R/V Clifford A. Barnes
Replacement

I

School of Oceanography
University of Washington

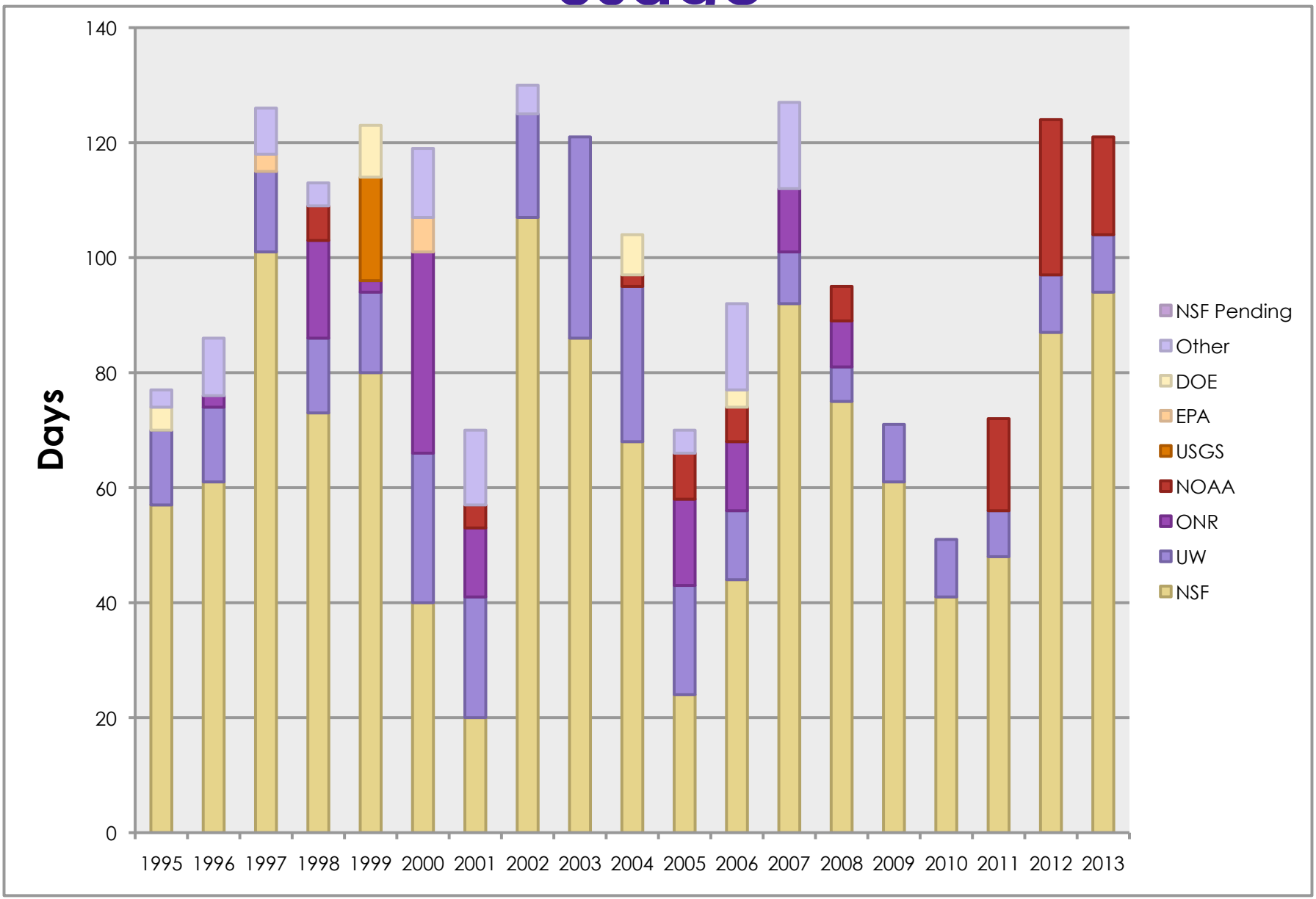
R/V Clifford A. Barnes

- 46 year old former 65' USCG ice capable tug
- In the UNOLS fleet since 1982

Condition

- Oct 2011 NSF Inspection results:
  - Material Condition – Good
  - Documentation & Stability – Good
  - Lifesaving & Firefighting – Good
  - Habitability – Fair
  - Hull – Good
  - Engineering Systems – Good
  - Load Handling Systems & Science Facilities – Fair
  - Science Outfitting – Good
- May 2012 Drydock
  - Addressed hull structure issues – hull in excellent condition
  - Shaft, rudder, sea valve, diesel engine keel cooler maintenance – all in excellent condition
  - Installed ADCP transducer – improved capability
  - Hull paint

Usage


Days
140
120
100
80
60
40
20
0
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
NSF Pending
Other
DOE
EPA
USGS
NOAA
ONR
UW
NSF

Timeline for Barnes Replacement - I

- April 2009 NSF Inspection and informal request that UW plan for a locally-owned replacement
- June 2009 – Establishment of Barnes Replacement Committee
  - Dr. William Wilcock -– Marine Geology & Geophysics
  - Dr. Cheryl Greengrove -– Geoscience and Environmental Science (UW Tacoma)
  - Dr. Rick Keil – Chemical Oceanography
  - Dr. Julie Keister – Biological Oceanography
  - Dr. Parker MacCready – Physical Oceanography
  - Dr. Andrea Ogston – Marine Geology & Geophysics
  - Ray McQuinn – Master, R/V Clifford A. Barnes
  - Jim Postel – Manager of Shipboard Science Support Group
  - Doug Russell – Manager of Marine Operations
- Fall 2009 – Spring 2010 Systematic Survey of past and potential users to seek design requirements

Timeline for Barnes Replacement - II

- June 2010 - Jensen Maritime Consultants commissioned to create conceptual design. Design undergoes 2 iterations
