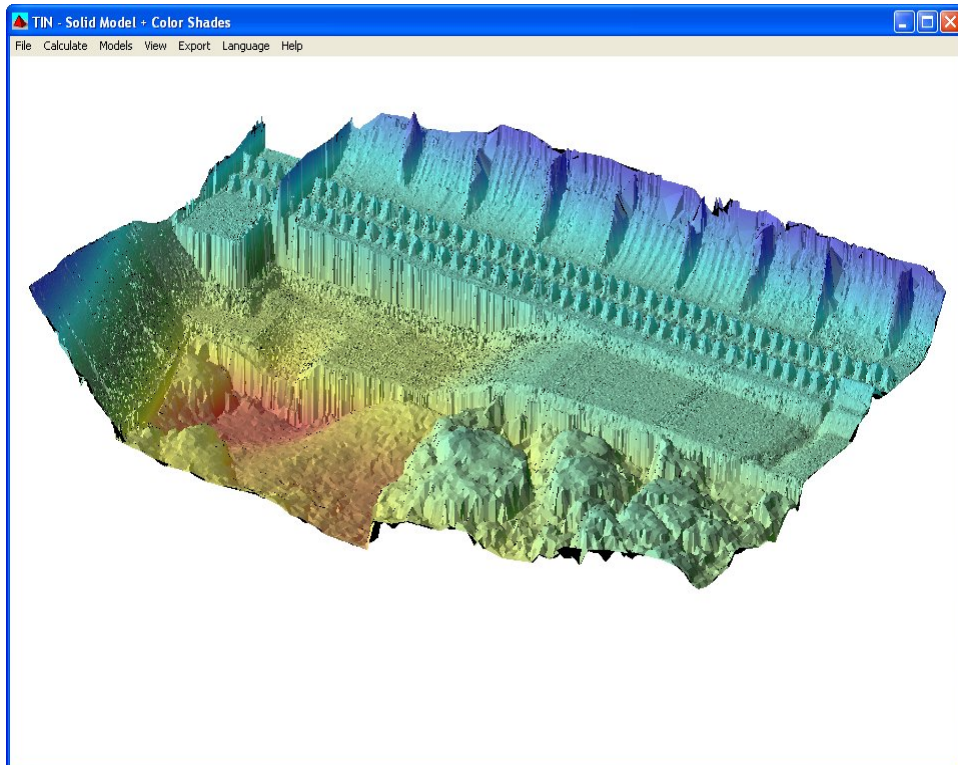


Solid filled contours with labels superimposed over a GeoTIF in HYPACK®

TIN MODEL

The TIN MODEL is a powerful tool that creates surface models (Triangulated Irregular Networks) of your survey data.

- Models can be viewed in gray-scale or color from any angle and perspective.
- Models can be printed to any Windows™ printer or plotter.
- Models can also be saved to BMP or JPG for import into documents.
- The TIN MODEL contains powerful volume routines to compute volumes for single beam or multiple transducer or multibeam data sets:
 - o TIN to Level
 - o TIN vs. Channel
 - o TIN vs. TIN
 - o Volume by sections.



A TIN Model of Bonneville Dam.
[Data courtesy David Evans and Assocs., Portland, OR]

CROSS SECTIONS AND VOLUMES

The CROSS SECTIONS AND VOLUMES (CS&V) program of HYPACK® is the most versatile volume computation program in the industry.

CS&V computes volume quantities by determine the area of material in segments above the design, overdepth and supergrade templates.

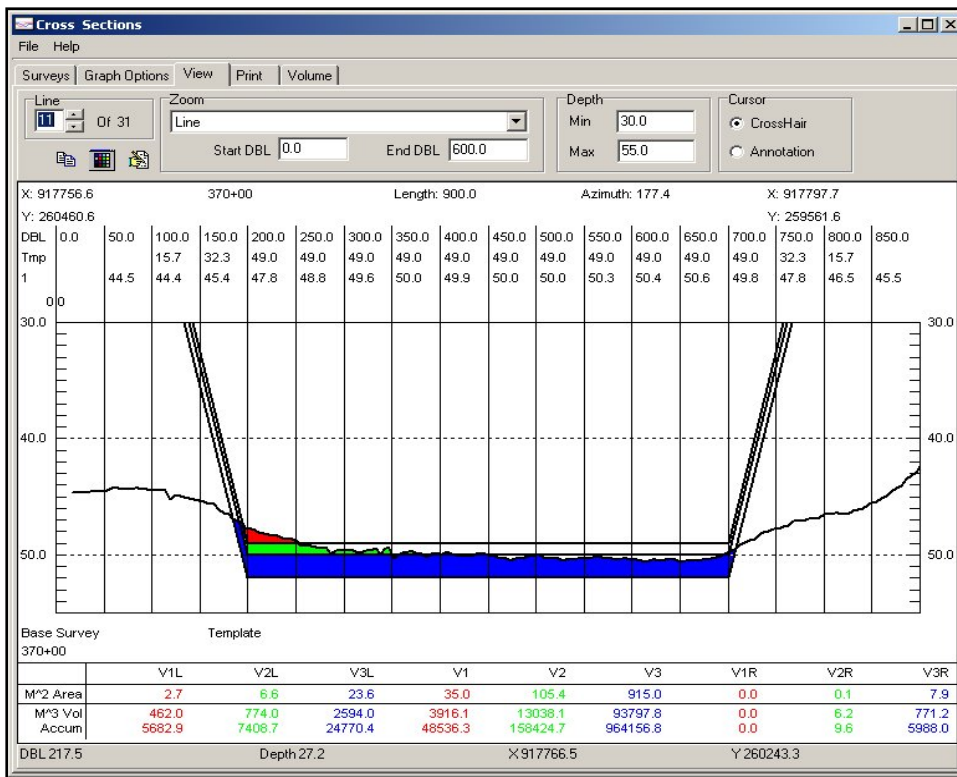
Available methods include:

