



# Shoreline Restoration and Infrastructure Protection Program

NASA Wallops Flight Facility

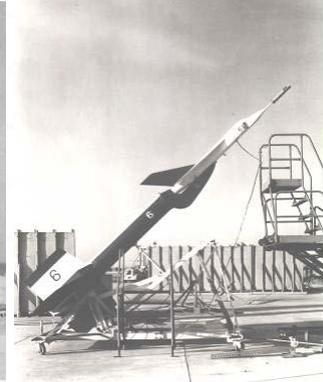
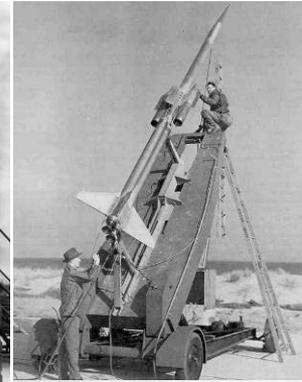
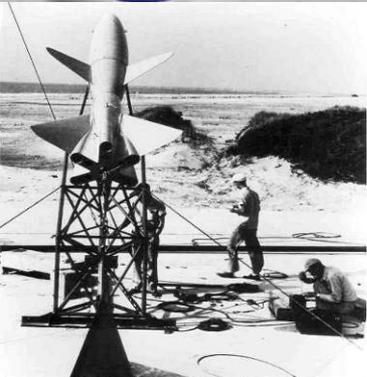
April 21, 2009



# Wallops Island History



- Established by National Advisory Committee on Aeronautics in 1945 as test site for aerodynamic research
- Over 16,000 launches conducted from Wallops Island during 64 year history
- Wallops mission has evolved to include:
  - Flight program management
  - Technology development
  - Scientific research





# Wallops Mission & Activities



## Mission

Wallops Facility will be a national resource for enabling low-cost aerospace-based science and technology

## Technical Activities

- Research Carriers
  - Sounding Rockets **Wallops Island**
  - Balloons
  - Aircraft & UAVs **Wallops Island**
  - Small Orbital Carriers **Wallops Island**
- Engineering Development & Technology Validation
  - Supporting Goddard Spacecraft Instruments and Subsystems
- Earth Science Research **Wallops Island**
- Mission Operations **Wallops Island**
  - Launch Range
  - Research Airport
  - Orbital Tracking



# Wallops Island Activities



WFF-11





# Numerous & Diverse Launch Capabilities



*MARS Pad 0B*



*20K ARC Rail Launcher*



*Pad 1 50K Launcher*



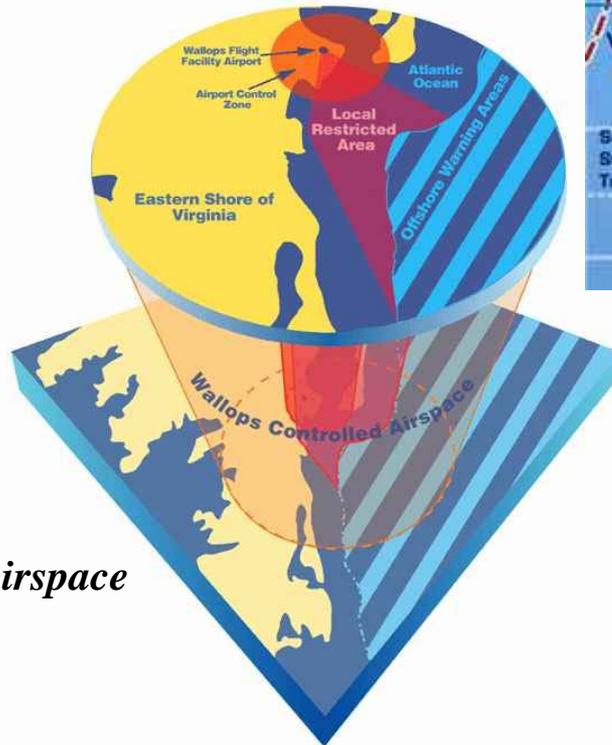
*20K AML Launcher*



*Navy Target Launchers*



# Research Range Airspace



*WFF Controlled Airspace*



*Typical WFF Orbits*



# U.S. Navy at Wallops



- Surface Combat Systems Center
  - Aegis Combat Training Center
    - Cruiser & destroyer simulators
    - Crew training
    - System development test bed
  - Ship Self-Defense Facility
  - DDG(1000) engineering facility
- Naval Air Warfare Center (Patuxent River)
  - Target launch operations
  - Aircraft development testing



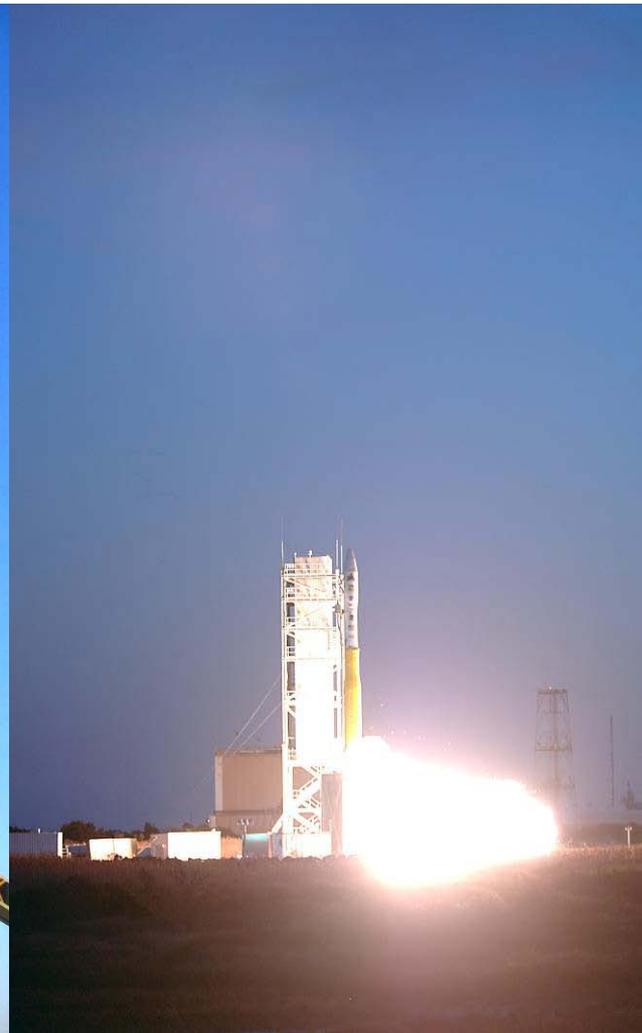
# Mid-Atlantic Regional Spaceport (MARS)



- In 1997, NASA entered into partnership with Virginia (later joined by Maryland) to establish a commercial spaceport at Wallops
- This innovative partnership enabled:
  - MARS augmentation of Wallops Launch Range
  - Joint NASA-MARS pursuit of new business
- Current agreements enable:
  - NASA support of MARS commercial launches
  - MARS support of NASA's government launches
- MARS owns 2 launch complexes at WFF
  - Support small-to-medium class ELVs



