R/V Clifford A. Barnes

End of Service Life and Status of the Replacement

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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

R/V Clifford A. Barnes (CAB)

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

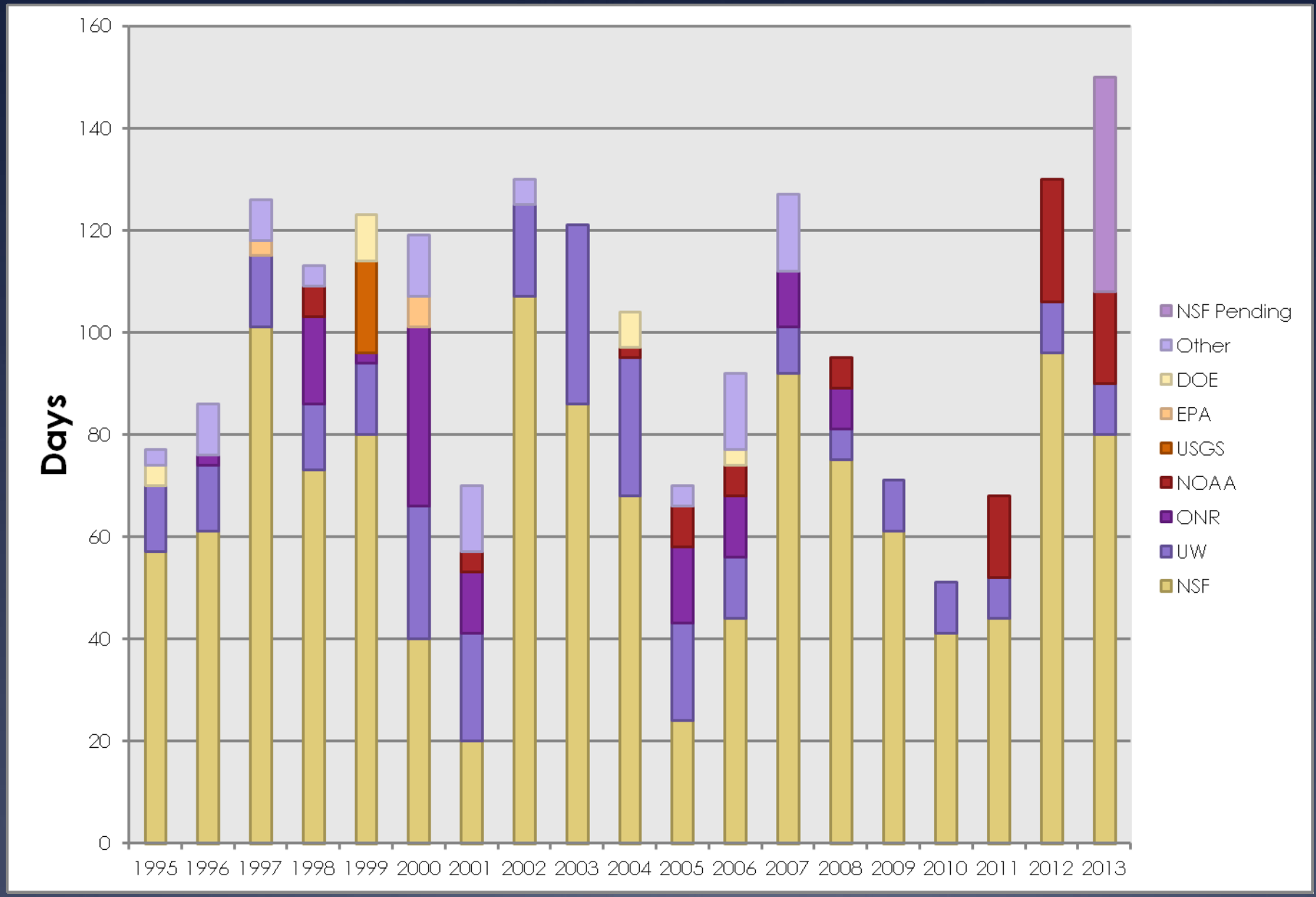
Capabilities

- 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

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
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1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
NSF Pending
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UW
NSF