- October 2010 – Conceptual Design presented to UNOLS FIC and shared with the UW Faculty
- March 2011 – Memorandum from NSF to UNOLS FIC recommending service life extension to 2016
- October 2011 – PowerPoint with update on status of replacement planning prepared for FIC
- June 2012 – FIC recommends to NSF continued operations of Barnes until end of 2016
- July 2012 – NSF concurs with FIC recommendation
- Fall 2012 – UW commits $1.5M, ok's legislative engagement

Ongoing Activities

- College of the Environment (CoEnv) Committee meeting regularly
  - Stephanie Harrington – CoEnv Assistant Dean Planning and Intiatives
  - David Dicks – CoEnv Director of Strategic Partnerships & Civic Engagement
  - Marilyn Montgomery, CoEnv Asst Dean, Advancement
  - Sandra Schuman – CoEnv Associate Director for Advancement
  - Ginger Armbrust – Director School of Oceanography
  - John Meyer - CoEnv Communications Specialist
  - William Wilcock – Associate Director, School of Oceanography
  - Suzanne Zitzer – CoEnv, Staff support

Ongoing Activities

- Fundraising – 3 pronged approach
  - State of Washington
    - Not part of official UW 2013-15 biennial request
    - Authorized by UW to engage state legislature for inclusion in 2013-15 budget – David Dicks
  - Advancement (Private Donors)
    - Sole capital objective of CoEnv in soon to be announced campaign
    - Extensive planning underway
  - Engaging Federal and Local stakeholders in Puget Sound
    - Met with EPA District 10 as lead federal agency for Puget Sound Partnership
    - Expanding these discussions

Ongoing Activities

- Seeking educational uses and support for days for
  - UW Oceanography
  - UW CoEnv
  - UW Tacoma
  - Other 4 year colleges – WWU & Evergreen
  - Community colleges
- Exploring potential to combine regular educational cruises with monitoring objectives