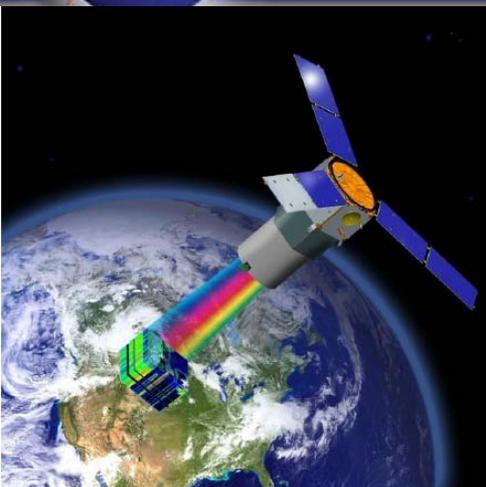
# Minotaur at Wallops



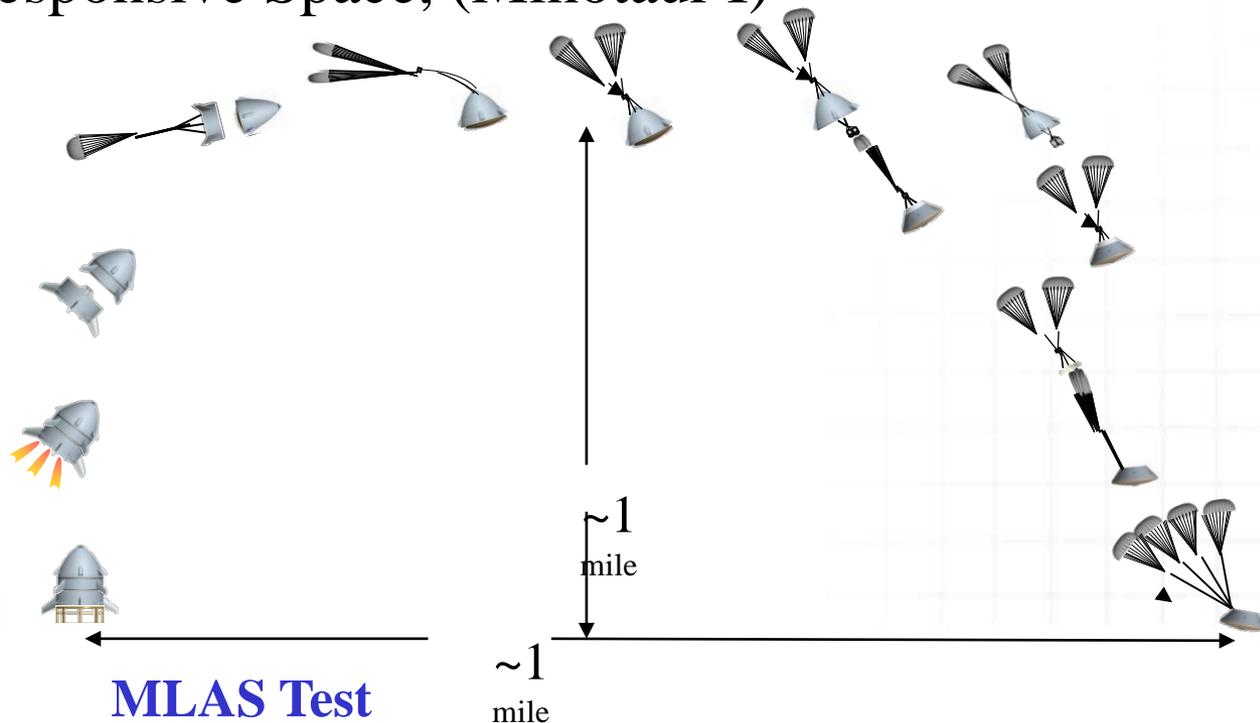
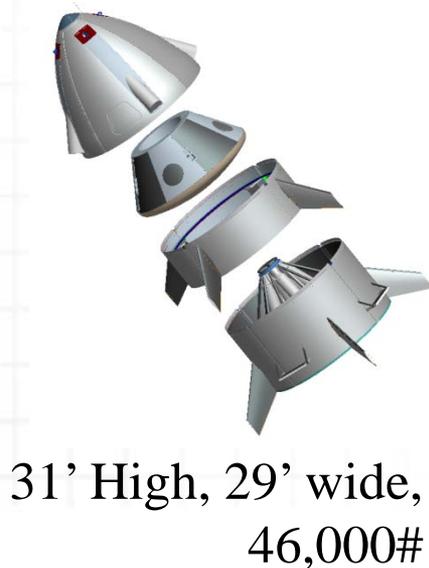




# Upcoming Major Launches



- May 5: TacSat-3 -- USAF satellite (Minotaur I)
- End of May: Max Launch Abort System (MLAS)
  - Demonstration of an alternative design crew module rescue system for NASA's Exploration Program
- October, 2010: ORSAT-1-- Operationally Responsive Space, (Minotaur I)





# Orbital Sciences Corporation Taurus II from Wallops Island

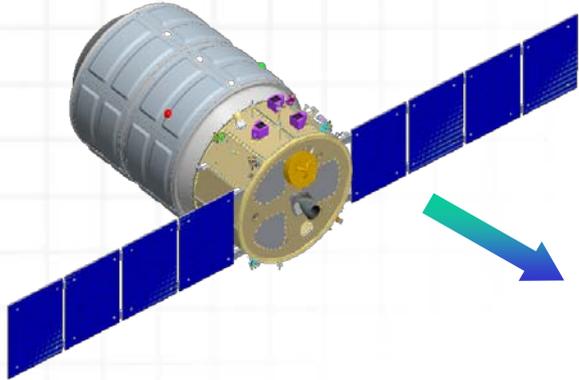


- Taurus II Launched from the MARS Spaceport on Wallops Island and supported by NASA Wallops facilities and the NASA Wallops Range.
- NASA's Commercial Orbital Transportation Services (COTS), a 3 year, \$320M program, \$170M from NASA and \$150M from OSC
  - Demonstration of a commercial cargo delivery system to orbit at the end of 2010
  - Consists a new spacecraft called Cygnus™, launched on Orbital's new Taurus II medium-lift rocket
- NASA's Commercial Resupply Services (CRS), a 5 year, \$1.9B program
  - Cargo transportation services to and from the International Space Station (ISS)
  - 20 metric tons of cargo, on 8 missions between 2011 and 2015
- At least \$40M of state and federal money invested in new facilities in support of Taurus II