- AEA 1 – Standard Average End Area (AEA) report as used by USACE.
- AEA2 – Standard AEA with contour dredging computation in overdepth.
- AEA3 – Standard AEA report for a Pre-Dredge versus Post-Dredge computation.
- Philadelphia Pre-Dredge and Post-Dredge – AEA method with special provisions for box cuts.
- Jacksonville Pre-Dredge and Post-Dredge – Special treatment of side slope material.
- Savannah – Specially formatted AEA report.
- Standard HYPACK – Improved method for non-parallel lines where material is stacked on the inside or outside of the turn.
- CHEC 1 and CHEC 2 – Methods developed for Chinese National standards.
- Panama City – Generates ENG 80 report format.
- GLDD 1 and 3 – Special routine for treatment of side slope material

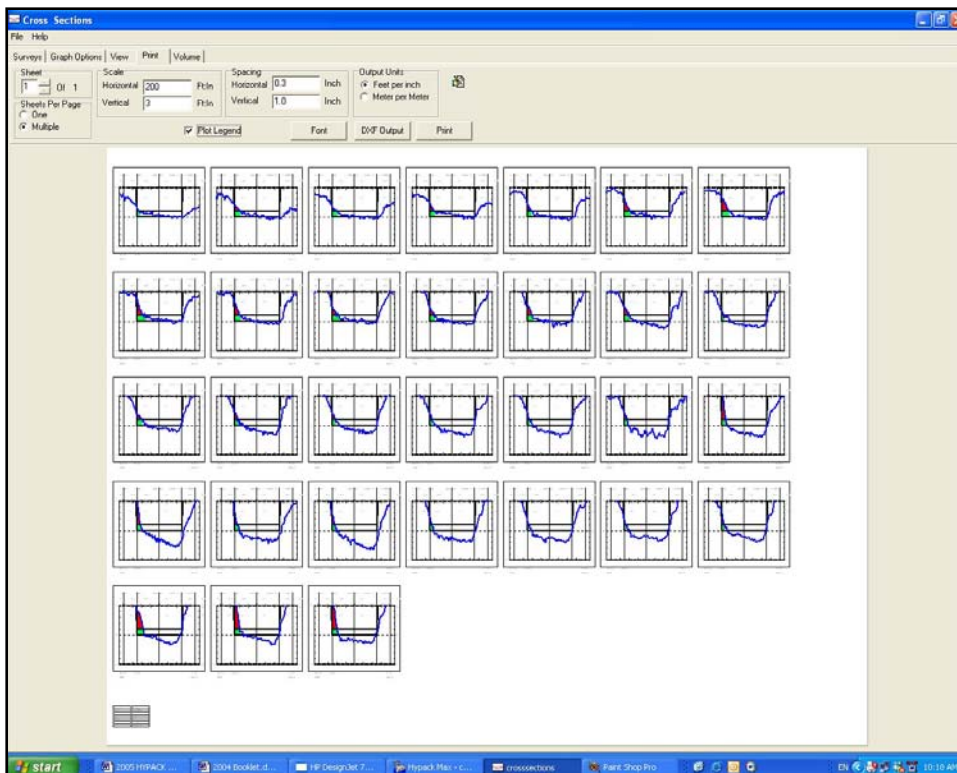
CS&V generates ASCII TXT reports for each method selected.

Sections and results can be sent to any Windows™ printer or plotter device.

- Plot one sections.
- Plot all sections each to their own page.
- Plot as many sections as you can fit on a page.



A display of a sectional profile showing the depth profile and the design template in the CROSS SECTIONS AND VOLUMES program. [Data courtesy USACE Buffalo]



A series of sections ready for plotting on a large format plotter.

3D TERRAIN VIEWER (3DTV)

The 3DTV program creates stunning visual representations of your survey data.

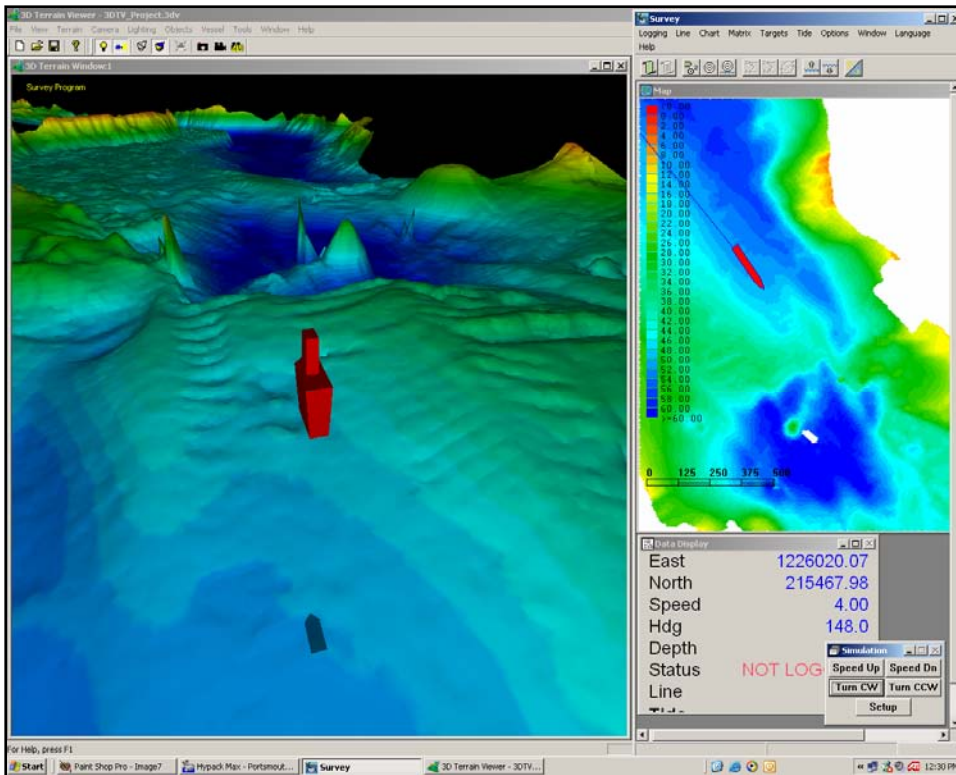
3DTV can read any HYPACK® LOG or XYZ data file to generate the surface model of the bottom.

