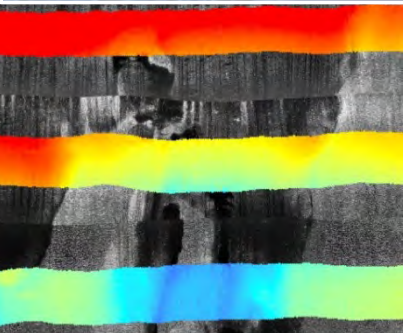
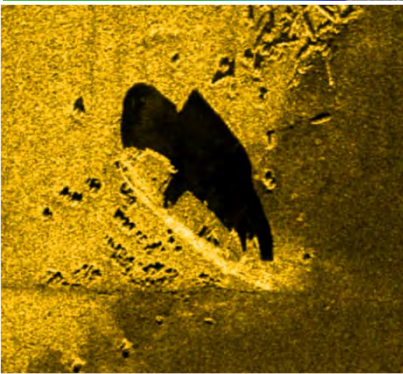
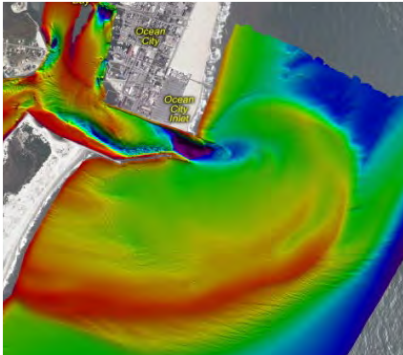


N|V|5

MARINE SOLUTIONS



Business Unit Information

Founded by university researchers in marine geology, coastal science and remote sensing with a simple business model in mind: Using cutting edge technologies and highly qualified staff, we provide meticulous data products to support our clients' multi-disciplinary needs. We remain narrowly focused within our area of expertise, and have spent decades developing specialized workflows, investing in evolving survey technologies, and building a team of dedicated and experienced scientists. The strength and continuing goal of our marine unit is to provide the client with the highest level of data quality and scientific integrity in a format that is easily applicable to both real-life management scenarios and research-oriented goals. Staff includes Certified Hydrographers, North Carolina Professional Land Surveyors, USCG Captains, Protected Species Observers and GIS Professionals.

Qualifications

Our team has been involved in high-resolution coastal shoreline mapping and analysis for over 20 years, with a track record of successfully performing high-accuracy beach and nearshore surveys using a modern seamless topo/bathy approach that incorporates terrestrial LiDAR laser scanning and supports the generation of datum-derived shorelines and detailed Digital Elevation Models of the shoreline from 0' to 30' of depth.

In addition, NV5 has extensive experience conducting both nearshore and offshore multibeam and geophysical surveys. These projects include shallow multibeam bathymetric surveys of shoals and inlets and numerous offshore sand resource identification and mapping surveys using multibeam, sidescan, sub-bottom and magnetometer.

NV5 has completed hydrographic and geophysical survey projects for clients including the US Navy NAVFAC Atlantic, NOAA Office of Coast Survey, NASA Wallops Flight Facility, and the US Army Corps of Engineers, among others. Our products and analyses have received high praise for our thoroughness, expertise, and prompt delivery. NV5 maintains a full suite of hydrographic and geophysical instruments and customized survey vessels to accommodate a variety of offshore and shoreline research objectives. All marine surveys adhere to IHO and USACE Hydrographic Survey Standards and are collected according to the NOS Hydrographic Surveys Specifications and Deliverables, and are supervised by a Certified Hydrographer (NSPS-THSOA).

Experience

The table below provides examples of NV5’ past projects demonstrating our experience with High-Resolution Geophysical & Hydrographic (HRGH) surveys and data analysis.

Table 2: NV5 Project Experience	Multibeam Depth	Sidescan Sonar	Acoustic Backscatter Data	Magnetometry	Sub-Bottom Profiles	Data & Tidal processing	Quality Control Routines	Data Reporting	GIS Database Creation
IDIQ Contract for Surveying Services, Areas Bounded by USACE Wilmington, Baltimore and Charleston Districts (over 80 hydrographic & geophysical projects)	■	■	■	■	■	■	■	■	■
Seafloor Mapping and Habitat Classification, Navy Underwater Submarine Warfare Training Range, Jacksonville, FL (4 projects)	■	■	■	■	■	■	■	■	■
Multibeam Survey of Ocean Dredged Material Disposal Site (Dam Neck, VA)	■		■			■	■	■	■
Survey and Assessment of Benthic Habitat in Call Area Wilmington-East: BOEM Renewable Energy Program, Wilmington, NC	■	■	■			■	■	■	■
NC Outer Banks Shoreline Mapping and Offshore Hydrographic & Geophysical Surveys – USACE Wilmington (Rodanthe, NC)	■	■	■	■	■	■	■	■	■
Geophysical & Hydrographic Survey Offshore Topsail Beach, NC	■	■	■		■	■	■	■	■
Ft Monroe Precise Positioning, Singlebeam, Sidescan and Geophysical Survey of Potential UXO, VA		■		■	■	■	■	■	■
Hydrographic & ROV Inspection Surveys to Support Naval Warfare Training (Kauai, HI)	■		■			■	■	■	■
USGS Surveys of Offshore Beach Morphology, Ocracoke Island and Wrightsville Beach, NC	■	■	■	■	■	■	■	■	■
High-Resolution Multibeam and Geophysical Surveys of the Inner Shelf to support Sand Resources, Bogue Banks, NC	■	■	■	■	■	■	■	■	■
Topographic & Shallow Hydrographic and Geophysical Surveys to Support Coastal Resilience (Hempstead Bay, NY)	■	■		■		■	■	■	■

