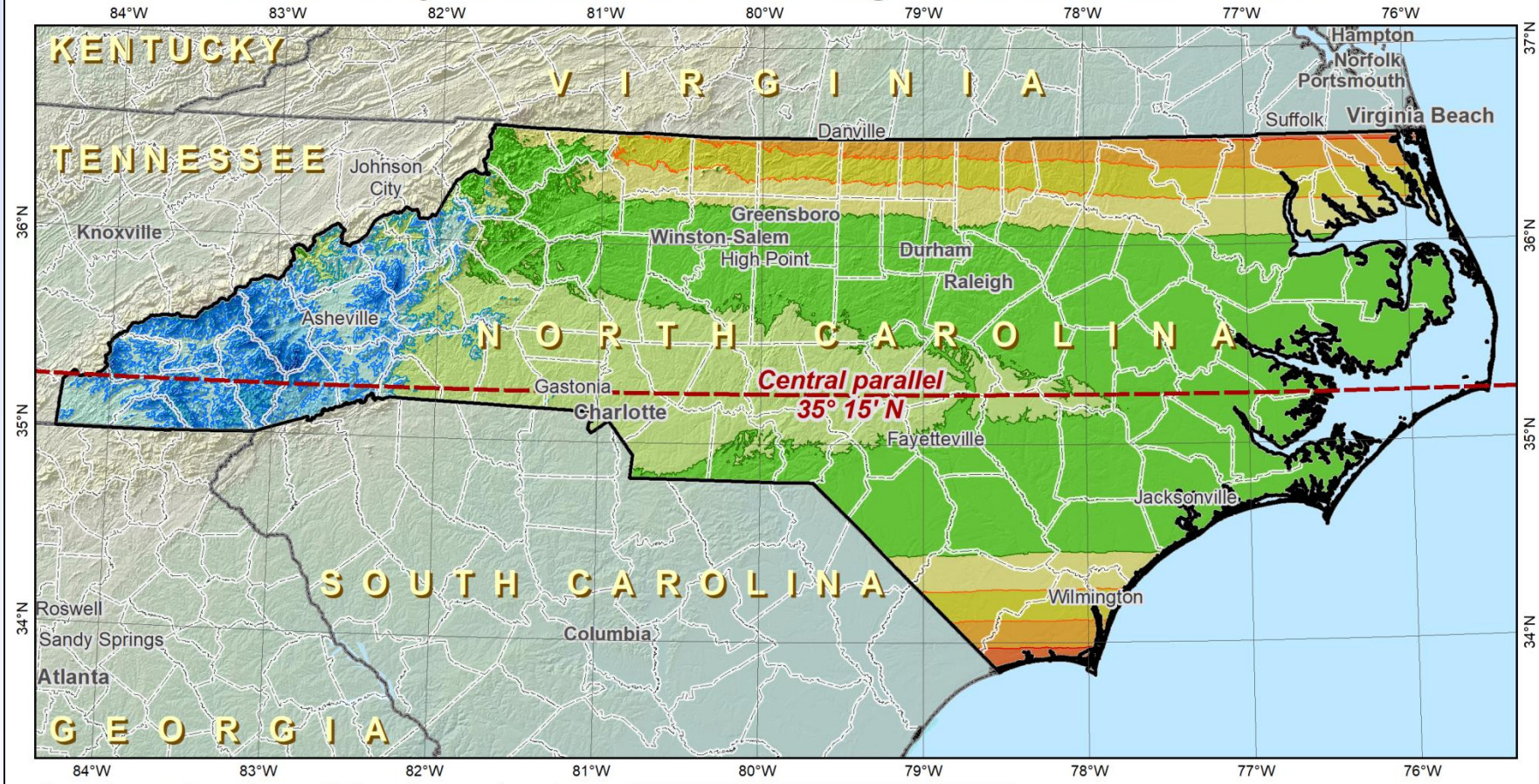
New Datums are Coming in 2022

Our preparations to date include:

- Created a 2022 Datum Working Group to develop implementation recommendations ✓
- Working with SC Geodetic Survey, SC, NC, and VA Department's of Transportation to develop common implementation plans ✓
- Working with the National Geodetic Survey to complete GRAV-D in North Carolina
  - Collecting terrestrial gravity data ✓
  - Collection of airborne gravity data completed ✓
- Developing a National Science Foundation grant to purchase an absolute gravity meters ✓
- Obtaining ellipsoidal heights on NAVD88 bench marks ✓
- Collecting statewide LiDAR elevation data (USGS QL1 and QL2) ✓
- Created 2022 Datum web page ✓
- Education outreach ✓
- National Geodetic Survey GPS on Bench Marks project ✓