Design Requirements

- Capability to operate further afield including offshore in summer
- Increased Cruising Speed (~12 knots)
- Improved maneuverability and station keeping
- Increased Berthing (10 scientists, up to 5 crew) and day use capacity (~30 students)
- Option for 24 hour operations (flexible day rate)
- 12-hour operations at same crewing level and comparable day rate to Barnes
- Increased Deck Space
- Increased Lab Space (flexible wet and dry lab spaces)
- Expanded/Increased Scientific Capability
- Improved Efficiency – Fuel economy and emissions

Salish Sea

- A major fjord system supporting complex ecosystems
- A biologically productive inland sea
- Major center of population – anthropogenic implications
- A sheltered accessible location for basic research
- Research in Puget Sound is Central to NSF recent emphasis on
  - Understanding coastal systems
  - Sustainability

Map by Stephan Freelan, WWU

Capabilities

- 2 person crew
- 6 person science party
- 10.2 knot max speed
- 8.5 cruising speed
- 4.5 day range – food & habitability
- 8 day range - fuel
- 1,600 lb telescoping crane
- 2 hydrographic winches – 4,500 ft of wire on each (0.322 & 3/16)
- 150 kHz ADCP
- Knudsen sub-bottom profilerqs (38 7 200 kHz)
- Data acquisition system
- CTD system
- 119 sq foot laboratory