The user can position the 'camera' using one of the following methods:

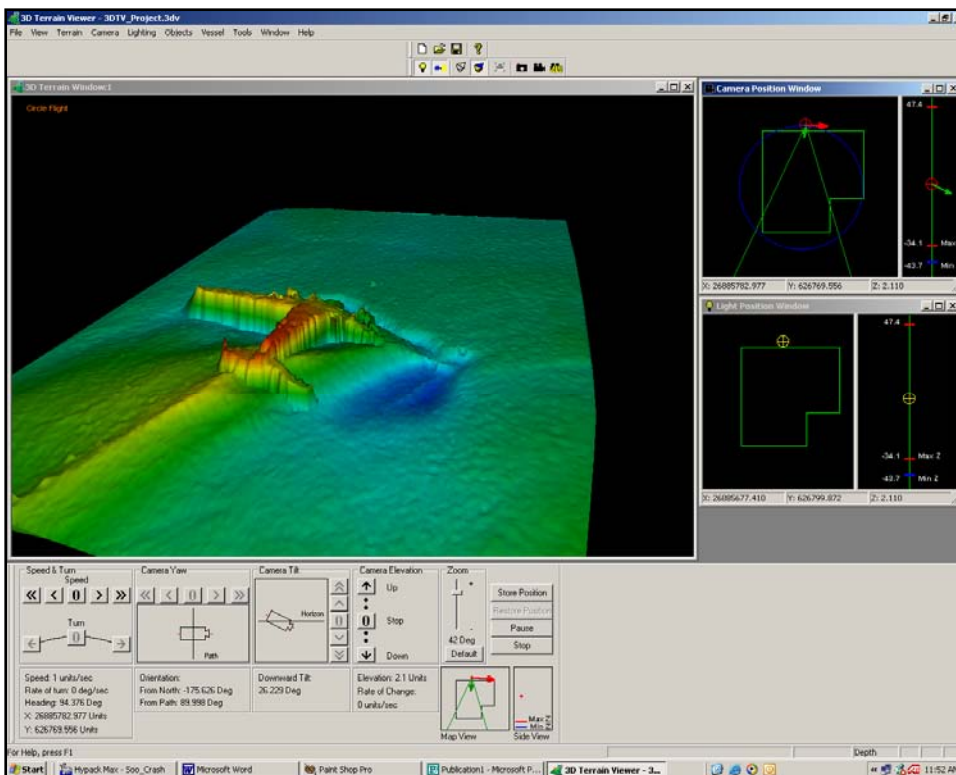
- **Manual Flight:** The user can position the camera and has complete control over its movements and direction.
- **LNW Flight:** The camera travels along a planned line file created in HYPACK®. The user can point the camera to the left or right of the planned line, but cannot move the camera off the line.
- **Circle Flight:** The camera travels around the perimeter of a user drawn circle. The camera always points towards the center of the circle. (Shown in the bottom figure.)
- **SURVEY Mode:** The camera is positioned and oriented relative to the vessel position and heading as supplied by the SURVEY program. (Shown in the top figure.)

The real time water level can also be displayed in different levels of transparency while in SURVEY mode.

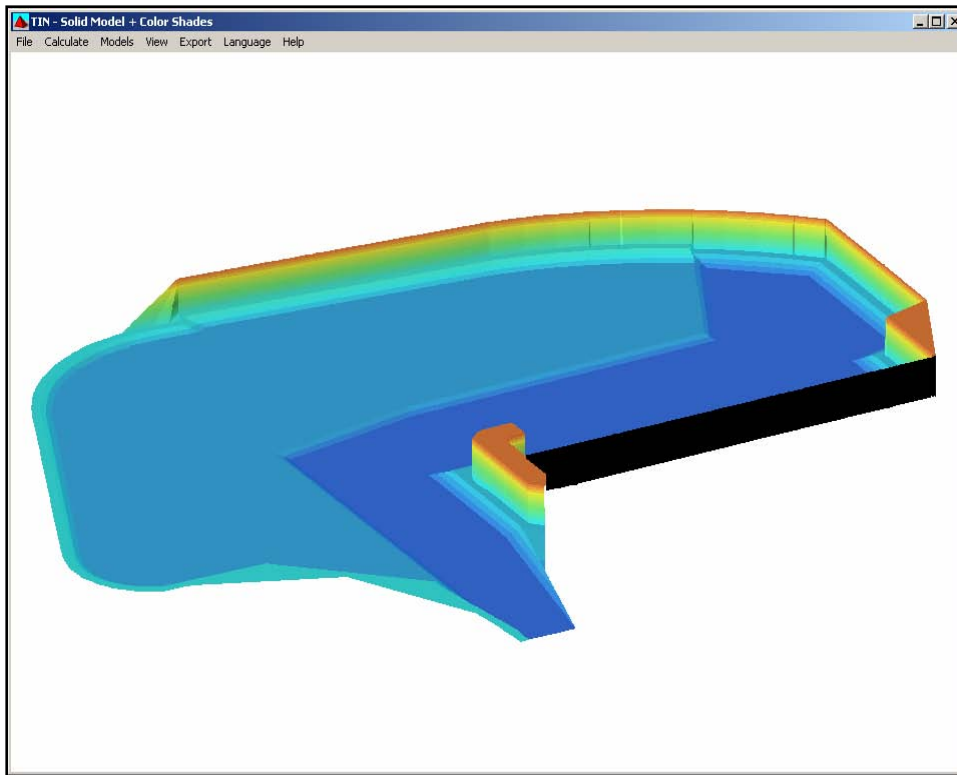
Users can also display a channel design file, using the *.CHN files created in the ADVANCED CHANNEL DESIGN program.



3DTV working in conjunction with the SURVEY program. The 3-D vessel shape is positioned and oriented based on real time info coming from SURVEY.



Viewing a plane using 'Circle Mode' in 3DTV.
[Data courtesy USACE – Sault Ste. Marie, MI]



A complex dredging plan created in the ADVANCED CHANNEL DESIGN program.

