Datums and Tools to Connect Geospatial Data Accurately

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National Geodetic Survey
National Oceanic and Atmospheric Administration

USGS CSS Brown Bag June 20, 2012

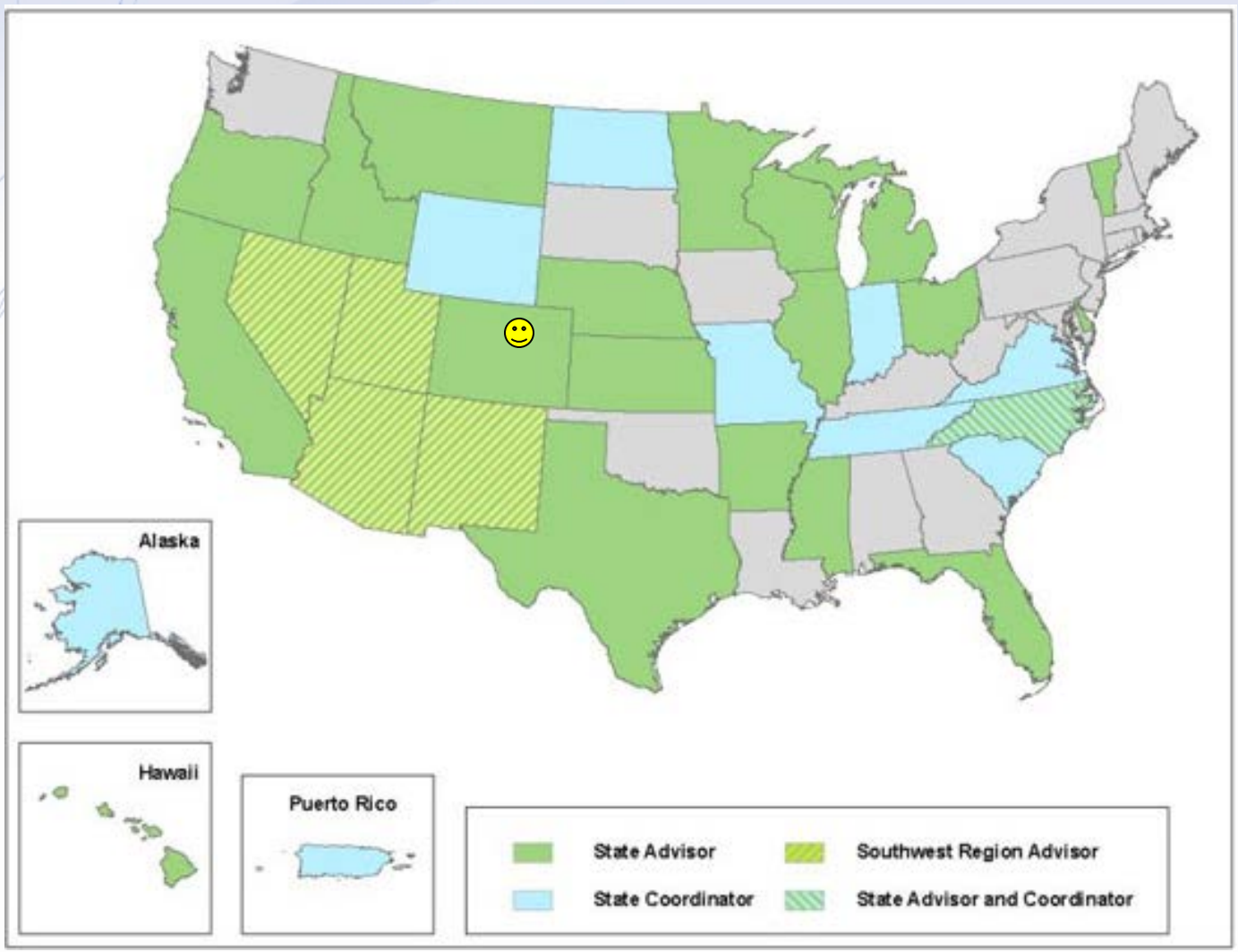
Agenda

- NGS - National Spatial Reference System
- NGS-USGS Collaboration Projects
- What is a Datum
- GPS - Accuracy
- MetaData
- Tools
  - DS-World
  - CORS
  - OPUS
- New Datums

