A satellite-style map of the Gulf of Mexico coastline, showing the Gulf of Mexico to the west and the Florida peninsula to the east. A large, swirling storm system is visible over the Gulf of Mexico, with a distinct eye and spiral bands. The text is overlaid on the top half of the image.

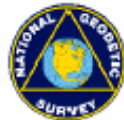
Plans to Fix and Maintain the Vertical Control System in Louisiana

Roy K. Dokka

Department of Civil & Environmental Engineering
Center for GeoInformatics

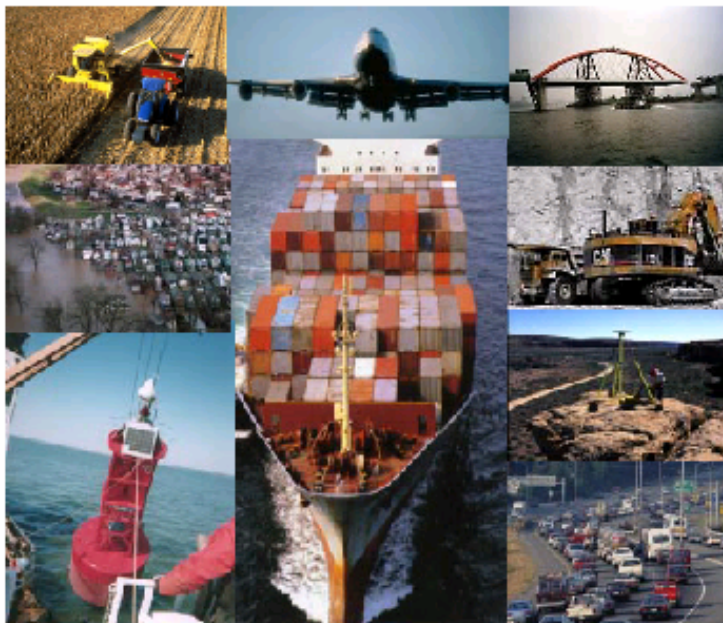
Louisiana State University, Baton Rouge, LA 70803