# International Space Station Resupply Concept of Operations



Cygnus Visiting Vehicle



Orbital System



Taurus II



Cargo Operations



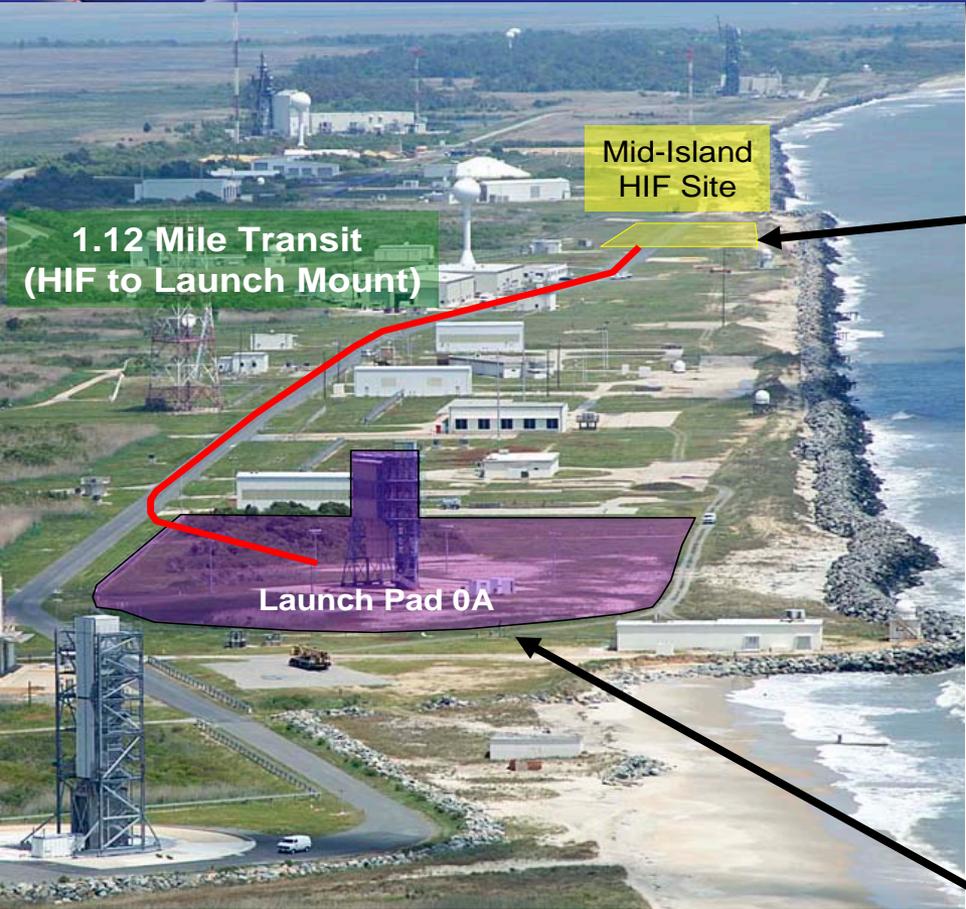
Mission Operations



Integrated Launch Site Operations



# New Wallops Island Facilities for Taurus II



Mid-Island  
HIF Site

1.12 Mile Transit  
(HIF to Launch Mount)

Launch Pad 0A

*Taurus II Island Site*

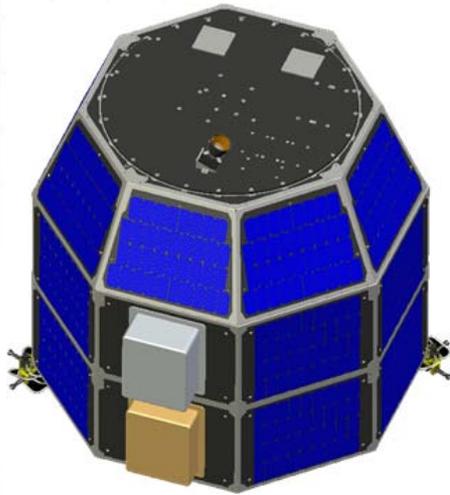


*Horizontal Integration Facility*



*Taurus II Launch Pad Design*

# Lunar Atmosphere & Dust Experiment Explorer (LADEE)



- Lunar orbiting spacecraft
  - Neutral mass spectrometer
  - Ultra-violet spectrometer
  - Dust detector
  - Laser communications demo
- Launch Vehicle: Minotaur V (first launch)
- Launch date:  
Late 2011-Early 2012



# Protecting the Shore's Vital Resources of Today



## Current Value of Wallops Island Assets

**NASA: \$170 Million**

**Navy: \$70 Million**

**Plus \$800 Million  
outfitting**

**MARS: \$5 Million**

**Total: \$1.1 Billion**

**Supporting: \$46.5  
Million in NASA and  
\$50 Million in Navy  
Programs Annually**



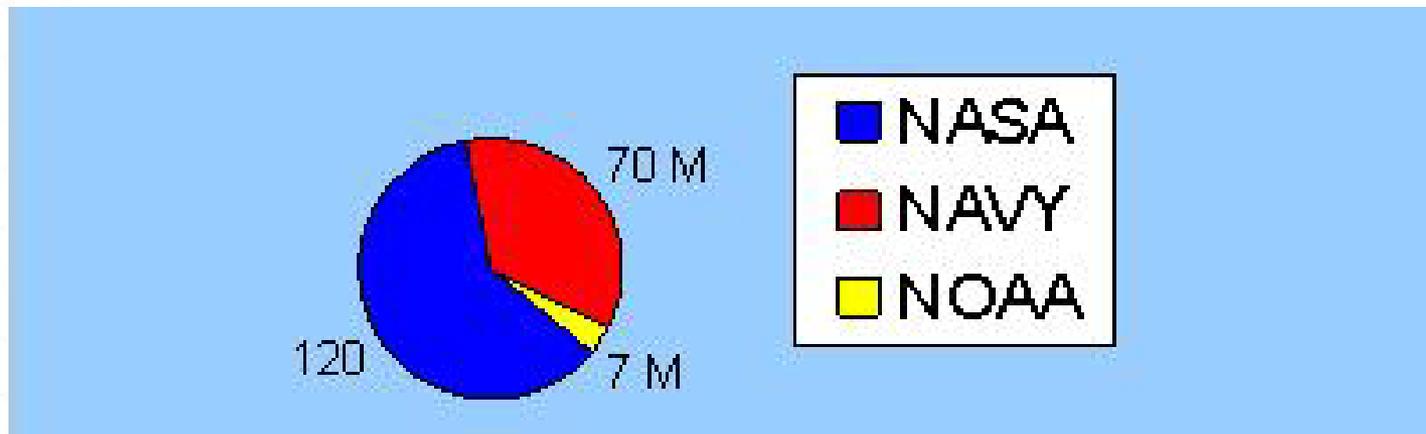


# WFF Regional Economic Impact



## Fiscal Year 2008 Budget for NASA Wallops Flight Facility: \$150 million

- Includes approximately \$25 million in reimbursable funds.



**\$197 Million Total Regional Impact**



## New Launch Range Infrastructure Investment:

Virginia: \$26 Million

Federal: \$14 Million

Private Sector: \$15 Million

Total: \$55 Million for  
\$1.9Billion Program  
(Taurus II CRS)