CHANGE

IMPROVEMENTS

NGS Advisor Program



U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Geodetic Survey

Mission: To define, maintain & provide access to the

National Spatial Reference System (NSRS)

to meet our Nation's economic, social & environmental needs

National Spatial Reference System

- Latitude
- Longitude
- Height
- Scale
- Gravity
- Orientation

& their time variations

The NSRS Supports

Nautical charts, among many other geospatial applications

National Oceanic and Atmospheric Administration

Flood zones for the National Flood Insurance Program

Emergency Response Imagery

Federal Emergency Management Agency

Levee Safety Program to determine levee heights and positions

United States Army Corps of Engineers

Topographic Maps and interior water data for the nation

United States Geological Survey

NSRS gravity data for the **geospatial mission of NGA**

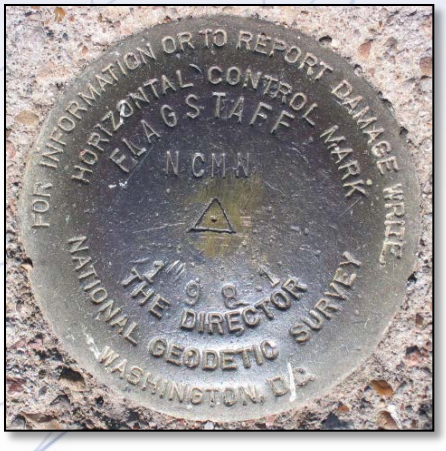
National Geospatial-Intelligence Agency

Aeronautical Data Quality Assurance

Federal Aviation Administration

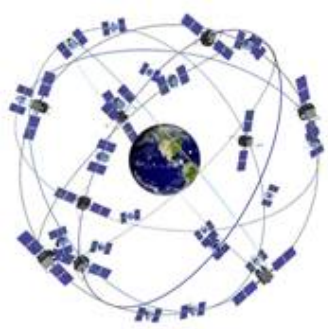
The NSRS Evolves

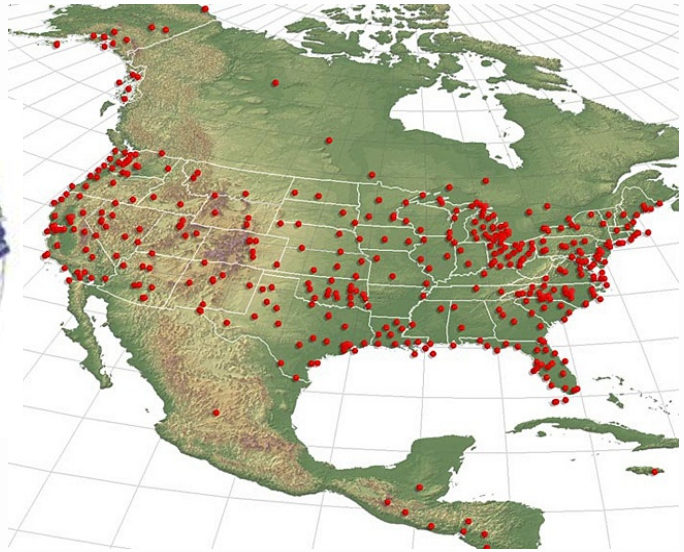
Positioning America in a dynamically changing world.



Passive Control (Monuments)

Active Control (CORS)





NGS
National Spatial Reference System(NSRS) Improvements

NETWORK	TIME SPAN	NETWORK ACCURACY	LOCAL ACCURACY
NAD 27	1927-1986	10 meters	(1 part in 100,000)
NAD83(86)	1986-1990	1 meter	(1 part in 100,000)
NAD83(199x)* HARN	1990-2007	0.1 meter	B-order (1 part in 1 million) A-order (1 part in 10 million)
NAD83(NSRS2007) (CORS)	2007 -	0.01 meter	0.01 meter