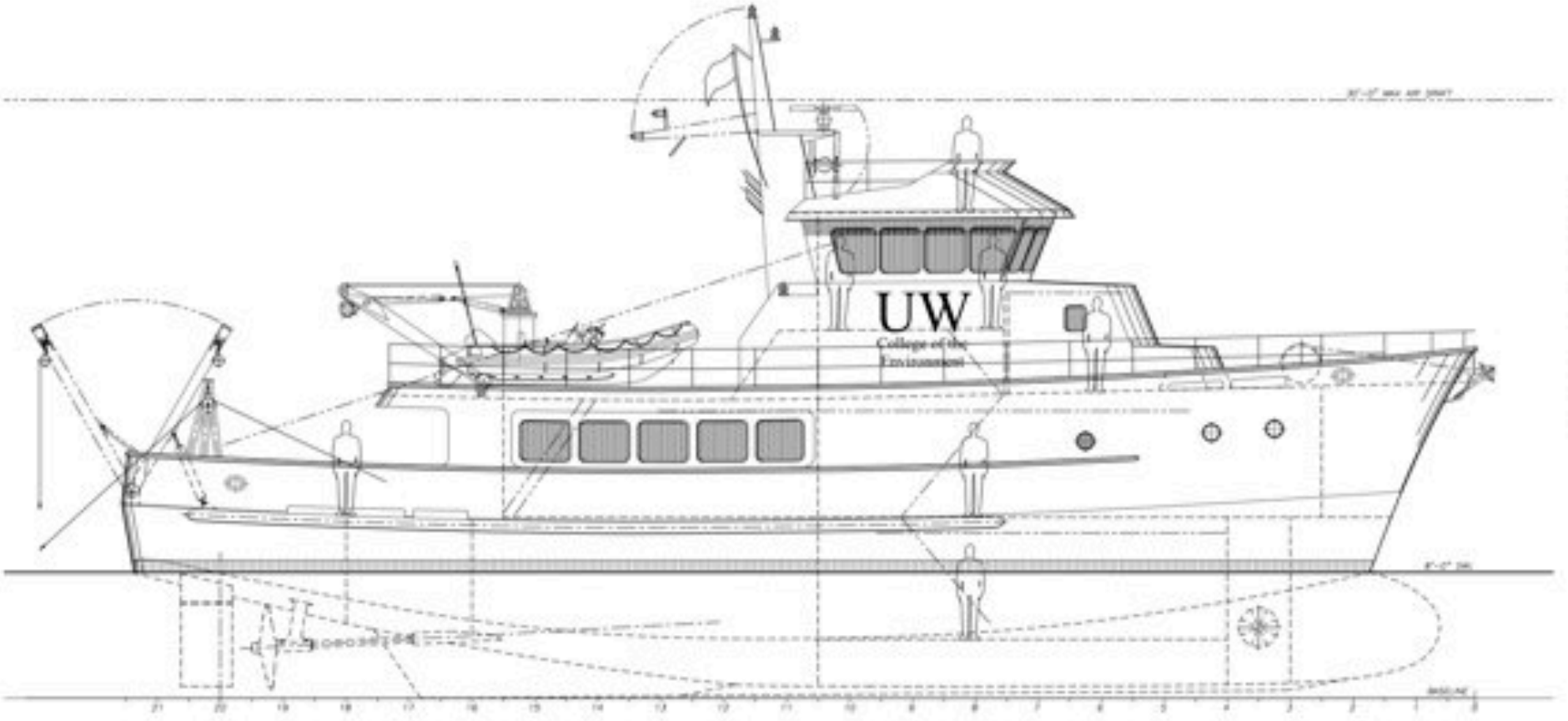
Examples of Recent Science Topics

- Hyperpycnal river plumes - an opportunity to study their transport and deposition in a controlled dam-removal experiment
- In Situ Experimentation to Determine the Impact of Sinking Particles on Denitrification and Anammox
- Significance of nitrification in shaping planktonic biodiversity in the ocean
- The role of regenerated nitrogen for rocky shore productivity
- Consequences of hypoxia on food web linkages in a pelagic marine ecosystem.
- Impacts of ocean acidification on early life stages of crustacean zooplankton
- Harmful algal blooms in Puget Sound
- Physical, chemical, and biological oceanographic conditions in the fjords of Barkley and Clayoquot Sounds, British Columbia, Canada