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

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

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

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

CAB Replacement Conceptual Design


UW
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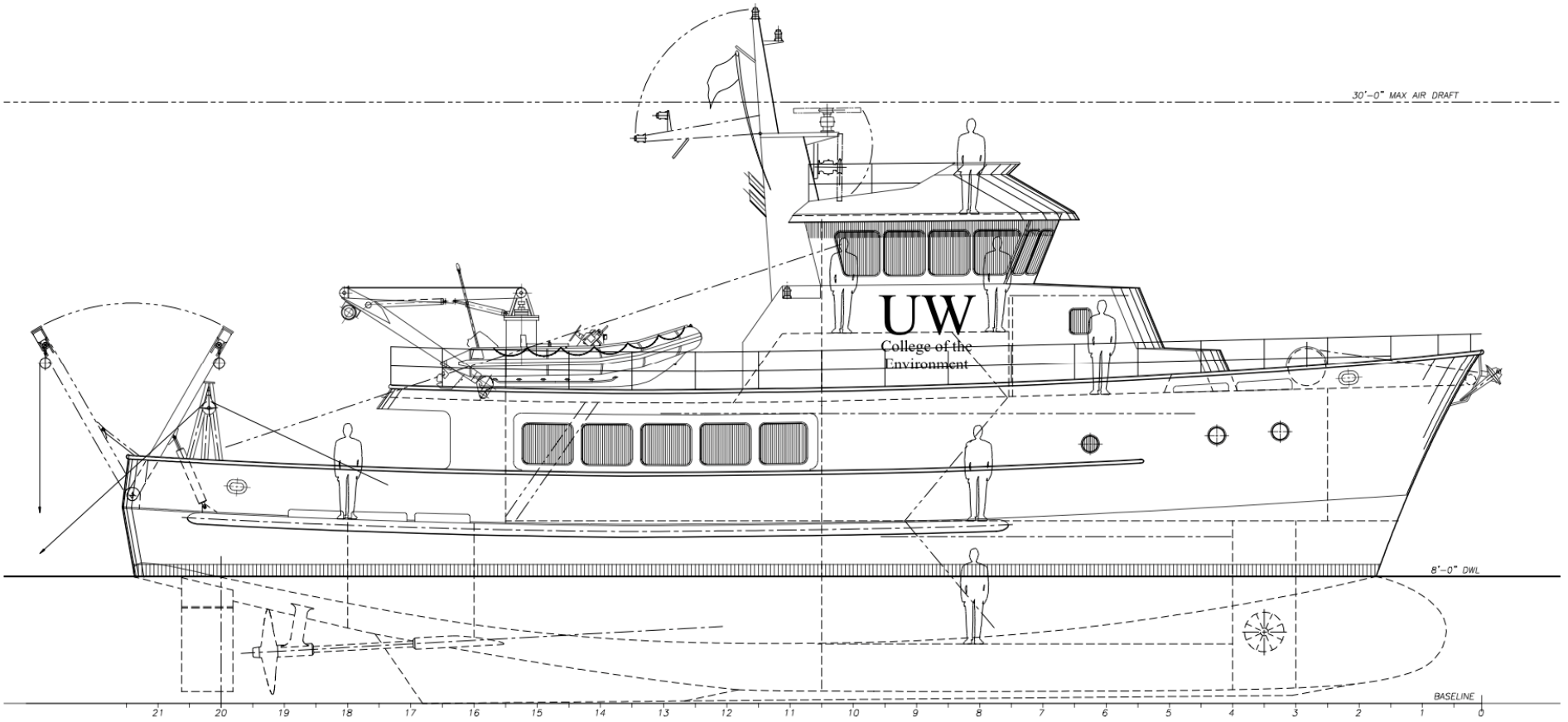
Environment