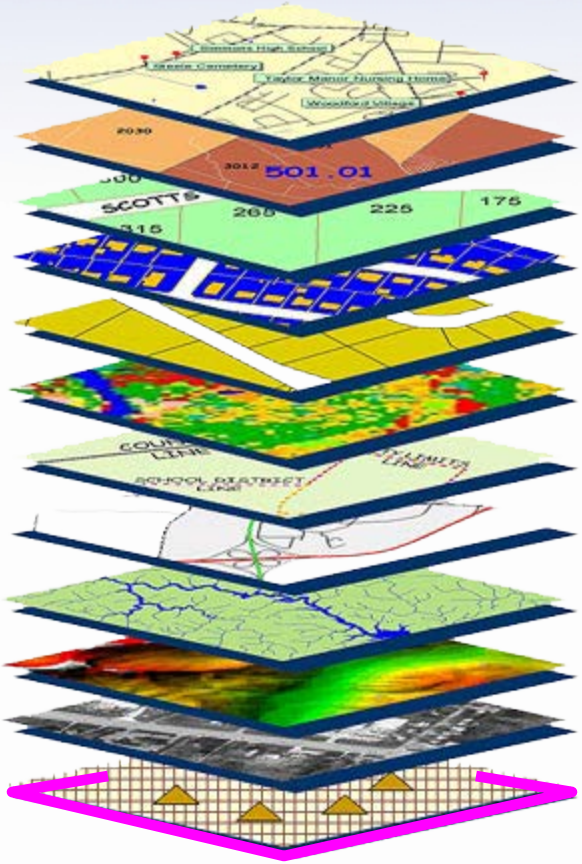
* CO was completed and adjusted in 1992

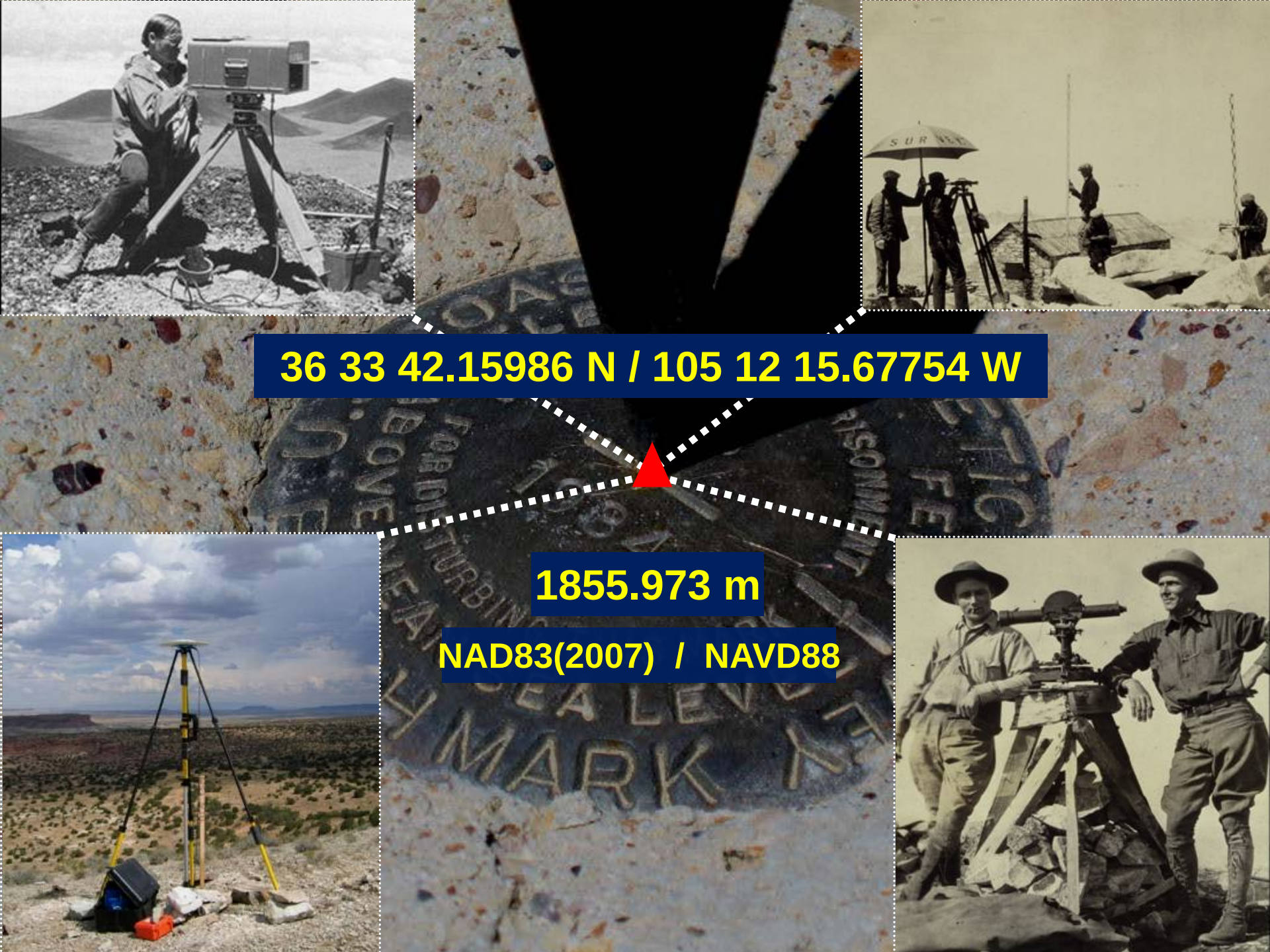
Accurate positioning begins with *accurate* coordinates