# Taurus II Projected Economic Impact



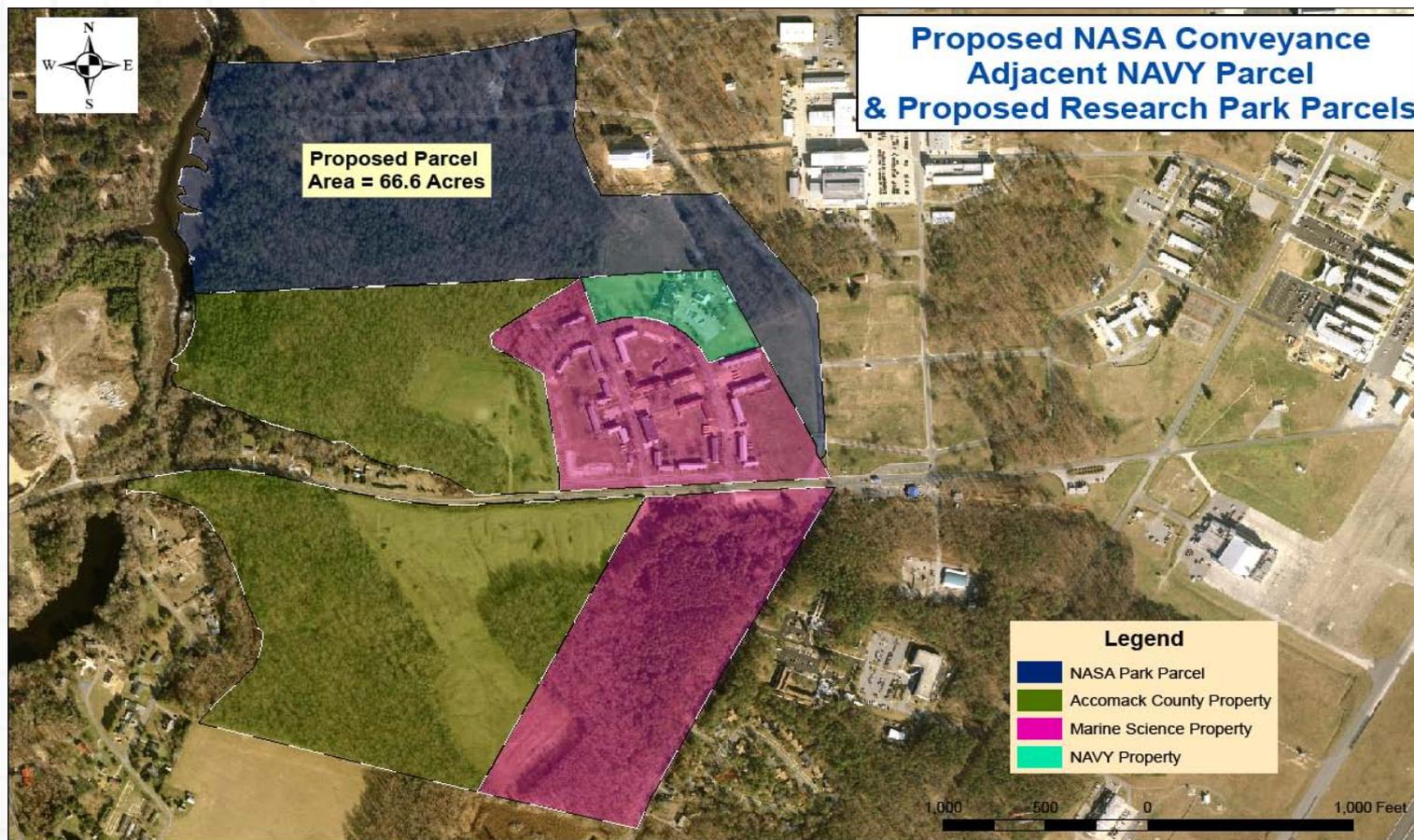
- 120 Permanent Personnel Increase for WFF On-Site and Near Site Personnel (Wallops Research Park potential)
- 50 to 75 Temporary Project Specific Personnel Coming in to Support the Launch. These people are staying up to 6 weeks in local lodging and eating in area restaurants.
- 100 to 150 invited guests have attended each launch. These people stay 1 – 2 nights in area lodging and eat in area restaurants.
- With the Growth of Facilities there will be more opportunities for local contractors and on-site maintenance and trades personnel
- Routine orbital launch schedules should draw up to 5,000 people from off the Shore to attend a launch. This may be up or down a couple thousand depending on the time of year and time of day. These people may stay 1-2 nights in area lodging and also eat in area restaurants.



# Growth of WFF Missions Supports County and Commonwealth Initiatives



## Wallops Research Park





# Historic Shoreline Facts



- Wallops Island Historic Shoreline Retreat of ~ 10 ft/year



Shoreline data: NOAA

10/6/2009

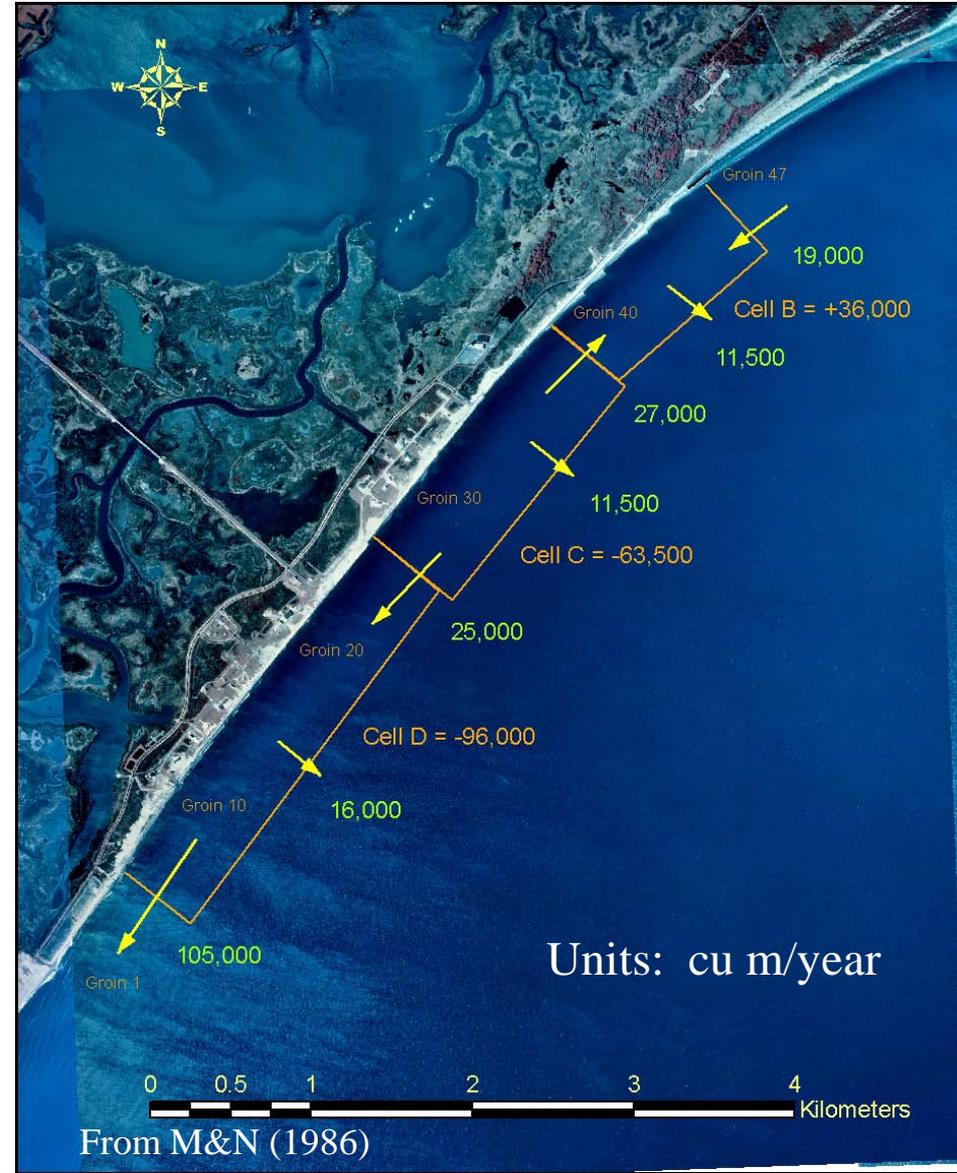
Measurements: ArcMap software



# Wallops Island Sand Movement



- Extreme North Wallops Island Gaining Sediment
- Nodal Point in Center of Island where Sediment Transport Changes Direction
- High Value South End Launch Areas Drastically Losing Sediment





# Current Problems



## Deteriorating Seawall



## Unprotected Structures



The Seawall Was Never Intended to be the Primary Waring Surface  
Between the Atlantic Ocean and the Launch Range



## Doing Nothing is No Longer an Option



- Atlantic Ocean in relation to MARS Pad 0-B



- Hurricanes “Ernesto” and “Florence” created a loss of asphalt along existing UAV Runway



- **Day In Day Out Beach Erosion**

- Long Term
- Continuous
- Permanent loss of beach material
- Allows increased storm damage
- Further Undermining of Seawall

- **Moderate Storm Damage**

- Short Term
- Elevated water levels
- Big Waves
- Flooding
- Infrastructure destruction