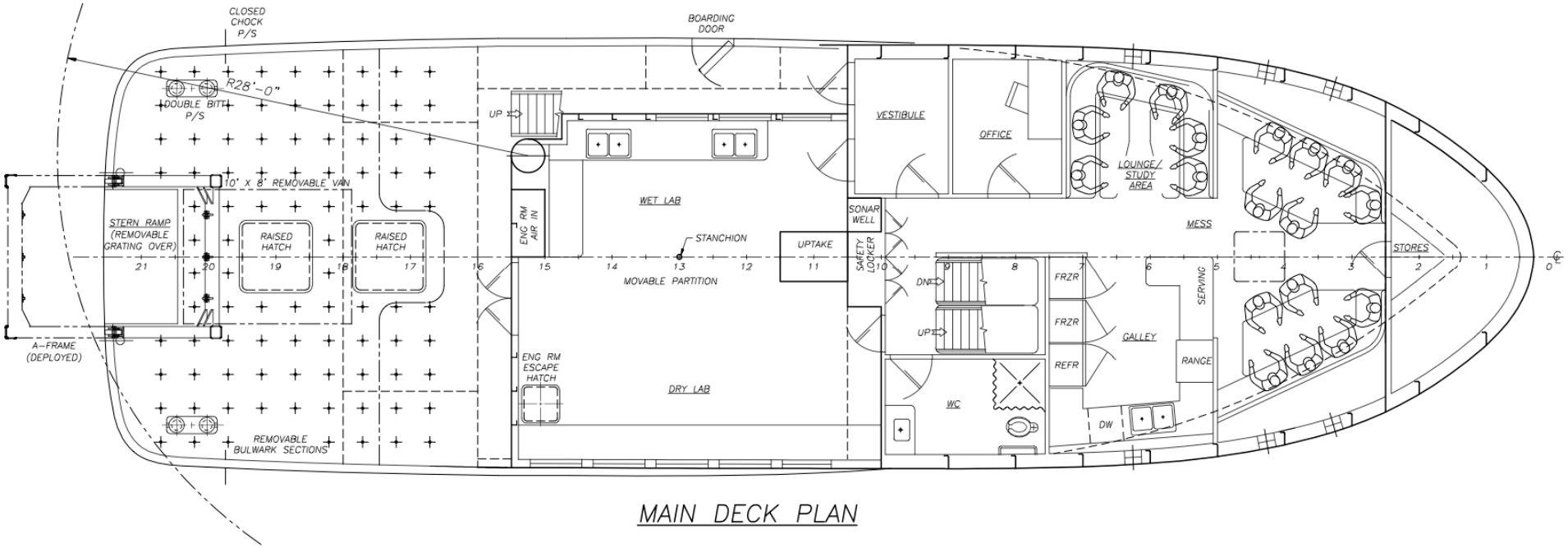
Outboard Profile



PRINCIPAL CHARACTERISTICS

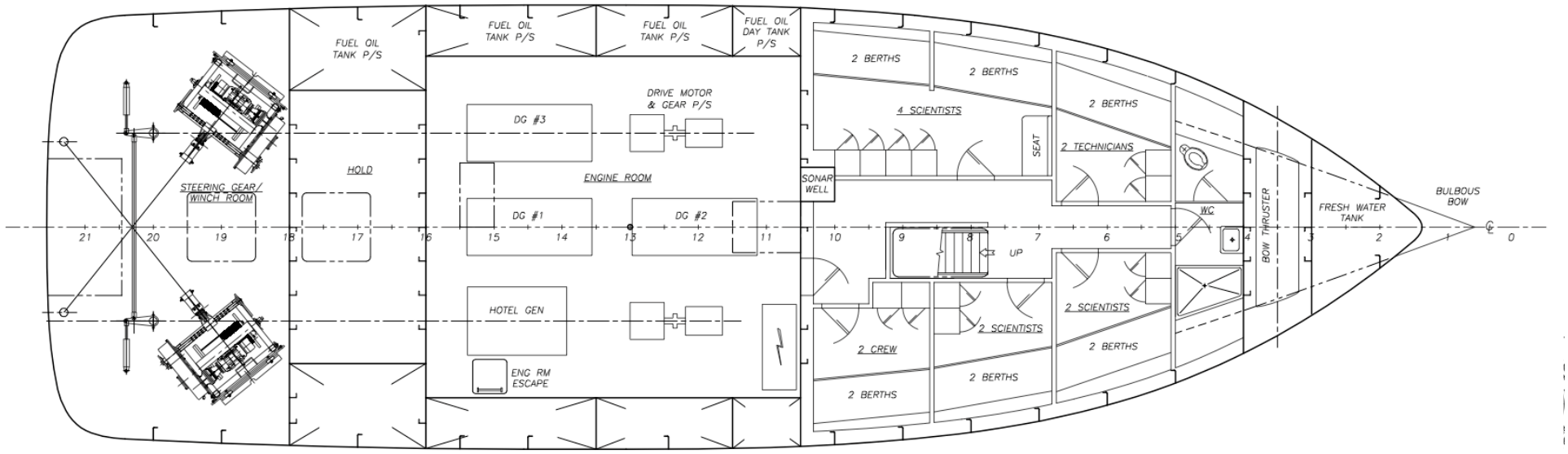
Designer	Jensen Maritime Consultants
Owner	University of Washington
Length (overall)	86' - 0" (26.2 m)
Beam	26' - 0" (7.92 m)
Depth	10' - 8" (3.25 m)
Draft (Full Load)	9' - 0" (2.74 m)
Displacement (Full Load)	250 LT
Speed, Full Load	12.0 knots
Propulsion	Diesel Electric, Twin Screw
Propulsion Motors	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