Geodetic control (the NSRS) is the foundation for all geospatial products.

Without Geodetic Control as a "base map" layer, GIS applications will not work properly

Source: Zurich-American Insurance Group



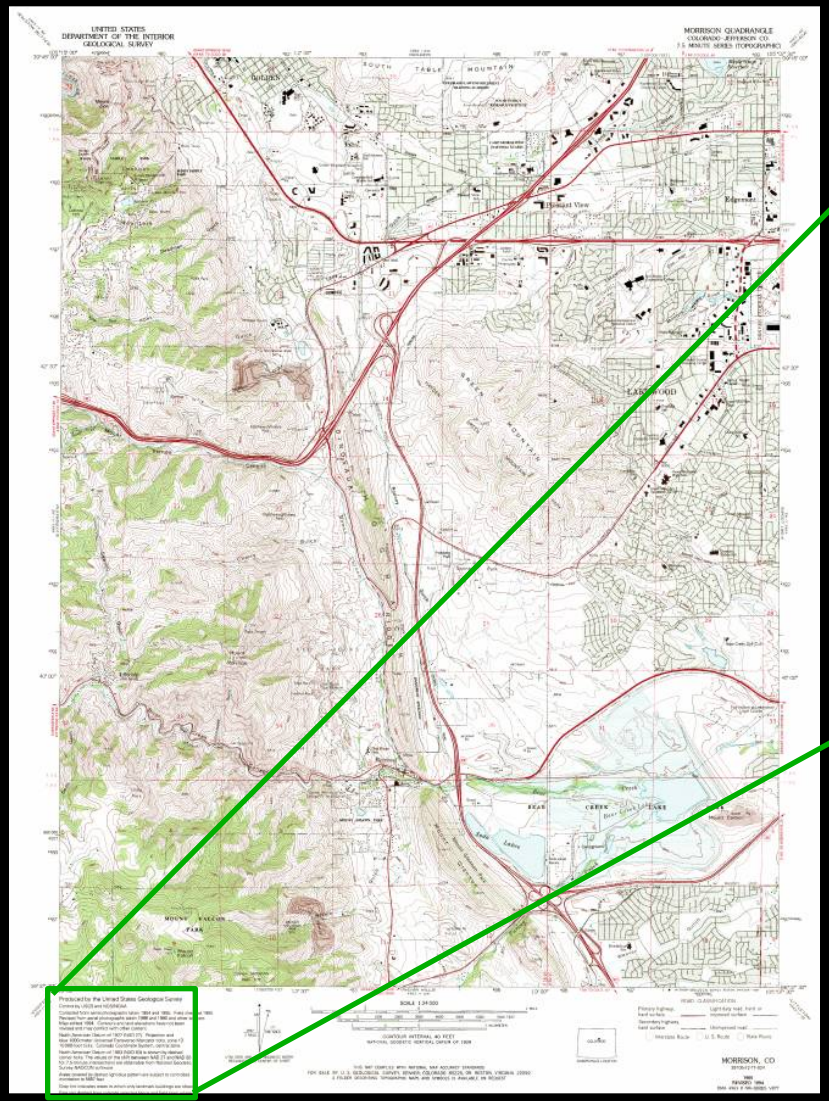

36 33 42.15986 N / 105 12 15.67754 W
1855.973 m
NAD83(2007) / NAVD88

NGS-USGS Collaboration/Partnership

- Mapping - Datums
- Stream Gages - Datums
- Wetland Surface Elevation Table (SET) Technology
- National Hydrography Dataset - Shoreline
- Ground water – Gravity measurements
- Office Space 
- ….