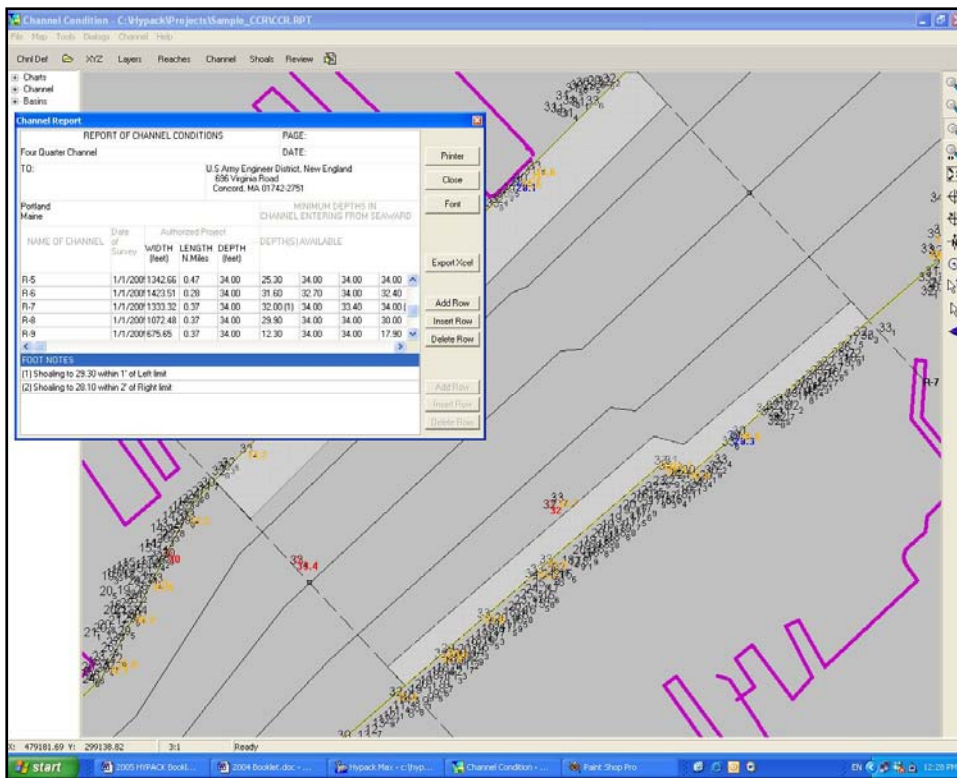
ADVANCED CHANNEL DESIGN (ACD)

ACD allows user to create an exact dredging plan for complex areas.

The channel files (*.CHN) created in ACD can be loaded in DREDGEPAK® to generate a real time cross sectional design profile based on the position of the digging tool.

The channel files can also be imported into 3DTV so the user can see exactly how the channel bottom relates to the design channel.

In ACD, the user enters X-Y-Z node information and then joins the nodes into planar faces.



Determine shoal depths per channel segment in CHANNEL CONDITION REPORTER.

CHANNEL CONDITION REPORTER (CCR)

CCR is a specialty program, designed for the US Army Corps of Engineers to meet Federal requirements of certifying the minimum depth at different reaches of a channel.

In the design phase of CCR, the user defines the channel lines and divides the channel into 'reaches'.

In the shoal phase of CCR, the user imports their latest survey data and CCR determines the minimum (controlling) depth for each segment of each reach. It then generates a report, as per the NOAA format, that can be printed or exported to EXCEL.

DREDGEPACK®

DREDGEPACK® is a specialty version of HYPACK® that is designed to operate on the bridge of dredges, excavators and derricks.

DREDGEPACK® maximizes the digging efficiency by providing real time information as to how deep the dredge is currently digging and how deep is the dredge plan at their current location.

The cross sectional profile views show:

- The As Surveyed Surface
- The As Dredged Surface
- The Channel Design Profile.

Profiles can be generated:

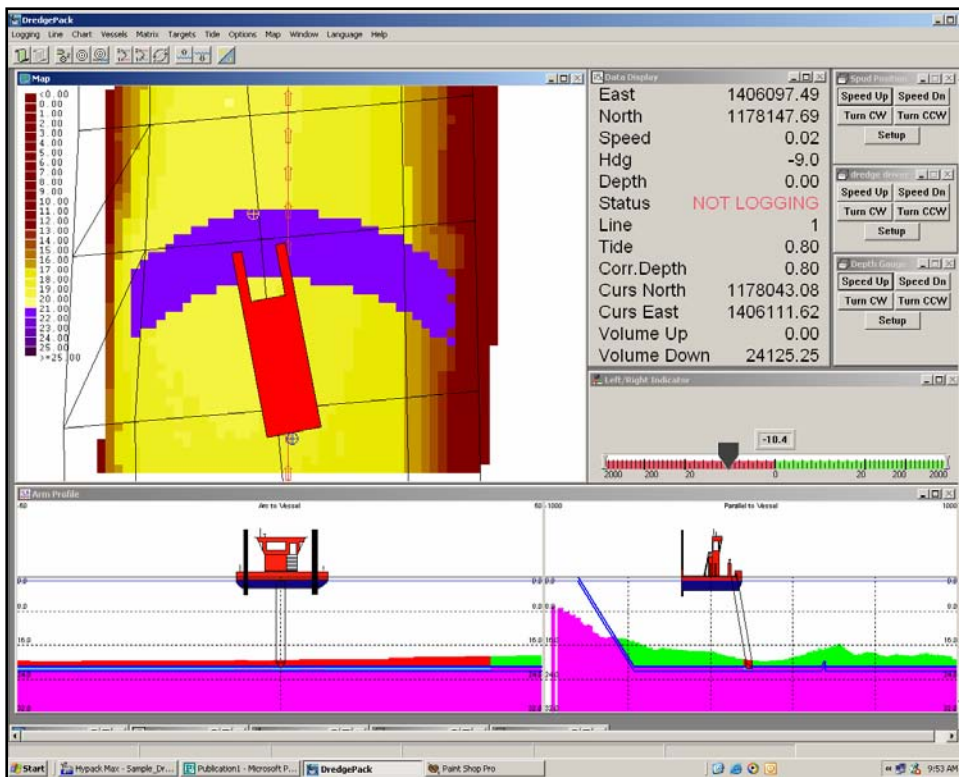
- Parallel to the vessel
- Perpendicular to the vessel
- Parallel to the planned line
- Perpendicular to the planned line.
- Along an arc (cutter suction swing)

DREDGEPACK® can access multiple matrix files, allowing you the detail needed when dredging long channels. The matrix file can show the depth that the cutting tool was at as it passes through each cell.