CAB Replacement Conceptual Design


UW
College of the
Environment

Outboard Profile

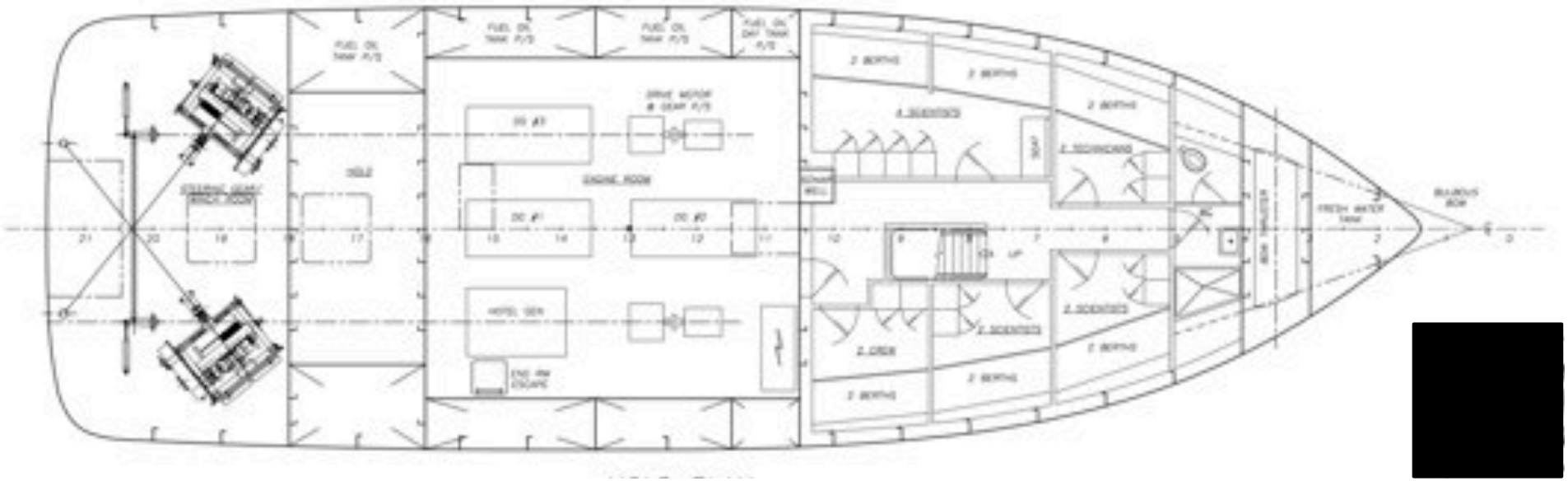


PRINCIPAL CHARACTERISTICS

Designer	Jensen Maritime Consultants
Owner	University of Washington
Length (overall)	86' - 0" (26.2 m)
Beam	26' - 0" (7.92 m)
Depth	10' - 8" (3.25 m)
Draft (Full Load)	9' - 0" (2.74 m)
Displacement (Full Load)	250 LT
Speed, Full Load	12.0 knots
Propulsion	Diesel Electric, Twin Screw
Propulsion Motors	2 x 325 kW (nom)
Bow Thruster	1 x 125 kW (nom)
Generators	4, 1200 kW Total
Propellers	64" (1.6 m), 4-blade
Capacities:	
Fuel	TBD Gallons
Water	TBD Gallons
Berthing	15 total

Main Deck Plan

Hold Plans



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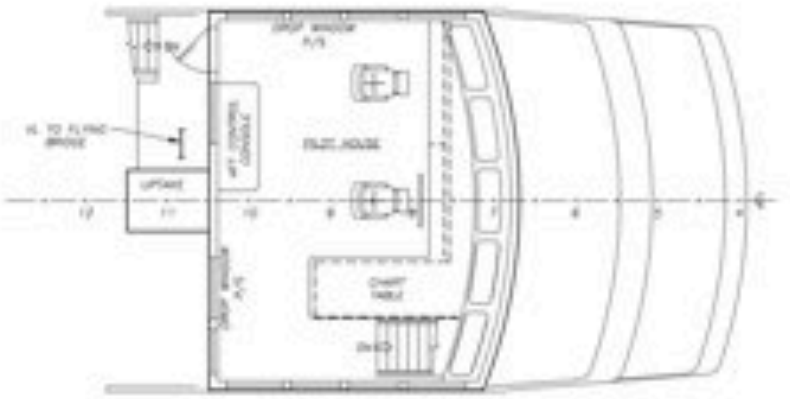
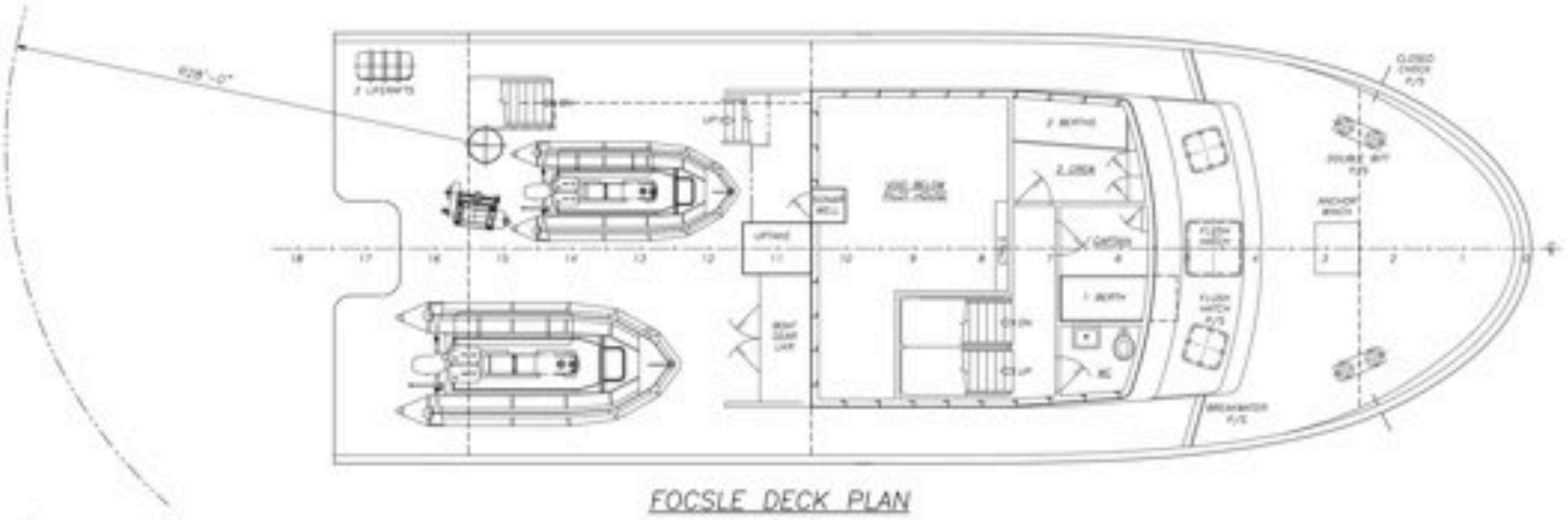
Forecastle Deck and Pilot House Plans