Prophetic Words



National Height Modernization Study

Report to Congress
Executive Summary



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
National Geodetic Survey

June 1998

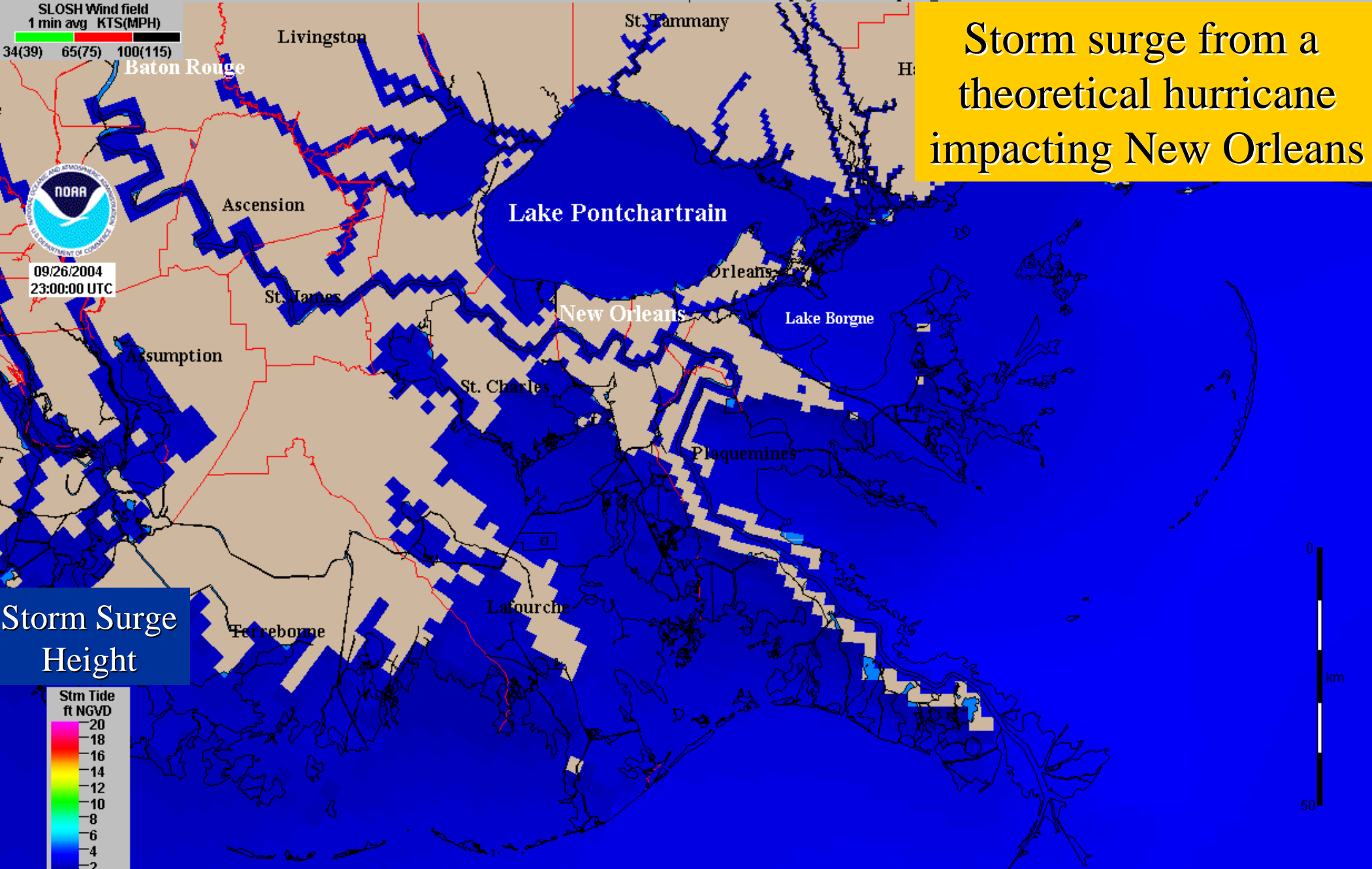
NGS-NOAA told Louisiana in 2001 that the system we use to measure elevations is,

**“inaccurate
and
obsolete.”**

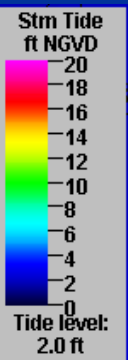
Storm surge from a theoretical hurricane impacting New Orleans