R/V Echo

Specifications

Dimensions:	21' x 9' x 1.2'
USCG:	Designated Re-search Vessel
Flag:	U.S.
Registry:	North Carolina
Reg No:	NC-7341 DT
Tonnage:	1
Lab space:	1 open console operator
Max Speed:	30 knots
Min. survey speed:	2.5 knots
Propulsion:	1 x 140 HP Suzuki
Auxiliary Power:	24v & 12v DC battery banks
Fuel capacity:	52 gallons
GPS:	Simrad
VHF:	Icom
Internet:	Verizon 4G LTE Jet-Pack

Survey Systems

- Singlebeam Sonar
- Mobile Laser Scanner
- Multibeam Sonar
- Sidescan Sonar
- Magnetometer
- Sediment Sampling

Vessel Information

Custom designed, engineered, and constructed in 2011, the R/V Echo is a 21' Cape Fear Catamaran. This aluminum catamaran features a central moonpool for equipment deployment, and is outfitted with state of the art navigation and battery bank technology. The R/V Echo offers 2 davits and 2 customizable mounting points for singlebeam, multibeam or sidescan equipment. Data acquisition computers are housed within the water-tight console and are powered through an onboard battery bank. The R/V Echo excels in extremely shallow environments, including beach surfzone profiles, with an 140hp four-stroke outboard motor mounted on an adjustable jack plate.



R/V 4-Points

Specifications

Dimensions:	25' x 10' x 1.2'
USCG:	Designated Research Vessel
Flag:	U.S.
Registry:	North Carolina
Reg No:	NC-5443 WV
Tonnage:	4.5
Lab space:	2 Operator Stations
Max Speed:	30 knots
Min. survey speed:	2.5 knots
Propulsion:	2 x 150HP Yamaha
Auxiliary Power:	6kW Fischer Panda generator
Fuel	120 gallons
GPS:	Simrad
Radar:	Simrad 4G
Autopilot:	Simrad AP-28
VHF:	I-Com
Internet:	Verizon 4G LTE Jet-Pack

Survey Systems

- Multibeam Sonar
- Sidescan Sonar
- Sub-Bottom Sonar
- Magnetometer
- Sediment Sampling
- ROV Inspection

Vessel Information

Geodynamics' research vessel 4-Points is a custom fiberglass survey boat designed specifically for shallow water sonar and acoustic operations. The vessel has a climate-controlled cabin (75 ft²) with built-in computer workspace, rack-mounted computers, and ample stern working deck (120 ft²). A rear davit specifically designed for sidescan towfish up to 600lbs and a custom transducer mount for multibeam surveys occupy the stern rails. A PONAR-type sediment sampler may be deployed from the rear working deck. The R/V 4-Points uses RTK/VRS GPS positioning from the POS-MV coupled with Hypack software for reliable and accurate survey line positioning.



R/V Benthos

Specifications

Dimensions:	30' x 10.5' x 2'
USCG:	Designated Research Vessel
Flag:	U.S.
Registry:	North Carolina
Reg No:	NC-8224 DW
Tonnage:	15
Lab space:	2 Operator Stations
Lavatory:	Full head
Max Speed:	45 knots
Min. survey speed:	2.5 knots
Propulsion:	2 x 300HP Yamaha
Auxiliary Power:	7.6 kW Westerbeke Genset
Fuel capacity:	220 gallons
GPS:	Simrad
Radar:	Simrad 4G
Autopilot:	Simrad AP-28
VHF:	I-Com
Internet:	Verizon 4G LTE Jet-Pack

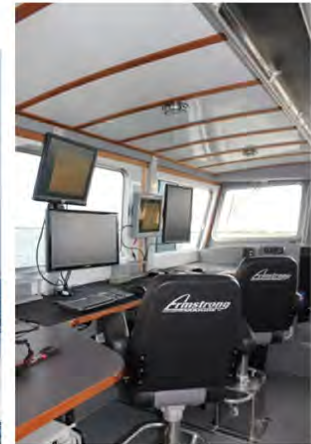
Survey Systems

- ◆ Multibeam Sonar
- ◆ Sidescan Sonar
- ◆ Sub-Bottom Sonar
- ◆ Magnetometer
- ◆ Sediment Sampling
- ◆ ROV Inspection

Vessel Information

The research vessel Benthos is a custom 30' Armstrong Marine catamaran specifically designed to support both hydrographic and geophysical survey operations as well as a variety of marine research objectives. The vessel's shallow draft, excellent maneuverability and stable catamaran hull provide a platform that can seamlessly span the nearshore and offshore regions while keeping roll to a minimum.