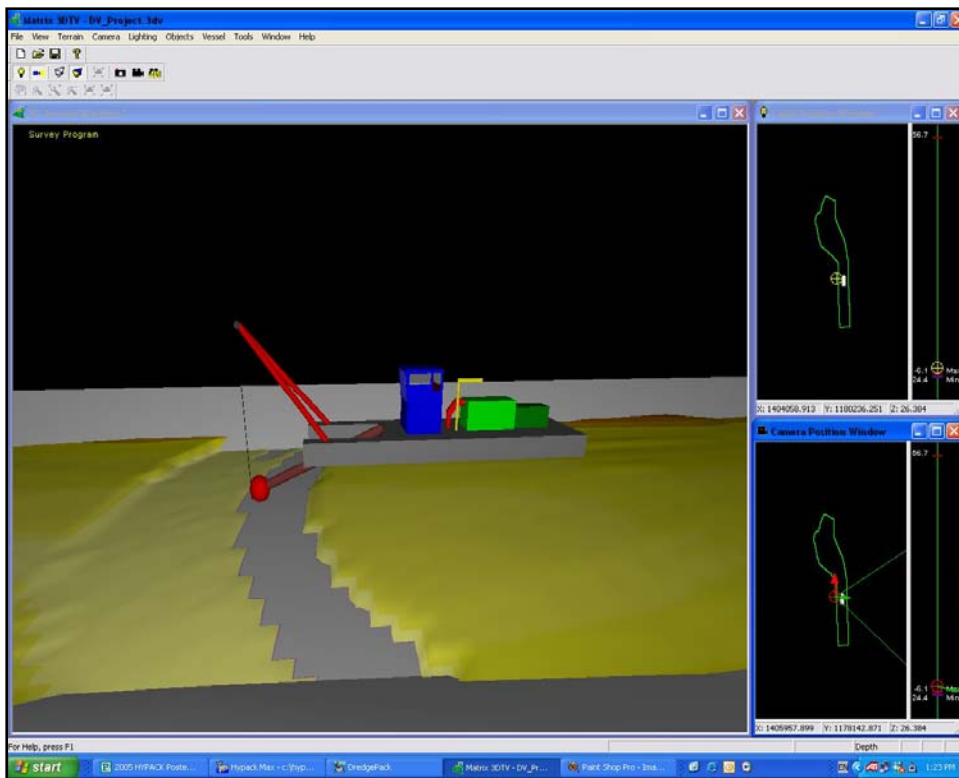
DREDGEPACK® supports the following dredge types:

- Cutter Suction
- Hopper
- Excavators
- Cranes & Derricks.

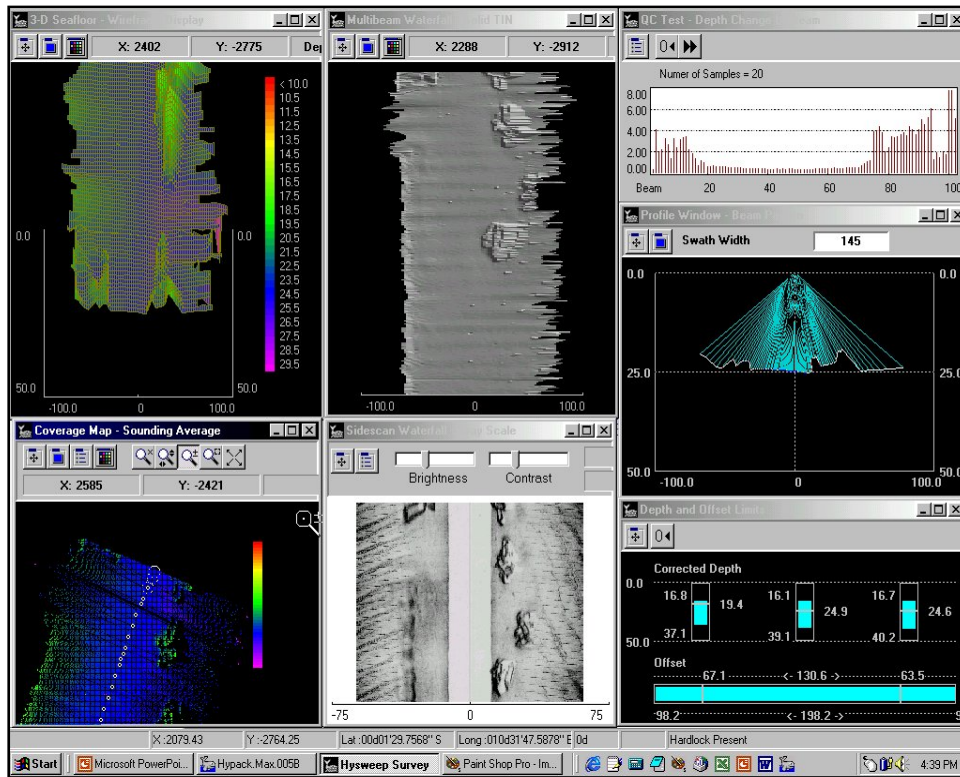
DREDGEPACK® can also be set up to track bucket 'drops' or 'placements', allowing you to generate a precise diagram to show capping operations.



A screen capture from DREDGEPACK® showing arc and longitudinal sections.



3DTV in SURVEY MODE, showing the position of the dredge and the digging tool relative to the design channel (gray) and the as-surveyed bottom.