Morrison, CO Quad

1994 7.5-minute Topographic Map



Horizontal datum = NAD27

Projection = UTM Zone 13

Contours = 1955 vintage

30″
105°15′ 00″
479
480

Produced by the United States Geological Survey

Control by USGS and NOS/NOAA

Compiled from aerial photographs taken 1954 and 1955. Field checked 1965
Revised from aerial photographs taken 1988 and 1990 and other sources
Map edited 1994. Contours and land elevations have not been
revised and may conflict with other content

North American Datum of 1927 (NAD 27). Projection and
blue 1000-meter Universal Transverse Mercator ticks, zone 13
10 000-foot ticks: Colorado Coordinate System, central zone

North American Datum of 1983 (NAD 83) is shown by dashed
corner ticks. The values of the shift between NAD 27 and NAD 83
for 7.5-minute intersections are obtainable from National Geodetic
Survey NADCON software

Areas covered by dashed light-blue pattern are subject to controlled
inundation to 5667 feet

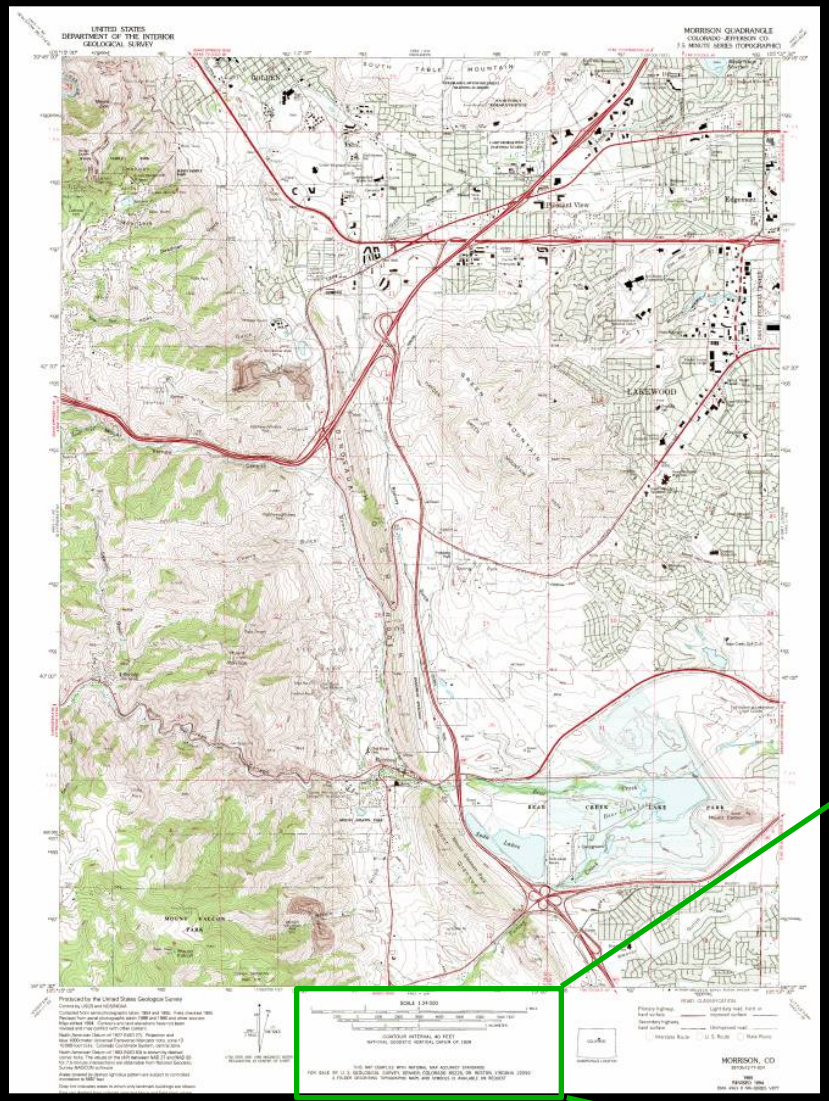
Gray tint indicates areas in which only landmark buildings are shown