In progress = ✓
Completed = ✓

Preliminary SPCS2022 default design: North Carolina Zone



Lambert Conformal Conic projection

North American Terrestrial Reference Frame of 2022

Central parallel: 35° 15' N

Central parallel scale: 0.999 95 (exact)

NOAA's National Geodetic Survey

Areas within ±100 ppm distortion (1:10,000 = ±0.53 ft per mile):

90% of population

78% of all cities and towns

76% of entire zone area

Distortion values (ppm)

Entire zone:

Min = -341 Range = 597

Max = +256 Mean = -14

Cities and towns:

Min = -222 Mean = -25

Max = +246 (weighted by

Range = 469 population)

Created 03/10/2019

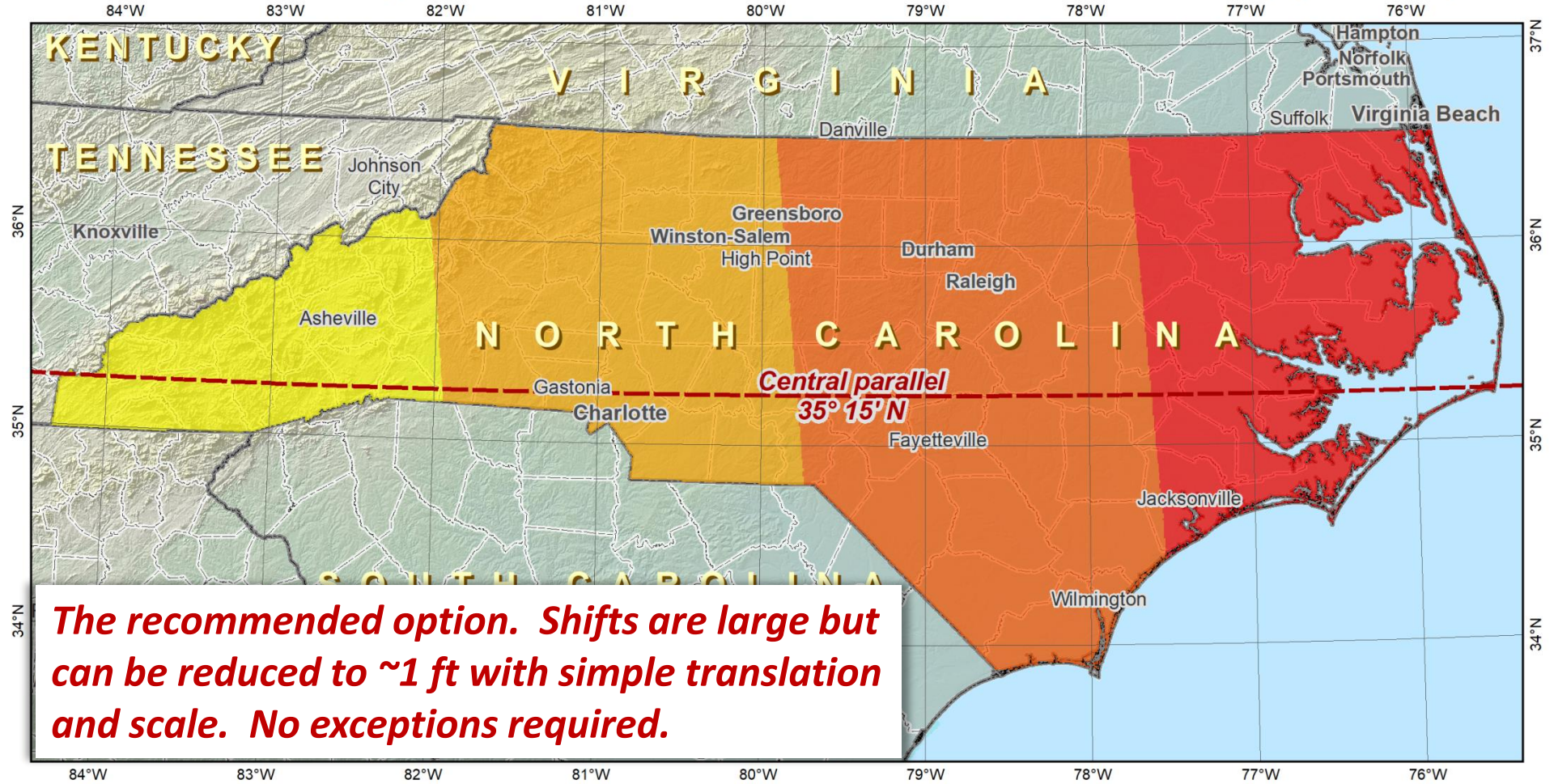
Linear distortion at topographic surface (parts per million)