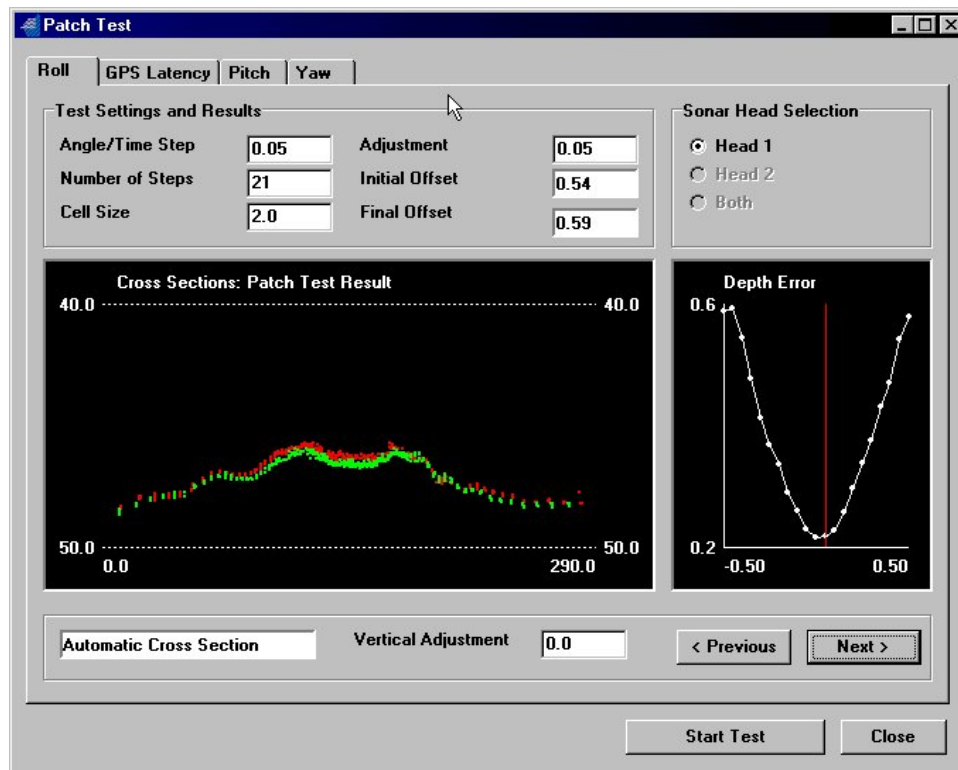


The HYSWEEP® SURVEY program, providing real time feedback during the collection of multibeam data.

HYSWEEP® SURVEY

The HYSWEEP® option to HYPACK® adds the ability to calibrate, log and edit data from multibeam and multiple transducer sonar systems.

- Integrates multibeam sonars from:
 - o Atlas
 - o Benthos
 - o Elac/Seabeam
 - o Odom
 - o Reson
 - o Simrad
 - o
- Provides for real-time display of:
 - o Bottom coverage
 - o Swath wire frames
 - o Swath TIN surface
 - o QC information
 - o Side scan
 - o Nadir beam to single beam comparison.

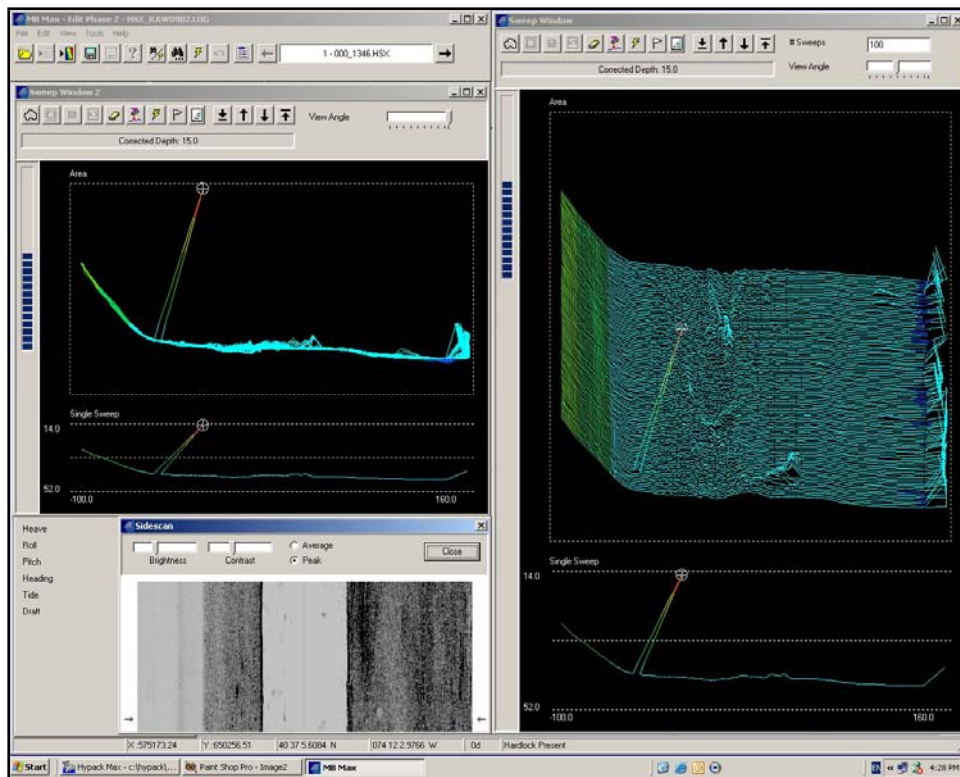


The 'Patch Test' portion of HYSWEEP® allows users to determine the exact alignment of their equipment.

HYSWEEP® CALIBRATION

HYSWEEP® provides tools to allow you to quickly and accurately calibrate the orientation of your multibeam transducer and the time delays between the sonar and positioning system.

- The Patch Test function inside the MBMAX multi-beam editor computes the following errors from a set of test lines:
 - o Roll
 - o Pitch
 - o GPS Latency
 - o Yaw
- Data that has already been collected can be corrected for alignment and delay errors.
- System calibration should be a matter of hours, not days.



Stage 2 Editing in MBMAX now allows for dual Sweep windows, allowing you to view the data in different perspectives.

HYSWEEP® EDITING (MBMAX)

The MBMAX program allows you to edit your multibeam and multiple transducer data.