09/26/2004
23:00:00 UTC

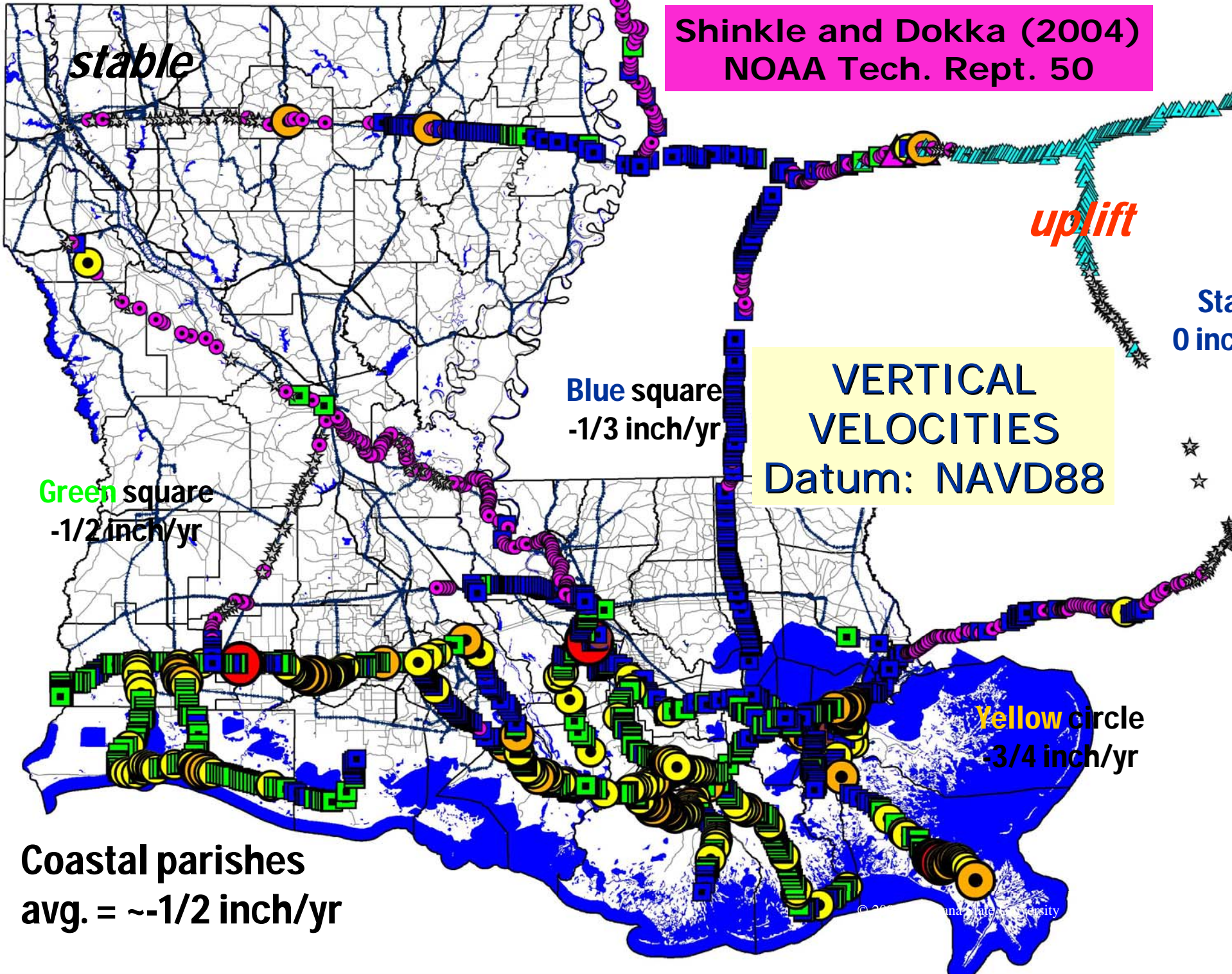


Storm Surge Height



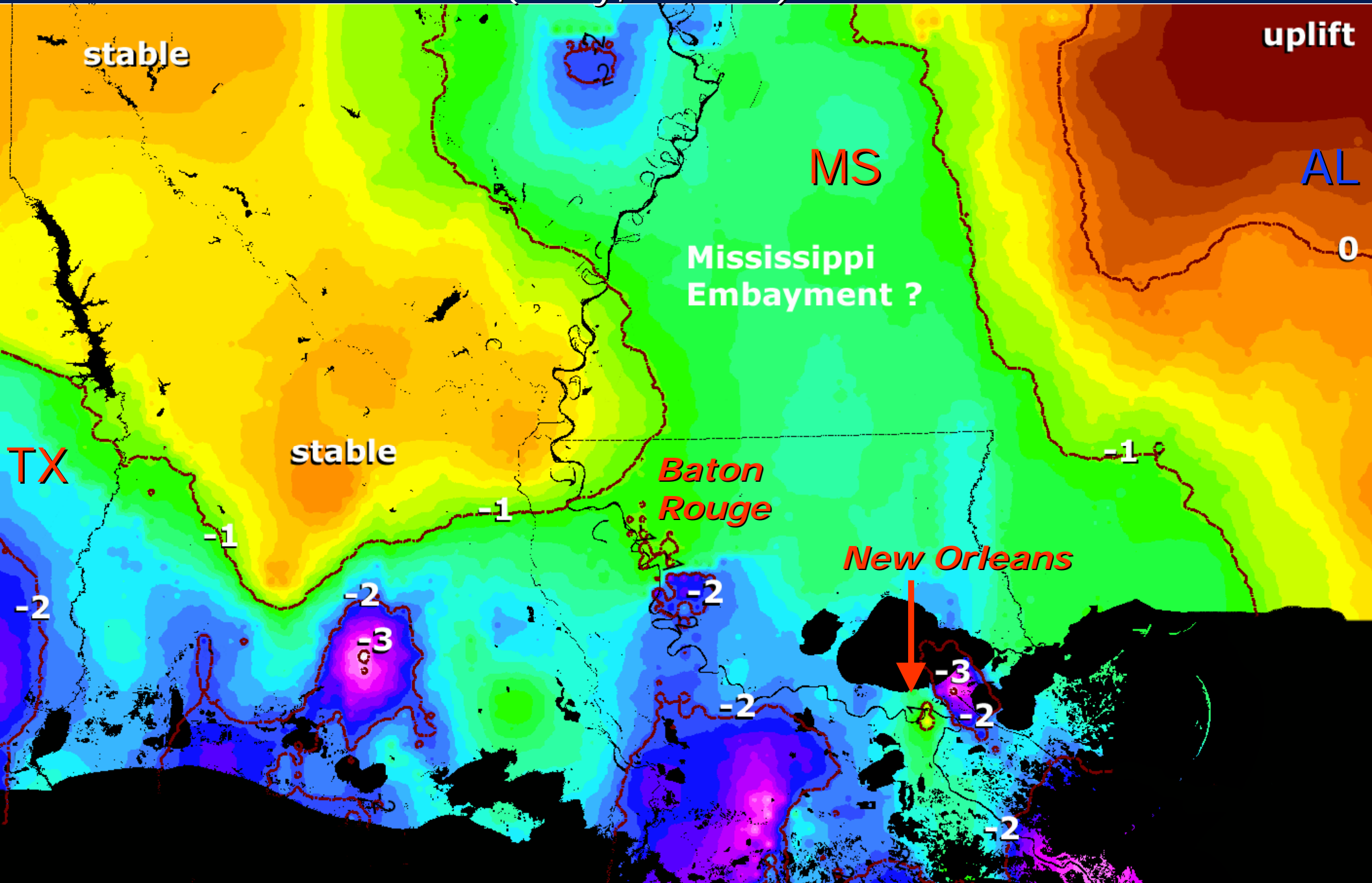
“Elevation is our salvation from inundation”

Shinkle and Dokka (2004)
NOAA Tech. Rept. 50



Subsidence in past 50-75 years

(sorry, in feet!)



What are the Needs?