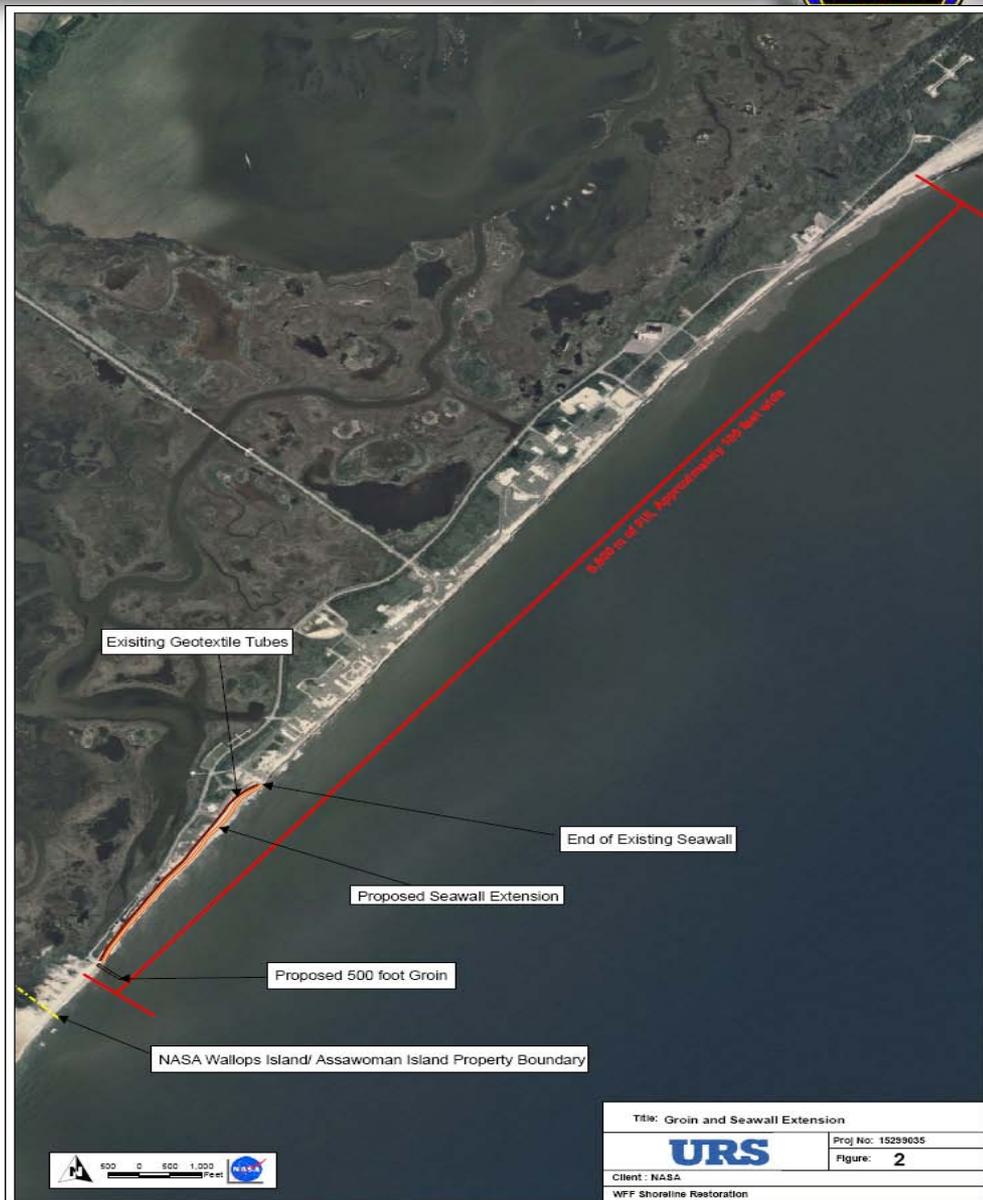
**This Project is Not a Major Hurricane Protection Plan**



# Proposed Project



- U.S. Army Corps of Engineers developed 54 alternatives
  - USCE and NASA Selected Proposed Alternative
- Product of Extensive Research and Analysis
- 3 Primary Components:
  - Shoreline Hardening
  - Sand Retention Structure
  - Beach Fill
- Ongoing Analyses During Planning Phase to Determine and Minimize Impacts to Surrounding Environment





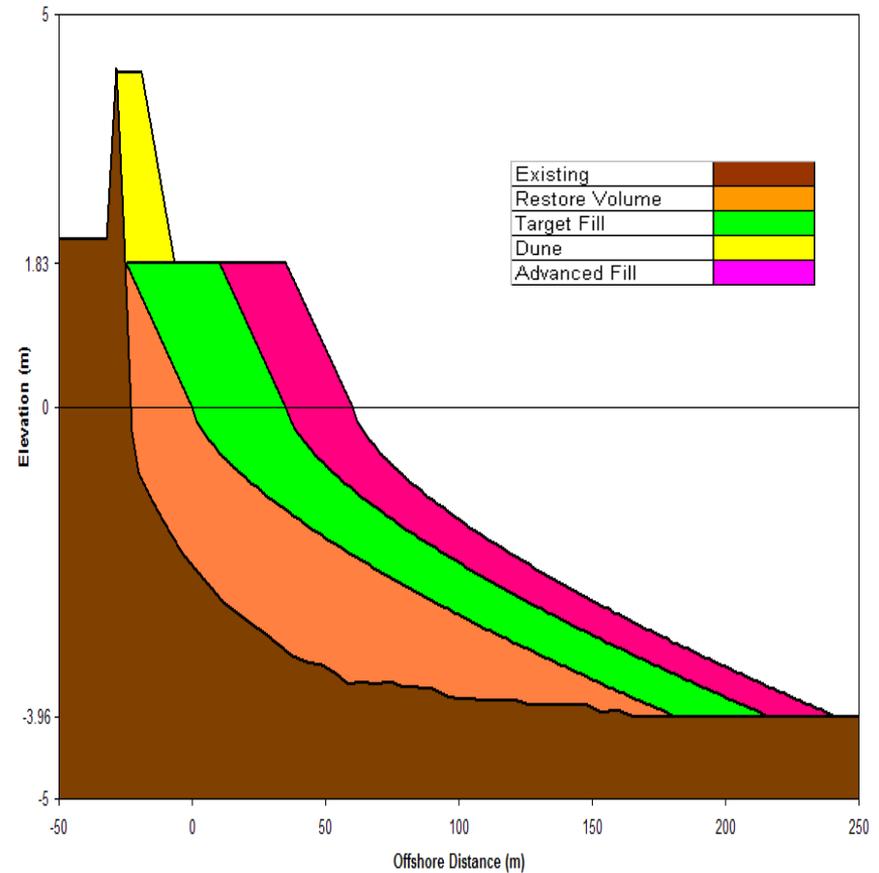
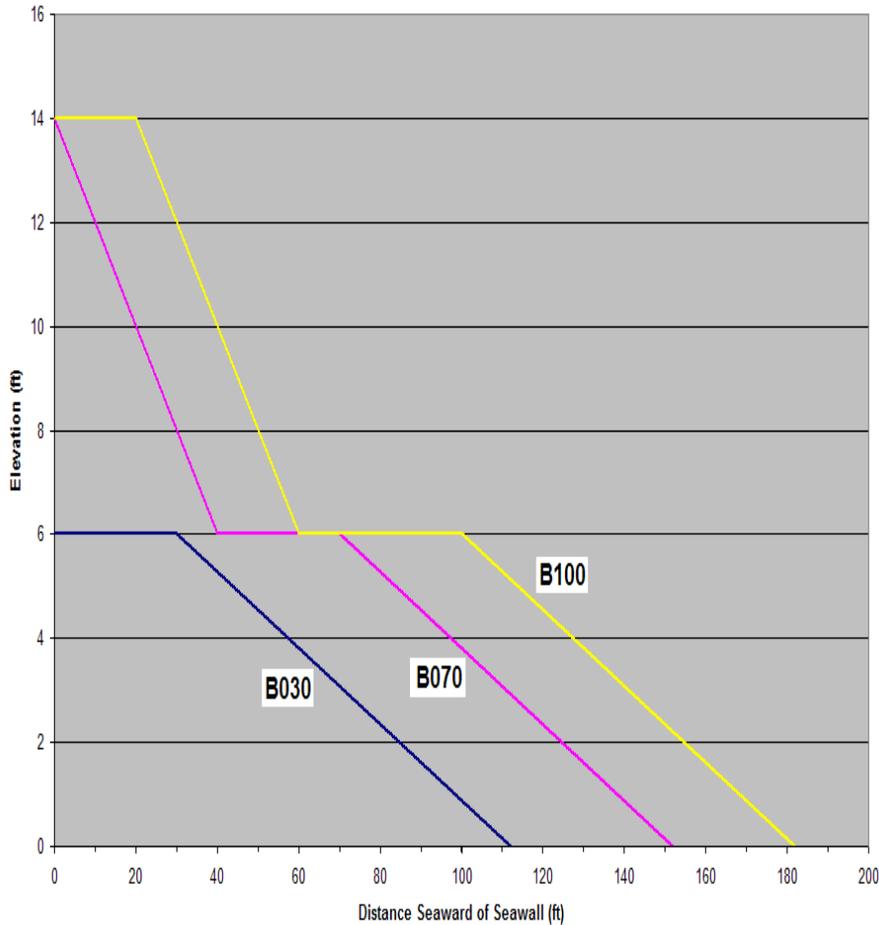
# Proposed Project – Details