Fine red dashed lines indicate selected fence and field lines where
generally visible on aerial photographs. This information is unchecked

Slide by John Kosovich, USGS

Morrison, CO Quad

1994 7.5-minute Topographic Map



Horizontal datum = NAD27

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30″ 105°15′ 00″ 479 480

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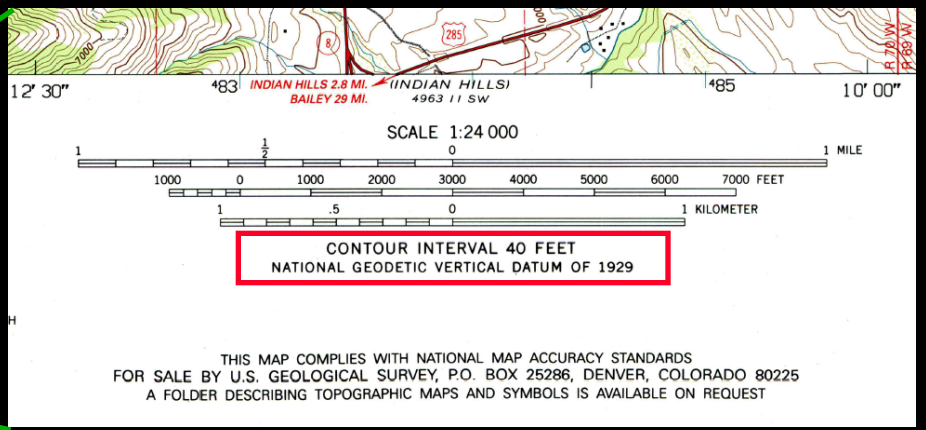
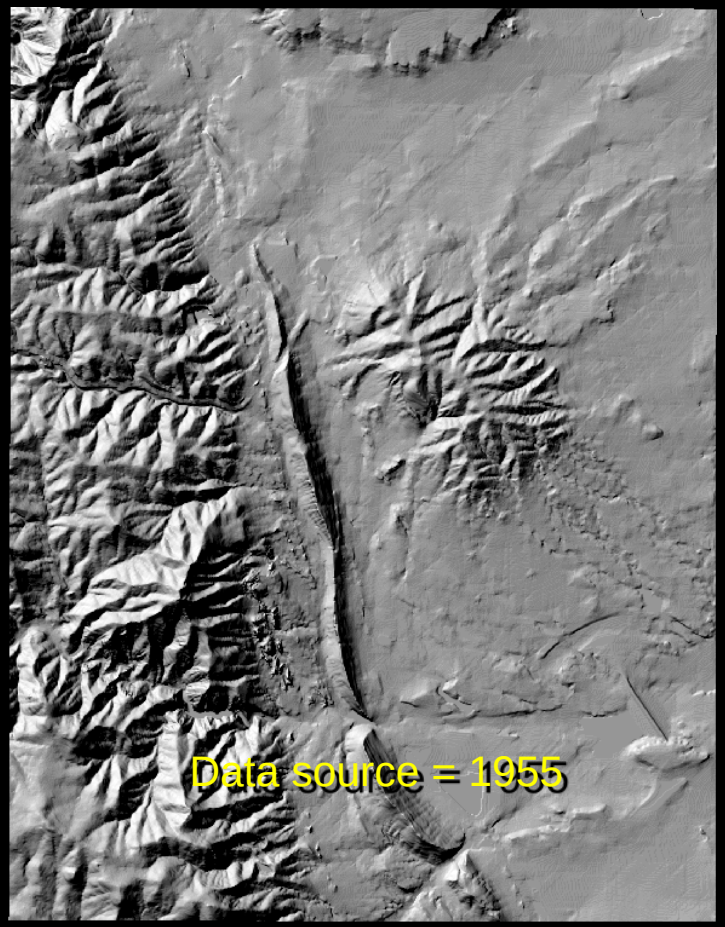
Vertical datum = NGVD29