< -400	to -200	to +150
to -400	to -150	to +200
to -350	to -100	to +250
to -300	±50	to +300
to -250	to +100	> +300

0 50 100 150 200 250 km

Option 2b

Horizontal change in SPCS2022 coordinates for North Carolina *(option 2b)*



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NOAA's National Geodetic Survey

Option 2b: *Reference frame plus parameter change:*

False northing = 200,000 m

False easting = 1,000,000 m

(same central meridian as SPCS 83)

Maximum relative change:

Delta north = 77 ft

Delta east = 205 ft

Horizontal change in coordinates

1,285,445 to 1,285,500 sft

1,285,500 to 1,285,550 sft

1,285,550 to 1,285,600 sft

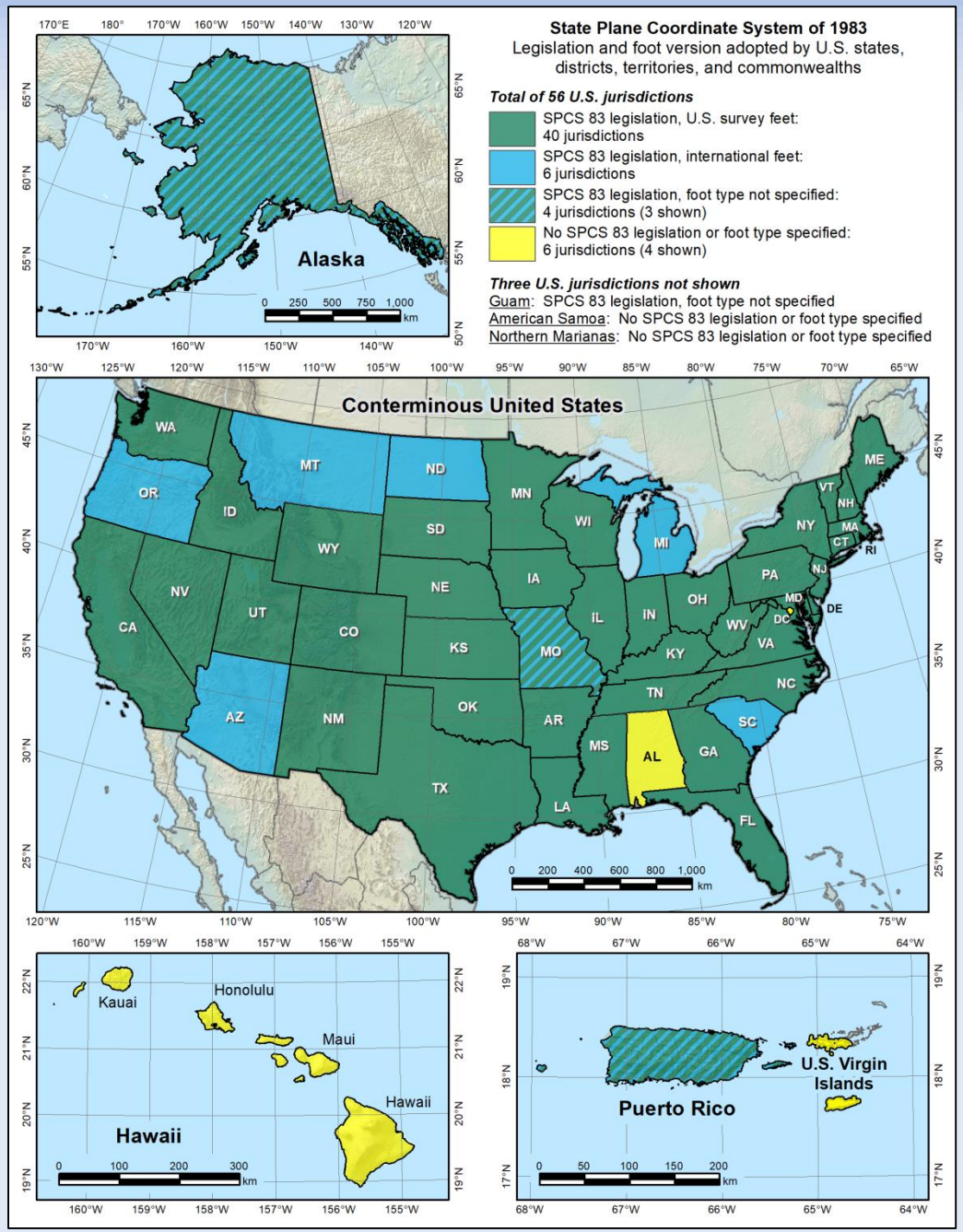