MAIN DECK PLAN

Hold Plans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FUEL OIL DAY TANK P/S
DRIVE MOTOR & GEAR P/S
DG #3
HOLD
ENGINE ROOM
STEERING GEAR / WINCH ROOM
DG #1
DG #2
SONAR WELL
HOTEL GEN
ENG RM ESCAPE
2 BERTHS
2 BERTHS
4 SCIENTISTS
2 BERTHS
SEAT
2 TECHNICIANS
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BOW THRUSTER
FRESH WATER TANK
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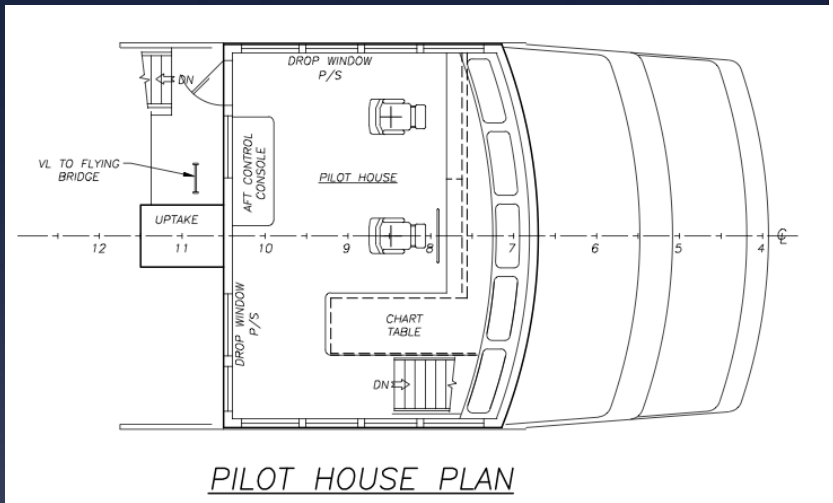
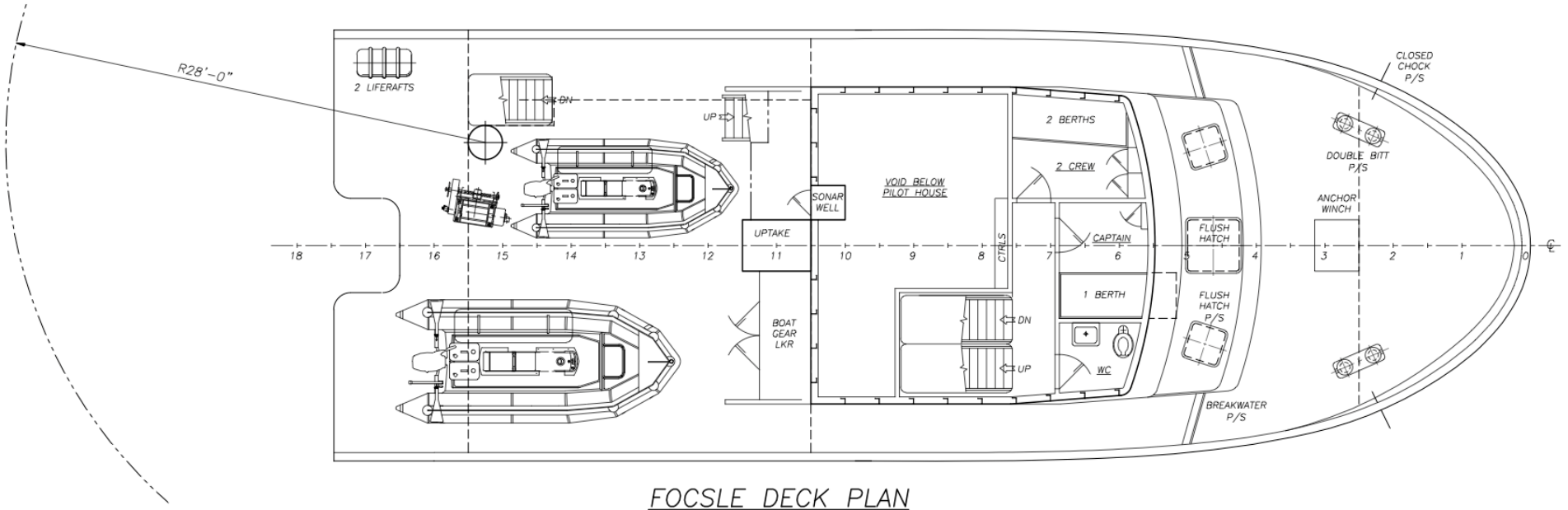
Forecastle Deck and Pilot House Plans