Slide by John Kosovich, USGS

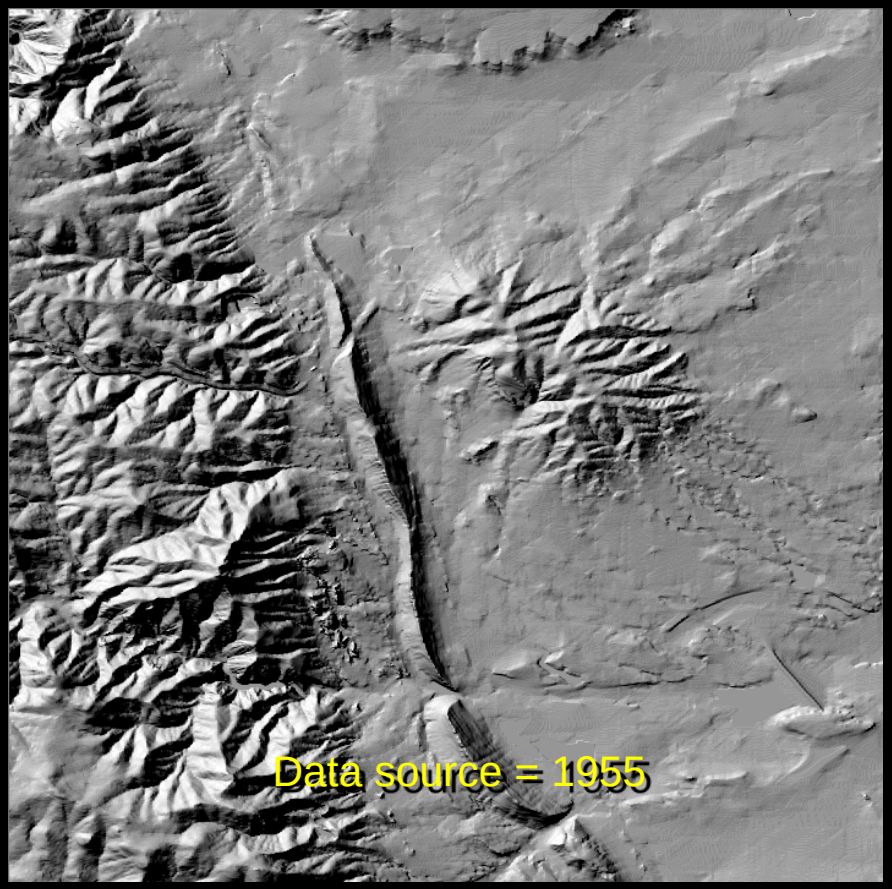
NED Made from DEM

USGS DEM:
Horizontal datum = NAD27
Projection = UTM Zone 13
H-units = meters, V-units = feet
Vertical datum = NGVD29