- MBMAX allows you to enter a tide correction file or to use water level corrections determined by RTK GPS elevations.
- The first stage of editing in MBMAX allows you to review and edit:
 - o Vessel tracklines
 - o Heave-pitch-roll
 - o Gyro
 - o Tide
 - o Draft
 - o Sound Velocity

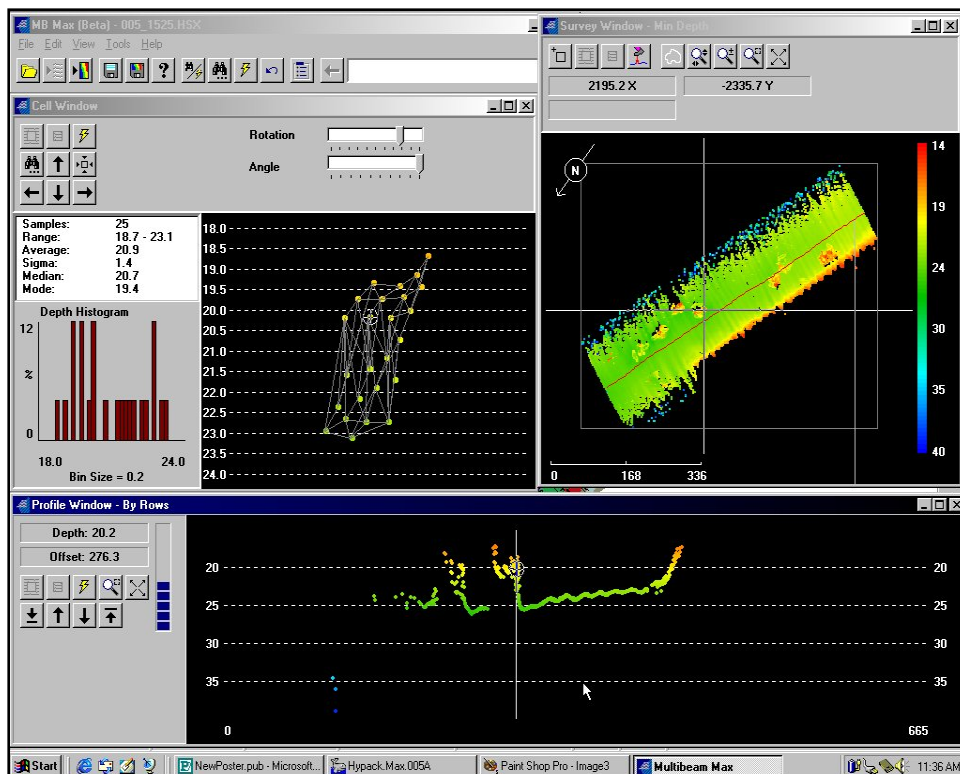
- The second stage of editing takes you to the Sweep Editor. During this stage, you can visually review each line and graphically edit or apply automated filters to each line. Filters include:

- o Min/Max Depth
- o Spike
- o Overhang/Undercut Topography
- o Sonar Quality Flag
- o Port/Starboard Beam Angle Limits
- o Specific Beams

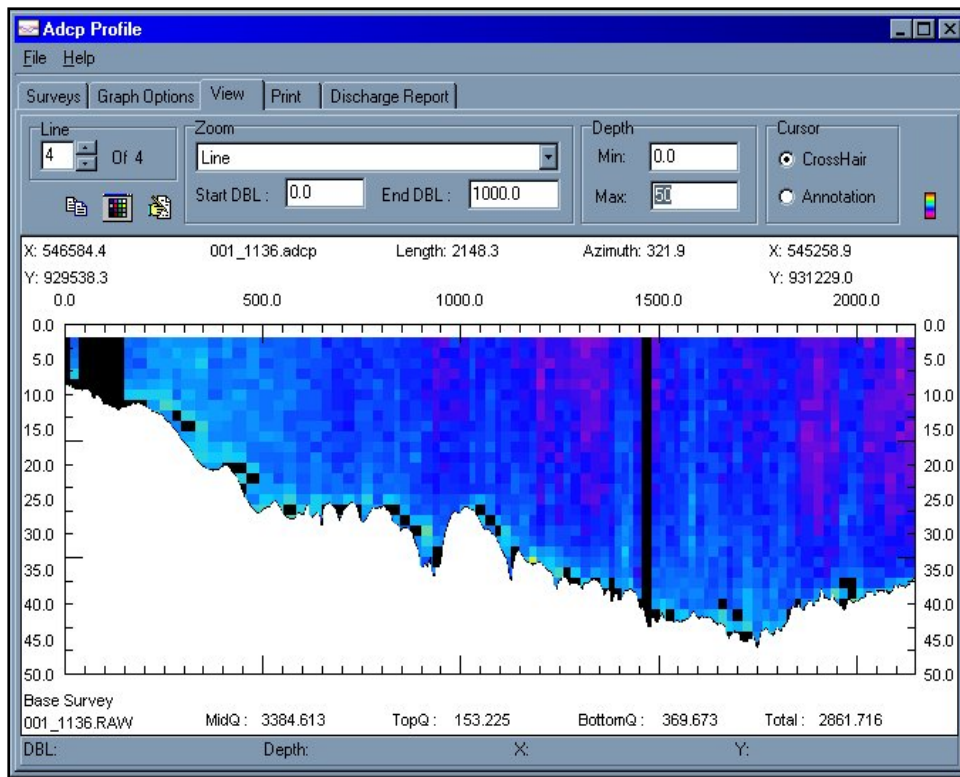
- During the third stage of editing, data from all multibeam lines is combined and displayed. Statistical filters can now be applied based on the surrounding multibeam data points. Displays include:

- o Survey window
- o Profile window
- o Cell window

- The third stage also contains the calibration (Patch Test) and System Performance tools to judge the overall quality of your multibeam system.



Stage 3 editing of MBMAX performs statistical filtering



The ADCP Profile program of HYPACK® processes ADCP data to generate cross-sectional flow profiles.