1,285,600 to 1,285,650 sft

0 50 100 150 200 250 km

North Carolina 2022 PIN conversion

- Equations for generating SPCS 83 (2011) epoch 2010.00 coordinates from SPCS2022 epoch 2020.00 coordinates, for the purpose of creating parcel IDs consistent with those currently used in North Carolina:
  - N83 = S*N2022 + Tn
  - E83 = S*E2022 + Te

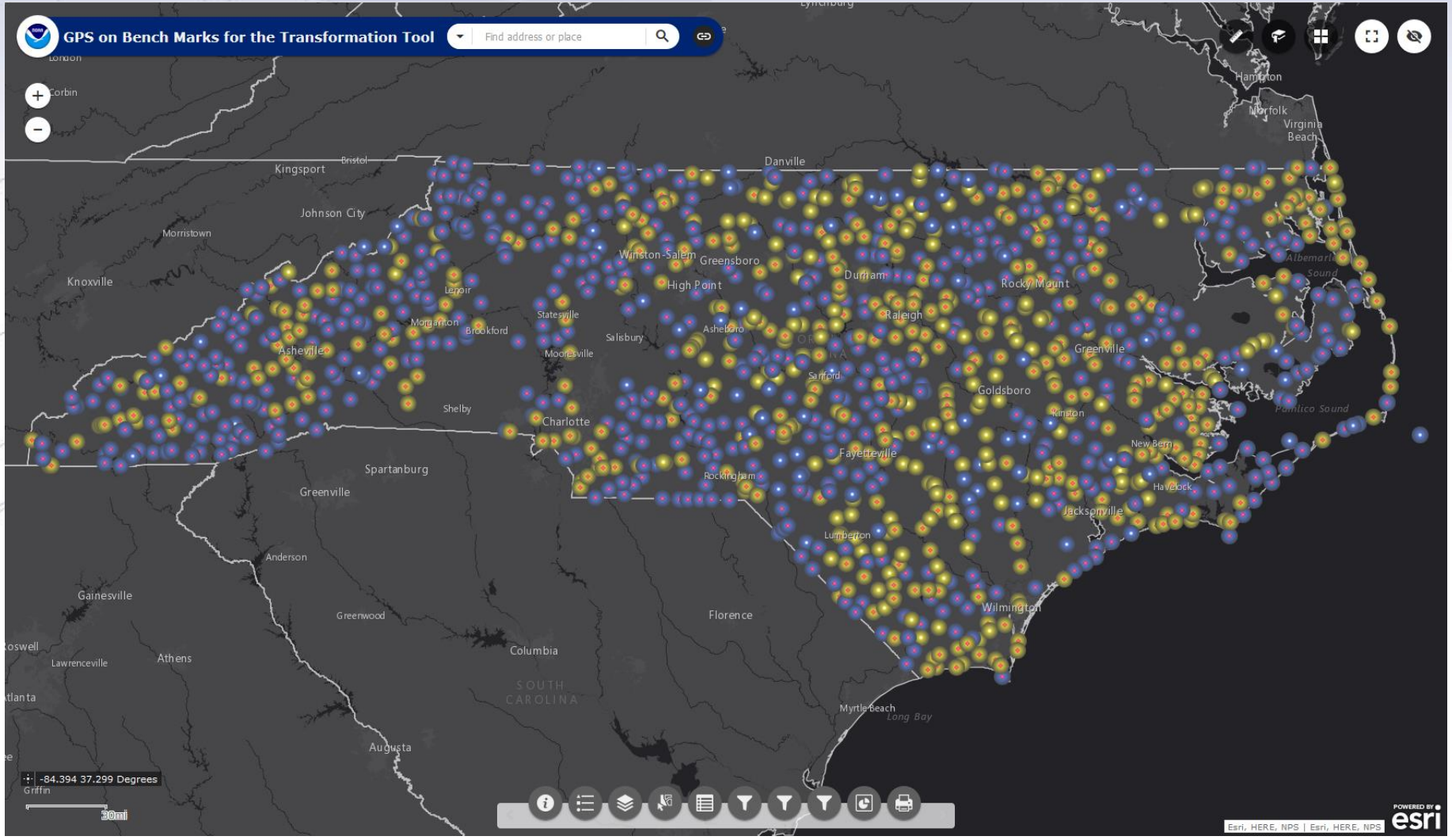
    - N83 and E83 = Output SPCS 83 northing and easting coordinates in US sft
    - N2022 and E2022 = Input SPCS2022 northing and easting coordinates (in survey or international feet as indicated)
    - S = Scale factor
    - Tn and Te = North and east translations (actually combined translation, origin, and scaled origin).