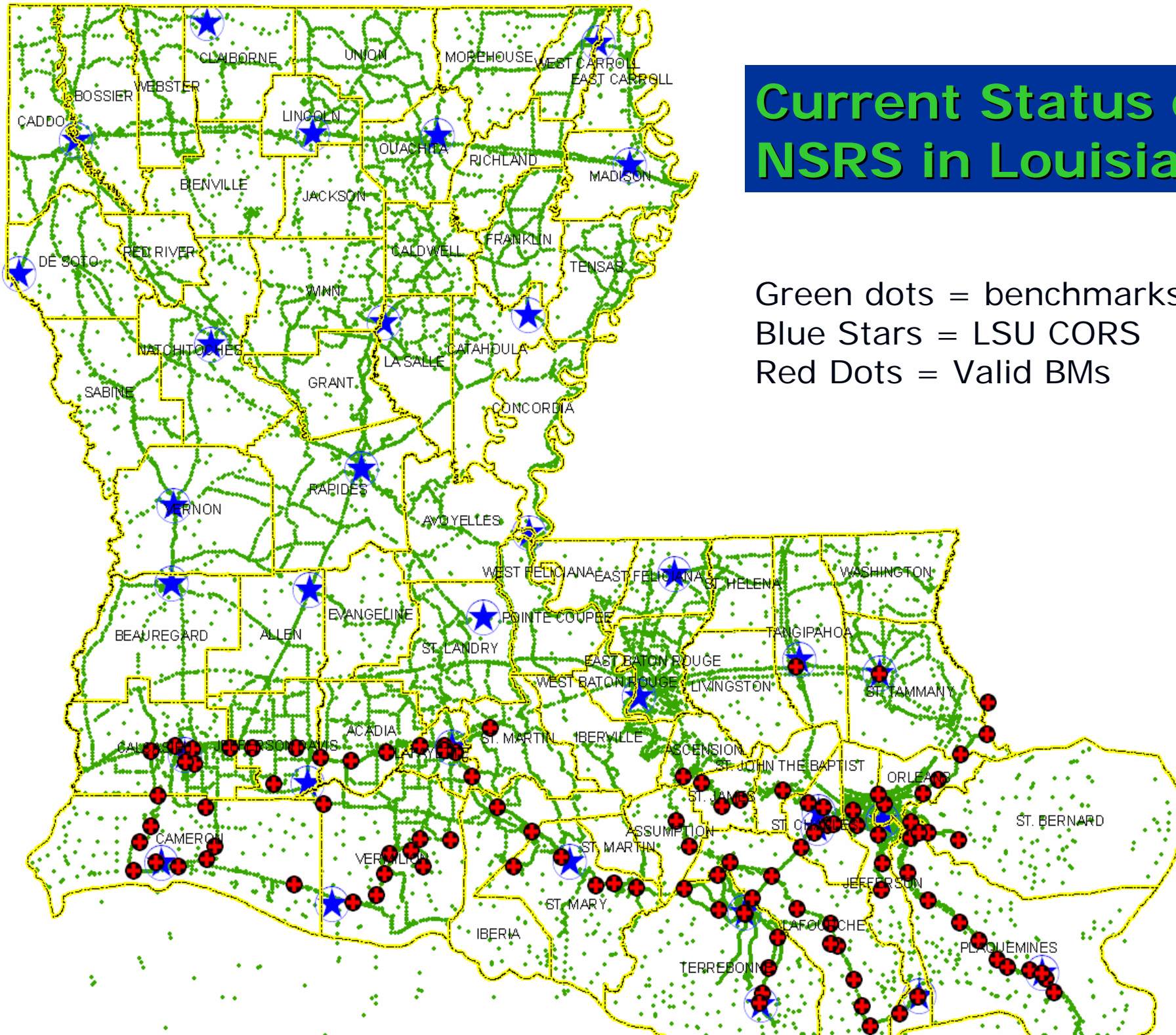
- Louisiana needs accurate elevations right now for flood certificates, rebuilding, and upgrading levees.
- This means access to the National Spatial Reference System.
- State-wide, local, and affordable access, that is.
- Access that will be sustainable into the future.
- Professionals with appropriate skills to exploit the system.
- An understanding by public and private sectors that elevations are changing and will require attention in the future.

National Spatial Reference System?

- The NSRS consists of current horizontal monuments, benchmarks and Continuously Operating Reference Stations (CORS). It also consists of gravimetric data that defines the reference geoid.
- NGS/NOAA is committed to providing access to NSRS. This is increasingly being accomplished through the use of GPS because of cost. A small (several hundred) group of BMs will be maintained in the future for regional calibrations and support for CORS. Training and partnerships.