- Initial Work
  - Build Southern Seawall Extension
  - Build Permeable South Terminal Groin
  - Rehabilitate Existing Seawall, as Needed
  - Beach Fill with 3,000,000 yds<sup>3</sup> sand over 6,800 linear meters
    - 70 feet of beach in front of seawall
- Beach Fill Renourishment Every 5-7 Years
  - 1,000,000 yds<sup>3</sup> sand
- Long Term Monitoring, Analysis, and Mitigation

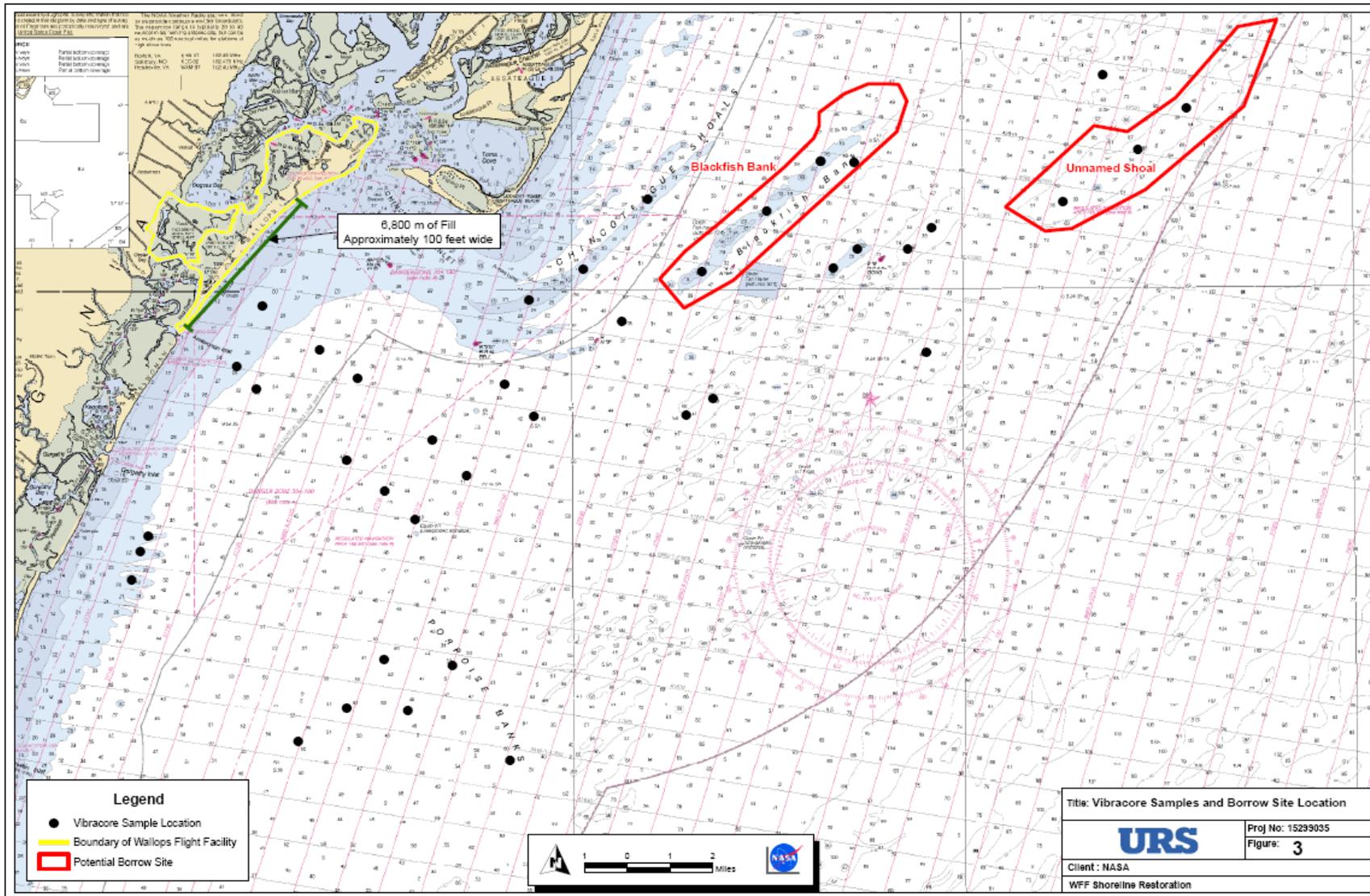


# Proposed Beach Fill Profiles





# Proposed Borrow Sites





# Planning Phase of the Process



- NASA Preparing Environmental Impact Statement (EIS) in Accordance with National Environmental Policy Act (NEPA)
  - U.S. Minerals Management Service and USACE participating in document development
- Purpose of NEPA is to Assess and Disclose the Impacts of the Proposed Project and Reasonable Alternatives
  - Alternatives currently being developed, primarily based on USACE recommendations
- Detailed Analyses being Conducted to Determine Impacts to:
  - Commercial and Recreational Fisheries
  - Benthic Habitat
  - Cultural and Historic Resources
  - Endangered Species
  - Physical Environment (Sand Transport, Wave Climate, etc)
- Public Involvement a Vital Part of the NEPA Process
  - Public participation period March 23 – May 11, 2009
  - Project Website On-Line March 23, 2009
  - Notices to be published in Federal Register and Local Newspapers
  - Public Meeting at Wallops Visitor Center April 21, 2009
  - Full consideration of comments before NASA and USACE select final project design