The climate-controlled cabin supports a modern internet-ready computer network with room for five shock-mounted workstations and state-of-the-art onboard navigation systems that guide the vessel safely and allow for precise positioning. The aft work deck supports a 1500 lb hydraulic A-Frame and 1000 lb davit for use in towed instrument operations or oceanographic deployment / retrieval.



R/V Chinook

Specifications

<i>Dimensions:</i>	<i>31' x 10.5' x 2'</i>
<i>USCG:</i>	<i>Designated Re- search Vessel</i>
<i>Flag:</i>	<i>U.S.</i>
<i>Registry:</i>	<i>North Carolina</i>
<i>Reg No:</i>	<i>NC-3730 EN</i>
<i>Tonnage:</i>	<i>15</i>
<i>Lab space:</i>	<i>2 Operator Stations</i>
<i>Lavatory:</i>	<i>Full head</i>
<i>Max Speed:</i>	<i>35 knots</i>
<i>Min. survey: speed:</i>	<i>2.5 knots</i>
<i>Propulsion:</i>	<i>2 x 250HP Honda</i>
<i>Auxiliary: Power:</i>	<i>8.0 kW Westerbeke Genset</i>
<i>Fuel: capaci- ty:</i>	<i>280 gallons</i>
<i>GPS:</i>	<i>Simrad</i>
<i>Radar:</i>	<i>Simrad Halo 20+</i>
<i>Autopilot:</i>	<i>Simrad AP-44</i>
<i>VHF:</i>	<i>I-Com</i>
<i>Internet:</i>	<i>Verizon 4G LTE JetPack</i>

Survey Systems

- **Multibeam Sonar**
- **Sidescan Sonar**
- **Sub-Bottom Sonar**
- **Magnetometer**
- **Sediment Sampling**
- **ROV Inspection**

Vessel Information

The research vessel Chinook is a 30' Armstrong Marine catamaran purpose built for oceanographic survey and research in 2007. Added to the Geodynamics fleet in 2019, Chinook has twin 250HP engines and a 280gal fuel capacity, onboard Westerbeke generator and cruising speed of 27 knots. The climate-controlled cabin supports a modern internet-ready computer network with shock-mounted workstations. The aft work deck supports a hydraulic A-Frame with Pullmaster PL-2 Planetary winch for use in towed instrument operations. The R/V Chinook uses RTK or DGPS positioning, motion reference unit Applanix POS-MV, and Hypack software for reliable and accurate survey line positioning.

The climate-controlled cabin supports a modern internet-ready computer network with shock-mounted workstations and state-of-the-art onboard navigation systems that guide the vessel safely and allow for precise positioning.



R/V Substantial

Specifications

Dimensions:	55' x 18' x 6'
Flag:	U.S.
Registry:	USCG
Reg No:	1245866
Tonnage:	46
Lab space:	3 Operator Stations
Accommodations:	3 Staterooms / 6 bunks / 2 full heads / Galley
Max Speed:	9.0 knots
Min. survey speed:	3.5 knots
Propulsion:	1x 290 HP Cummins 855
Generator Power:	20 kW Northern Lights
Hydraulics:	60hp Aux. engine
Fuel capacity:	3600 gallons
GPS:	Simrad
Radar:	Simrad Halo 24
Autopilot:	Simrad AP-70
VHF:	I-Com
Internet:	Verizon 4G LTE JetPack

Survey Systems

- Multibeam Sonar
- Sidescan Sonar
- Sub-Bottom Sonar
- Magnetometer
- Sediment Sampling
- ROV Inspection

Vessel Information

Geodynamics operates a 55' steel-hulled Seaton Trawler that has been custom retrofit as an extended-duration multibeam and geophysical survey vessel. With three staterooms, 2 heads, a full galley and large central working office space, the Substantial can support up to six people conducting 24h survey operations for up to 14 days at sea. The vessel has been equipped with a Seakeeper 20HD to reduce vessel roll, a modern electric and hydraulic generator, and Imtra Side-Power bow and stern thrusters. Crew safety is ensured through several state-of-the-art vessel safety systems, including a FLIR thermal camera and Fireboy fire suppression.

A dual-head Kongsberg EM2040c is hull-mounted, with motion corrections from an Applanix POS-MV. The working deck includes a rear operator station, an available calibrated USM pole mount, and A-frame and Hawboldt hydraulic winch for towed gear deployment. An integrated AML Moving Vessel Profiler ensures that sound speed data can be collected without halting continuous survey operations.