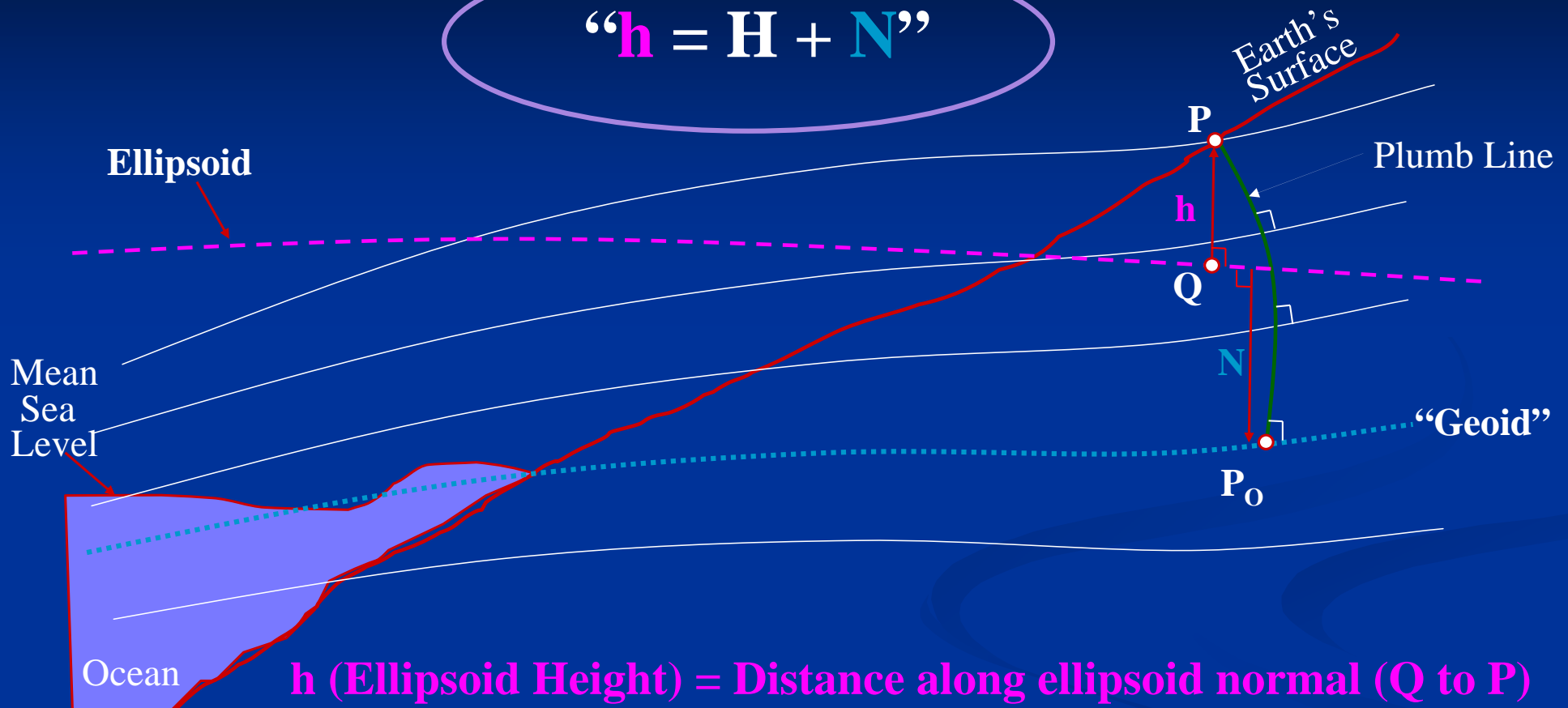
Current Status of NSRS in Louisiana

Green dots = benchmarks
Blue Stars = LSU CORS
Red Dots = Valid BMs



Ellipsoid, Geoid, and Orthometric Heights

$$h = H + N$$



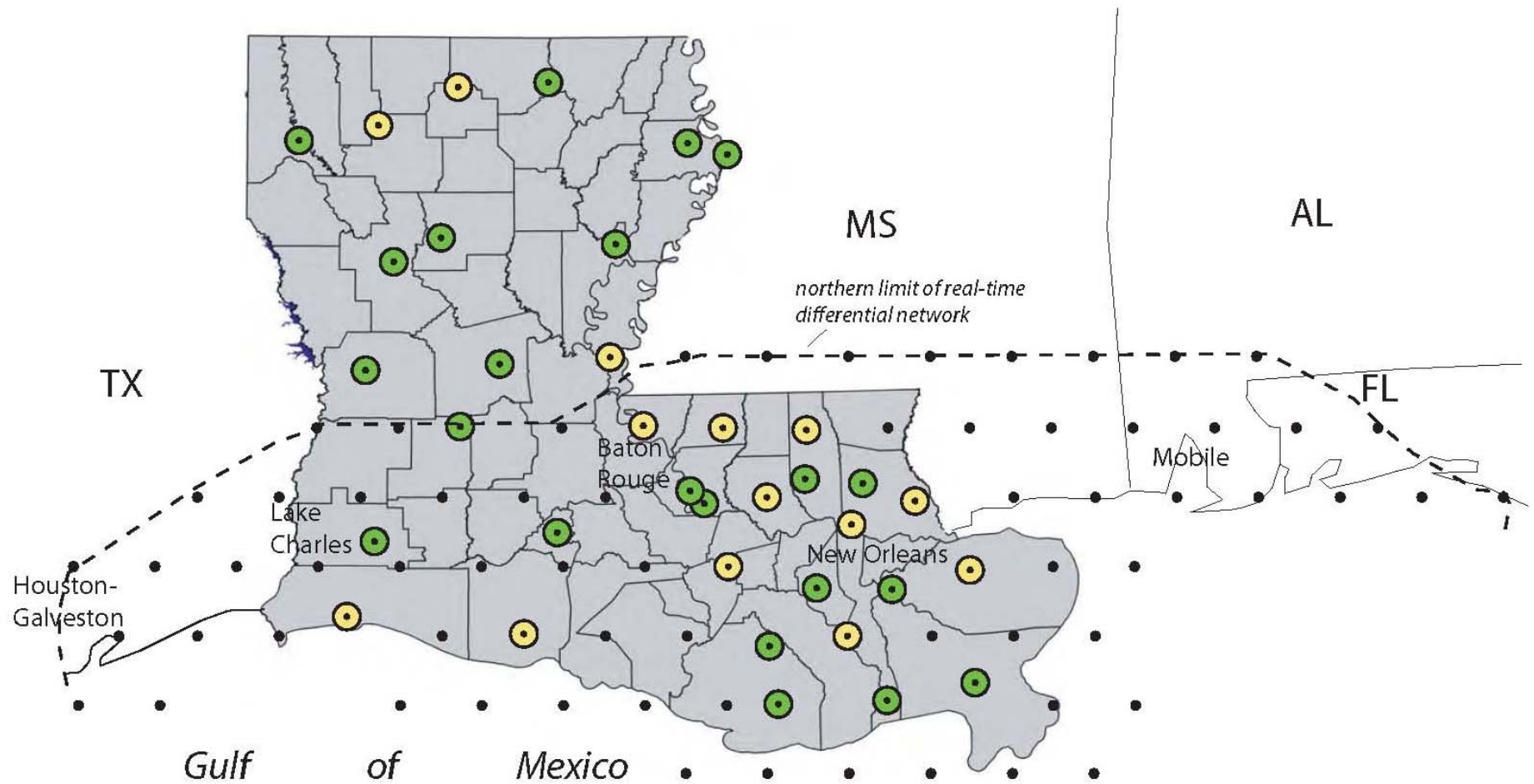
h (Ellipsoid Height) = Distance along ellipsoid normal (Q to P)

N (Geoid Height) = Distance along ellipsoid normal (Q to P₀)

H (Orthometric Height) = Distance along plumb line (P₀ to P)

\$\$ Dictates the Plan

- Recalibrating all of the benchmarks in Louisiana by geodetic leveling would cost \$40-50M. Because of motion, recalibration would be required every 1-10 years. All these costs will be local and from unidentified sources.
- Most states are opting for a dense state-wide network of CORS tied to an accurate geoid model. System will have RTK capability that will allow users to obtain $\pm 2\text{cm}$ with 5-30 sec. observation. All data tied to network validated every 3 days by NGS/NOAA.