PILOT HOUSE PLAN



FOCSLE DECK PLAN

Preliminary Cost Estimate

- Estimated Cost – Preliminary Rough Order of Magnitude
  - $7.1M - $9.5M – incl.
    - Design Engineering
    - Shipyard Engineering
    - Construction Supervision
    - Delivery Costs
    - Construction: hull, machinery, & outfit
    - 5% Contingency

    - Note: Estimate completed Oct 2010
- Jensen is presently updating these cost estimates

Fly By Video

Status of Funding

WA State

- State budget operates on a biennial cycle (e.g. July 1, 2011 – June 30, 2013)
- UW planning for request starts ~18 months before start of biennium with formal request submitted ~9 months before hand
- Construction projects are normally funded over 2 bienniums (planning in the 1st, construction in the 2nd)
- The Barnes replacement is being seriously considered by the UW administration for the 2013-15 biennium

Private

- UW is in the process of launching a major capital campaign
- Barnes replacement is a high priority for the College of the Environment's portion of the campaign
- Excitement about the potential for an expanded role in experiential learning
- Process takes years.
- Complementary to state request.

The Case for Service Life Extension

* *"Currently, the BARNES' retirement date is listed as 2013; or 47 years from original delivery. Based on these findings, NSF recommends the BARNES' published retirement date be extended to 2016 (50 years old) to allow the University of Washington time to consider their options for a replacement. NSF has no intension of replacing BARNES with a new federally- owned "Local" vessel. The actual retirement date for the BARNES will be determined by NSF in discussions with the University of Washington based on the evolving materiel condition of the vessel and the projected scientific demand".* - Bauke Houtman, March 2011 memorandum to Clare Reimers.

What has changed?

* Material Condition of Vessel remains excellent for a vessel of its age
  * ARRA support
  * Fall 2011 NSF Inspection
* Scientific demand has increased significantly against the UNOLS trend.

Why a service life extension to 2016?

1. Vessel is in demand for high priority research at NSF and other agencies
2. It provides a cost effective way to support high quality research in the Salish Sea
3. No other regionally located UNOLS assets can take the Barnes load cost-effectively
4. 2016 provides a tight but reasonable timeline to secure local funding through some combination of the UW/State of Washington and private sources
5. If the R/V Thomson undergoes a mid-life refit the Barnes will likely play an increased role in education programs
6. Year to year extensions will add additional uncertainty

A local vessel in Puget Sound belongs in a right-sized fleet.

Questions?

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Preliminary ROM Cost Estimate

Preliminary Order of Magnitude Cost Estimate

Item	Costs Low	Costs High	Notes
Hull - Structure and Outfit	$ 4,500,000	$ 5,250,000	Includes outfit, installation of equipment, steel and piping
Machinery:			
Diesel generators	$ 360,000	$ 440,000	2 x 450 kW, 1 x 350 kW, 1 x 250 kW - Caterpillar or equal
Deck Crane and A Frame	$ 90,000	$ 135,000	HydroPro, high includes SST fitting and HPU unit. Hinged A-Frame - removeable
Winches	$ 485,000	$ 485,000	Markey - 2 x Com10, 1 x Com4, electric drives with panels
DE Propulsion System	$ 500,000	$ 900,000	Motors, inverters, switchboard and control systems - Note 1
Bow Thruster	$ 50,000	$ 75,000	24", Electric Driven, nominally 100 BHP, 2 control stations
Transmission Gears	$ 75,000	$ 85,000	Includes Gear, shafting, bearings and fixed pitch propellers - Note 1
HVAC	$ 25,000	$ 65,000	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	$ 100,000	$ 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	$ 100,000	$ 300,000	Mission Specific - excludes winches above
Construction Support:			
Design Engineering	$ 150,000	$ 300,000	Contract Design issued to yard for Contract bid-out
Shipyard Engineering	$ 100,000	$ 300,000	Includes working drawings and lofting
Construction Supervision	$ 125,000	$ 300,000	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	$ 6,760,000	$ 9,220,000	Excludes any state and local taxes, UW Facilities Supervision fees and UW Development "taxes"
Recommend Contingency	$ 338,000	$ 461,000	5%