ADCP SUPPORT

HYPACK® now supports ADCP sensors from RD Instruments. The following programs are included in MAX:

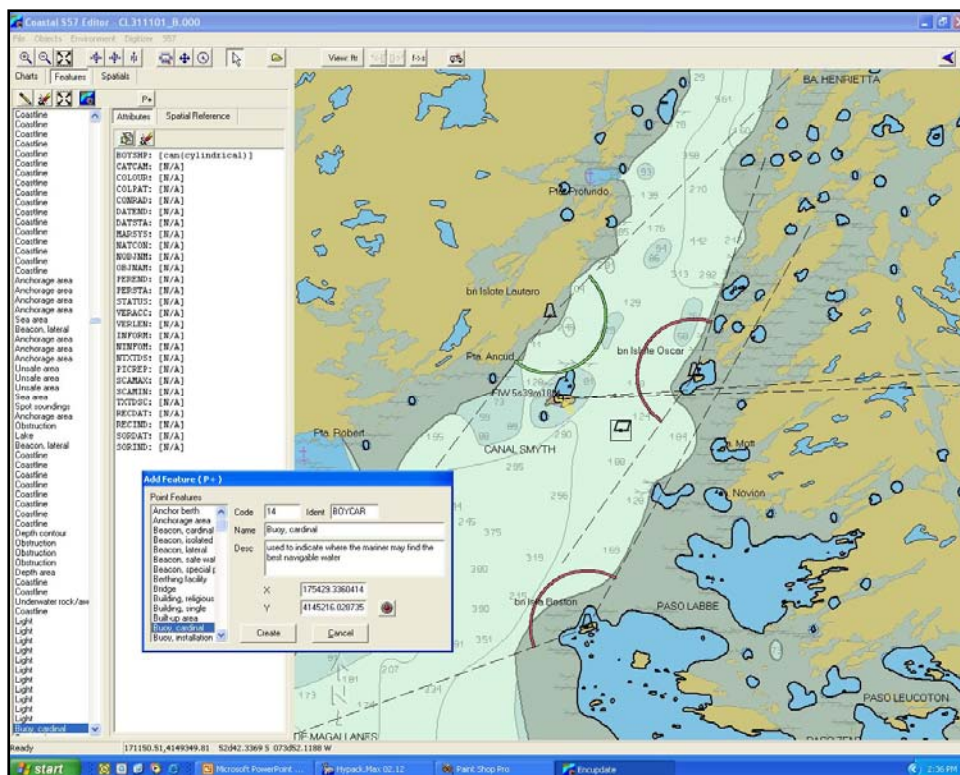
- **ADCP Logger:** Runs simultaneously with SURVEY. Allows you to 'deploy' and log ADCP data from the RD Instruments Workhorse and Rio Grande ADCPs.
- **ADCP Profiles:** Combines velocity data from the ADCP files with cross sectional data from the edited HYPACK files. Provides color-coded flow diagrams and overall flow values.
- **ADCP to DXF:** Allows you to export DXF current vectors at selected depth levels for import of velocity data to CAD/GIS.

ENCEdit

ENCEdit is sold separately from HYPACK®. It is designed to allow users to modify existing S-57 charts by adding, moving, deleting, and re-attributing chart objects.

MiniENC

The MiniENC program is also sold separately from HYPACK®. This program was designed under the direction of the US Army Corps of Engineers. It automatically updates S-57 charts by removing old sounding data, entering new soundings, re-contouring, and saving the updated S-57 data to a new chart.



The ENCEdit program is designed to modify S-57 charts by allowing you to add, delete, move and re-attribute features. ENCEdit is not a part of HYPACK®.

HYPACK, Inc.

56 Bradley St
Middletown, CT 06457 USA
Tel: 860-635-1500
Fax: 860-635-1522
Sales: sales@hypack.com
Web: www.hypack.com

HYPACK® Distributors

China – Mainland

China ORE Inc.
7 Nanhai Road
Qingdao, 266071
People's Republic of China
Tel: +86-532-287-9818
Fax: +86-532-287-9818
e-mail: chore@ms.qdio.ac.cn

France

Acthyd
Z.A. du Clois aux Pois
Rue de la Closerie
CE5245 LISSES
91052 EVRY Cedex France
Tel: +33-1-69-91-43-43
Fax: +33-1-69-91-43-44
e-mail: acthyd@wanadoo.fr

India

ASB Systems Pvt. Ltd.
64 Juhu Supreme Shopping Centre
Gulmohar Cross Rd #9 JVPD Scheme
Mumbai 400 049
India
Tel: +91-22-623-4753
Fax: +91-22-632-6448
e-mail: arvindb@vsnl.com

Japan

TOYO Corporation
1-6, Yaesu 1-Chome
Chuo-Ku, Tokyo 103-8254
Japan
Tel: +81-3-5688-6800
Fax: +81-3-5688-6900
e-mail: sales@toyo.co.jp
Web: www.toyo.co.jp

Korea

Golden Wheel Corporation
#301 Shin Tae Yang Bldg.
736-8 Ban Po-1 Dong
Seo Cho-Ku
Seoul 137-041
Republic of Korea
Tel: +82-2-512-2257
Fax: +82-2-512-2259
e-mail: goldenwheel@goldenwheel.co.kr
web: www.goldenwheel.co.kr

The Netherlands

Nautikaris BV
Hoofstraat 170
Santpoort-Noord EM 2071
NETHERLANDS
Phone: +31-23-538-9502
Fax: +31-23-537-2415
e-mail: sales@nautikaris.com
Web: www.nautikaris.com

Russia

Geomatics Centre Ltd.
Moscow University Park
4 Vorobyovi Gori Suite 512
Moscow 119899
Russia
Tel: +7-95-137-5417
Fax: +7-95-137-5417
e-mail: stol@orc.ru
Web: www.geomatics.ru

United Kingdom

Del Norte Technology Ltd
Unit 20, BSS-South Marston
Hunts Rise,
South Marston Park
SWINDON, Wilts, UK SN3 4TG
tel: +44(0)1793 827982
fax +44(0)1793 827984
e-mail: lsmith@del-norte.co.uk

Brazil

Sight GPS
Rua Visconde de Santa Isabel
20, Sala 310, Bairro Vila Isabel
Rio de Janeiro, RJ 20560-120
Brazil
Tel: 011-55-21-2577-1002
Fax: 011-55-38795535
e-mail: jader@sightgps.com.br

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