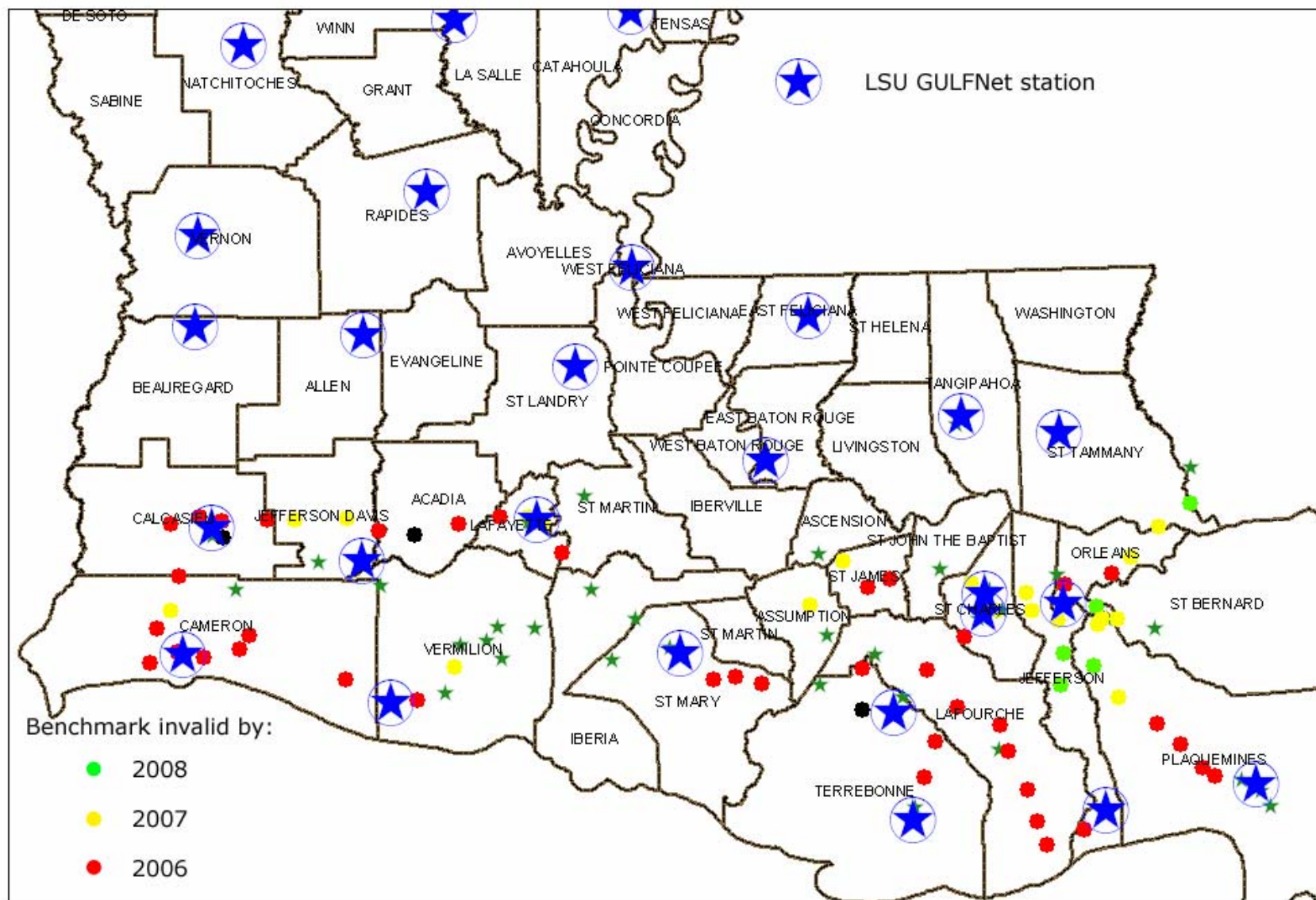


GULFNet CORS

- Existing
- Equipment in hand but not yet installed.
- Location of new CORS proposed for this project.

Figure 2. Location of LSU GULFNet CORS network. Also shown are proposed additional CORS needed for implementation of real-time differential GPS. This network will provide precise 3-D positioning anywhere along the central Gulf Coast to support post-Katrina and Rita recovery and mitigation. New CORS: LA = 35, MS = 10, TX = 10, AL = 7, FL = 5. CORS spacing is 30 miles.

The only valid benchmarks in LA. Released in 2005, most will be bad by end of 2007



Coming Activities

- Kickoff meeting → late April-early May
- National CORS densification in south Louisiana (~75 km). Further densification to support RTK.
- Re-observation of original “85” benchmarks and an additional 115 benchmarks. New BMs will support regional GPS elevation transfers and CORS calibration.
- Implementation of RTK in southeast Louisiana.
- Free training to users on NGS/NOAA standards, requirements and methods, RTK, etc.

Questions!