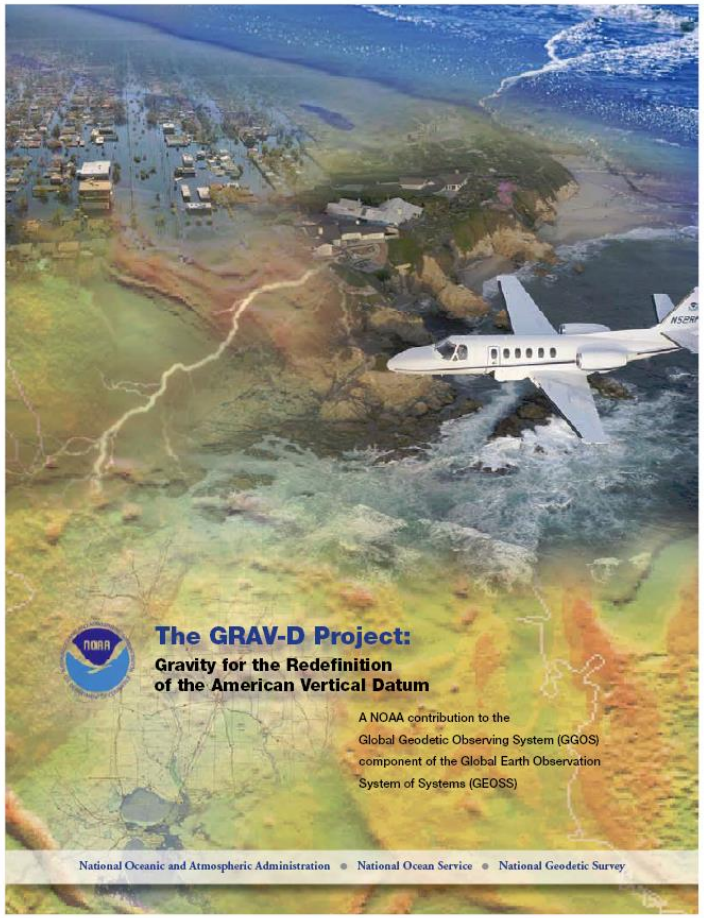
DEPARTMENT OF PUBLIC SAFETY

EMERGENCY MANAGEMENT
NORTH CAROLINA

2019 GPS on Bench Marks



GRAV-D Project Overview



- **Overall Target**: 2 cm accuracy orthometric heights from GNSS and a geoid model
- **GRAV-D Goal**: Create gravimetric geoid accurate to 1 cm where possible using airborne gravity data
- **GRAV-D**: Two thrusts of the project
  - Airborne gravity survey of entire country and its holdings
  - Long-term monitoring of geoid change

Relative Gravity Meter Data Collection

- New gravity marks established
  - One hundred and twenty (120) in western North Carolina
  - Partnering with NGS to establish eleven (11) new absolute gravity stations in western North Carolina (NC)
    - Observations in the Winter of 2019

New Datums are Coming in 2022

Our preparations to date include:

- Issue Papers
  - Professional Land Surveyor ✓
  - Professional Engineer ✓
  - Land Records ✓
  - Local Governments ✓
  - Precision Agriculture ✓
  - Legal ✓

In progress = ✓
Completed = ✓