# Current Project Budget and Schedule



- EIS (\$890k)
  - Design (\$1M )
    - 3/2009 thru 6/2010
  - Phase I Construction: Shoreline Hardening and Groin (\$11M )
    - 9/2010 thru 10/2010
  - Phase II Construction: Beach Fill (\$26 M)
    - 6/2012 thru 7/2013
  - Beach Renourishment:
    - Ongoing Every 5 – 7 Years (\$4 M )
- Total \$38.9 M

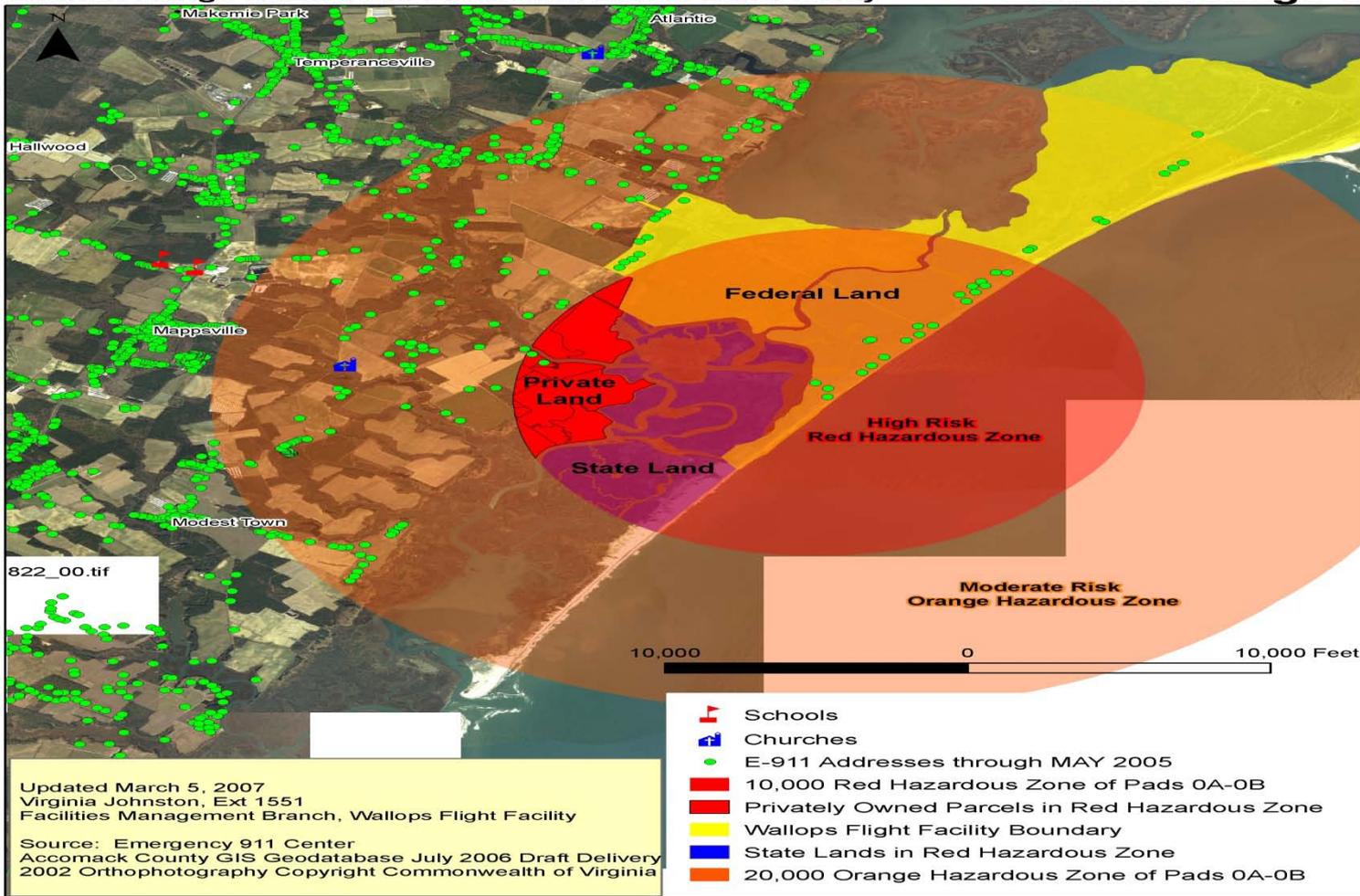


# Local Comprehensive Plan: The Two Sides of Launch Range Protection



Launch Range Hazardous Protection Zones Land Study

Launch Range 3



Protection from the Atlantic Ocean to the East and Protection of Pristine Marsh Buffers from Development to the North, South, and West