PILOT HOUSE PLAN



FOCSLE DECK PLAN

Fly By Video

Preliminary Cost Estimate

- Estimated Cost – Preliminary Rough Order of Magnitude
  - $8.8M - $12M – incl.
    - Design Engineering
    - Shipyard Engineering
    - Construction Supervision
    - Delivery Costs
    - Construction: hull, machinery, & outfit
    - Hybrid Option ($500K adder)
    - 5% Contingency
- Estimate last updated June 2012

Questions?

Dr. William Wilcock
Associate Director
(206) 543-6043
wilcock@uw.edu

Capt. Doug Russell
Manager of Marine Ops
(206) 543-5062
dgruss@uw.edu

Preliminary ROM Cost Estimate

Preliminary Order of Magnitude Cost Estimate

Item	Costs Low	Costs High	Notes
Hull - Structure and Outfit	$ 5,000,000	$ 5,500,000	Includes outfit, installation of equipment, steel and piping
Machinery:			
Diesel generators	$ 375,000	$ 490,000	2 x 450 kW, 1 x 350 kW, 1 x 250 kW - Caterpillar or equal
Deck Crane and A Frame	$ 94,500	$ 141,750	HydroPro, high includes SST fitting and HPU unit. Hinged A-Frame - removeable
Winches	$ 509,250	$ 509,250	Markey - 2 x Com10, 1 x Com4, electric drives with panels
DE Propulsion System	$ 1,000,000	$ 2,000,000	Motors, inverters, switchboard and control systems - Note 1, Note 2
Hybrid Additions	$ 350,000	$ 500,000	Batteries & Bridges
Power Management/Alarm & Monitoring System	$ 100,000	$ 150,000	Generator/Propulsion Control - Ship's Alarm System
Bow Thruster	$ 52,500	$ 78,750	24", Electric Driven, nominally 100 BHP, 2 control stations
Transmission Gears	$ 78,750	$ 89,250	Includes Gear, shafting, bearings and fixed pitch propellers - Note 1
HVAC	$ 26,250	$ 68,250	Heating, fans and AC for accommodations
Pumps, Steering Systems	$ 40,000	$ 60,000	Includes exhaust, Fuel and water pumps and pressure sets, steering system
Outfit: (not included in above)			
Pilot House Electronics	$ 150,000	$ 300,000	Navigation and Electronics - radars, sonars, radios, internal communications
Laboratory Equipment	$ 50,000	$ 150,000	Allowance for Chem hoods, sinks, refrigerators/freezers, scales
Oceanographic electronics	$ 105,000	$ 315,000	Mission Specific - excludes winches above
Construction Support:			
Design Engineering	$ 157,500	$ 315,000	Contract Design issued to yard for Contract bid-out
Shipyard Engineering	$ 150,000	$ 450,000	Includes working drawings and lofting
Construction Supervision	$ 137,500	$ 330,000	Low is local yard, support from the office, high is 1 person on site for 9 months
Delivery Costs	$ 10,000	$ 75,000	low is local yard, high is from the Gulf Coast
Approximate Vessel Cost(w/Hybrid)	$ 8,386,250	$ 11,522,250	Excludes any state and local taxes, UW Facilities Supervision fees and UW Development "taxes"
Approximate Vessel Cost(wo/Hybrid)	$ 8,036,250	$ 11,022,250	
Recommend Contingency	$ 419,313	$ 576,113	5%