# *Launch Range Protection: Offshore Drilling*





# *Launch Range Protection: Offshore Drilling*





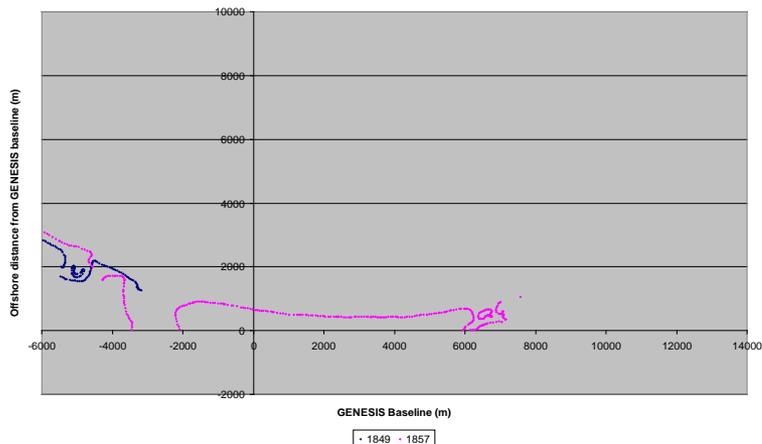
# Back-up Slides



# Wallops Island Shoreline Changes

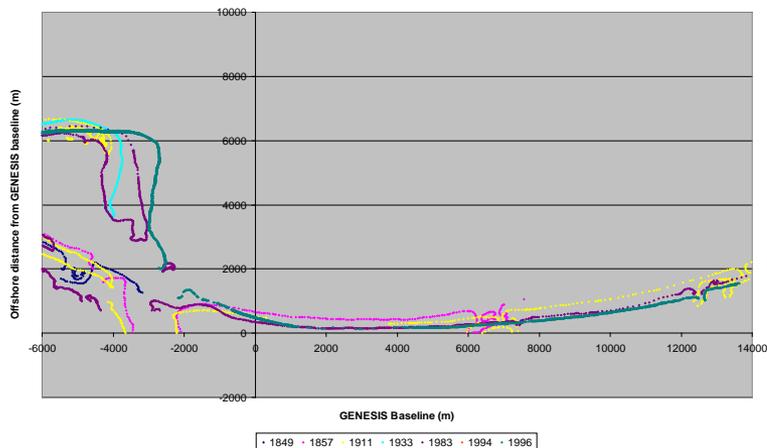


Wallops Island Shoreline



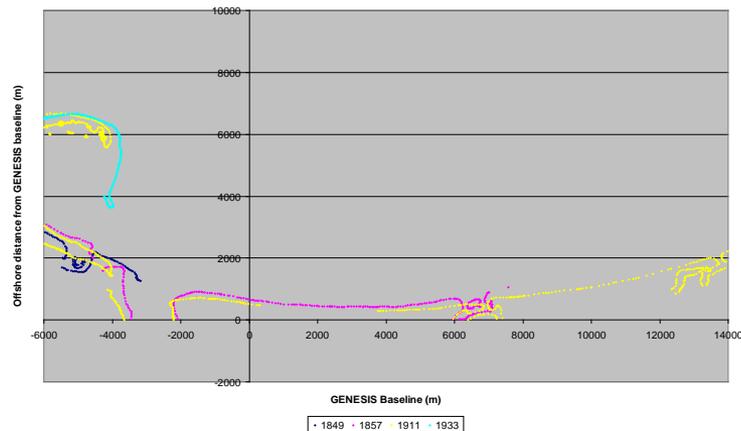
## To 1857

Wallops Island Shoreline



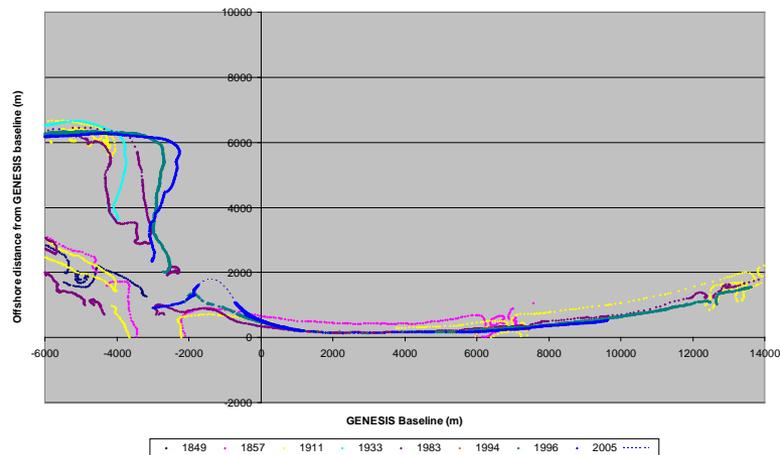
## To 1996

Wallops Island Shoreline



## To 1933

Wallops Island Shoreline



## To 2005



# Historical Data Analysis



- In 2005, NASA retained U.S. Army Corps of Engineers, Norfolk District and Engineering Research and Development Center, Vicksburg, MS for study
- 149 Year Storm Dataset
  - Hurricanes – 41 between 1854 and 2003
  - Nor'easters – 39 between 1954 and 2003
- Basis for Development of 54 Alternatives



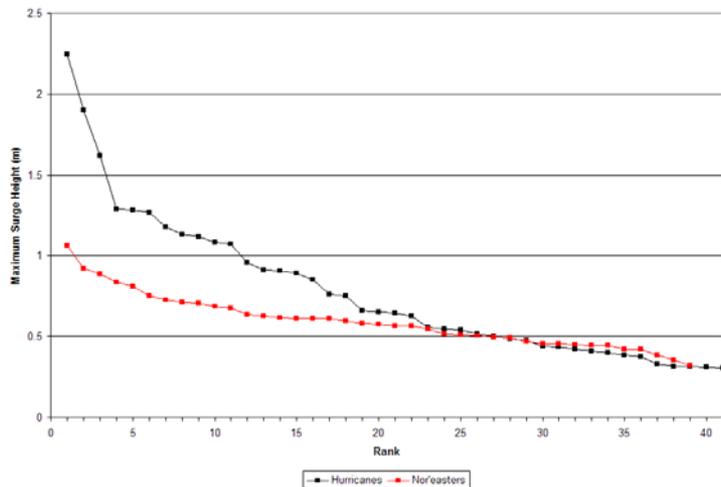
US Army Corps  
of Engineers®



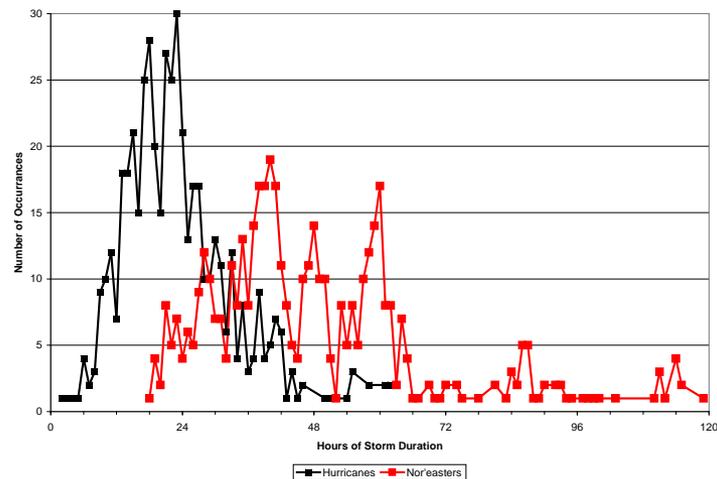
# Historical Data Analysis



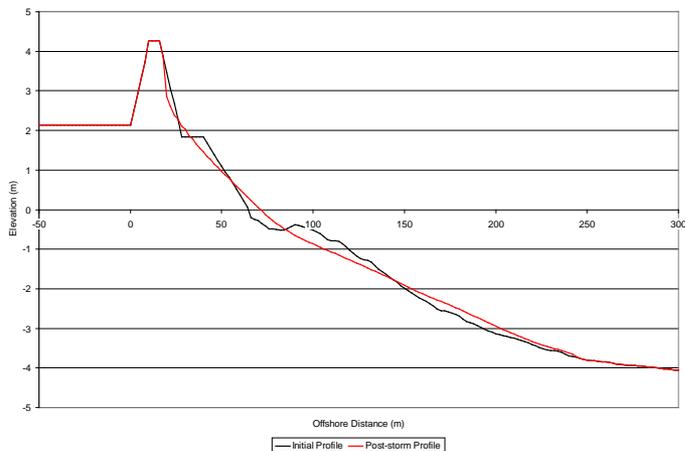
## Storm Surge Heights



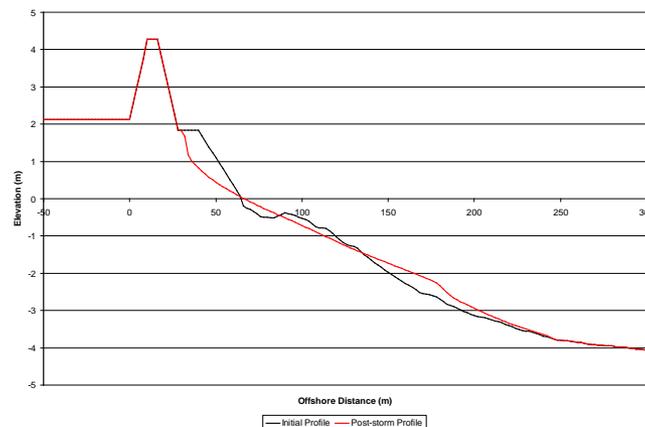
## Storm Durations



## Example Hurricane Profile Change



## Example Nor'easter Profile Change





# 1961 – Early 1990s - Groins



1962



1983



- 1958-1963** – NASA constructs a timber seawall that is parallel to the beach and is tied into eth perpendicular groins.
- 1961** – NASA installed 47 shore-perpendicular wood timber groins on Wallops Island.
- 1997** – NASA removes “failed” groins – They failed because NASA did not receive funding to maintain properly nor initiate a beach fill project.



# 1988 - Experimental “Beach Berms”



**1988** – NASA and Navy Experimental Beach Still Modules (“beach prisms”) at Three Areas on Wallops Island, but They Did Not Perform

- Much too porous (large voids) and Displaced by storm waves
- Settled and sank into seabed
- Did not protect shoreline



# 1992 - Present - Seawall



**Mid-1990s** – NASA in-house labor constructs ~4,600 meter rock seawall; dune behind seawall is constructed to mitigate flooding but is subsequently lost due to erosion.