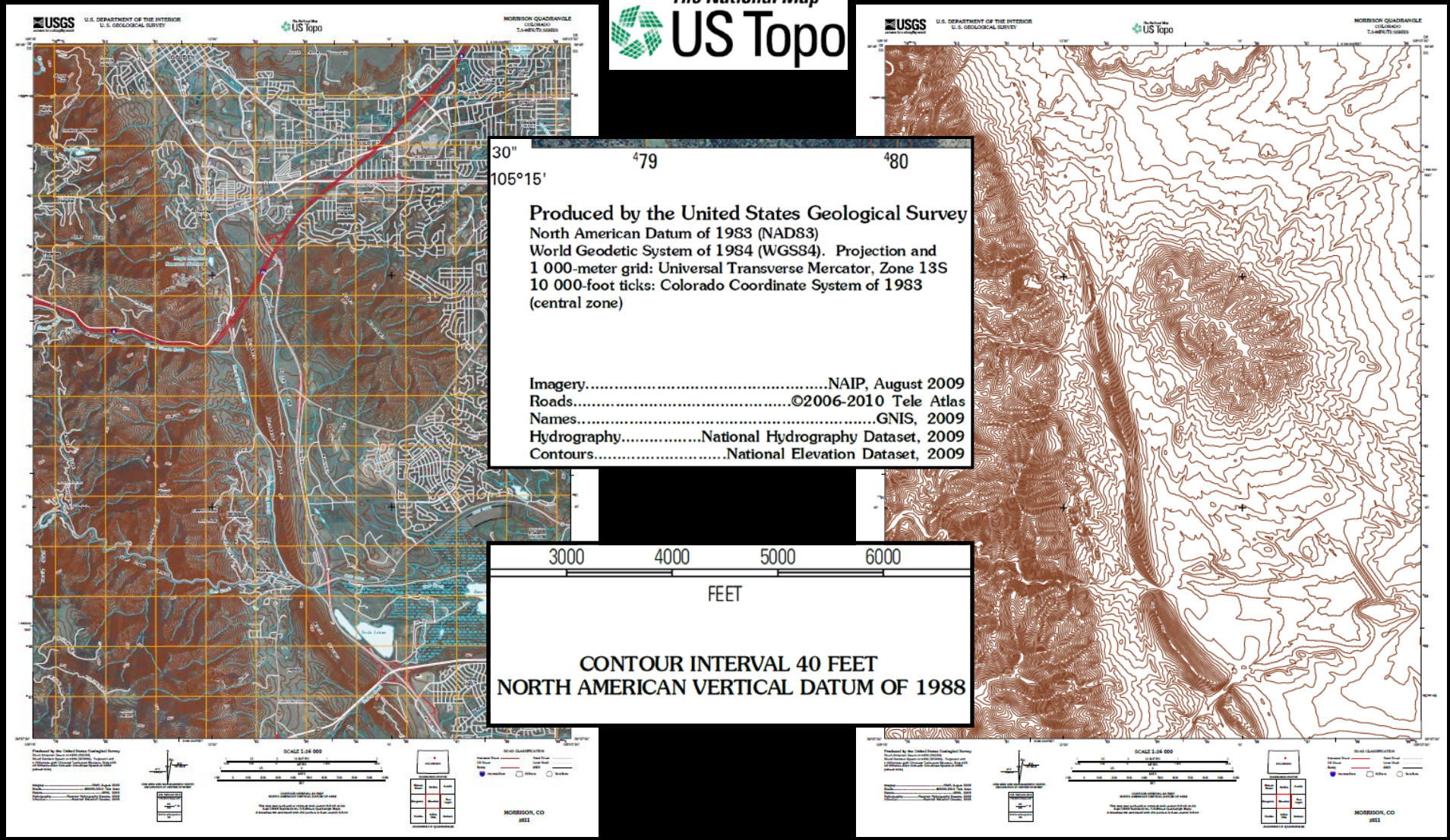
Both tiles are 7.5' x 7.5' to illustrate projected vs. un-projected distortion

National Elevation Dataset (NED):
Horizontal datum = NAD83
Projection = Un-projected ("Geographic")
H-units = decimal degrees, V-units = meters
Vertical datum = NAVD88



Slide by John Kosovich, USGS

2011 US Topo Map

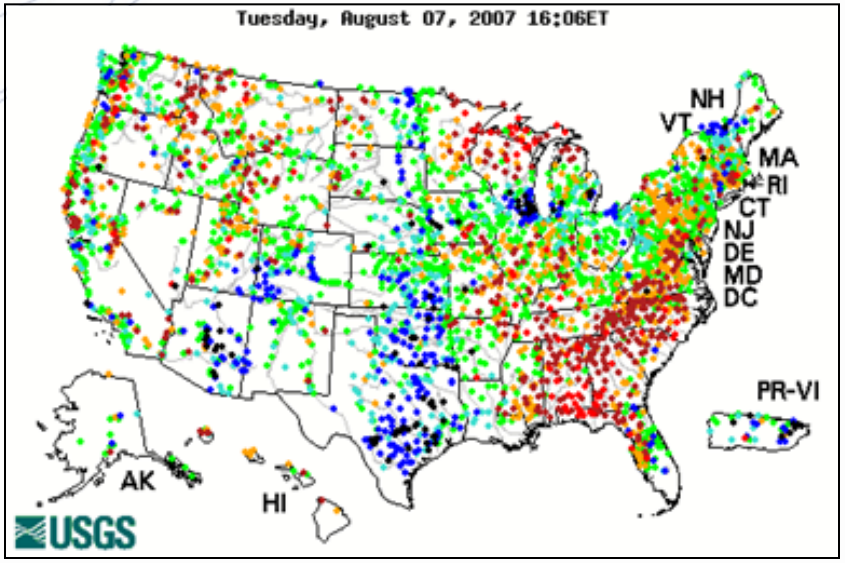


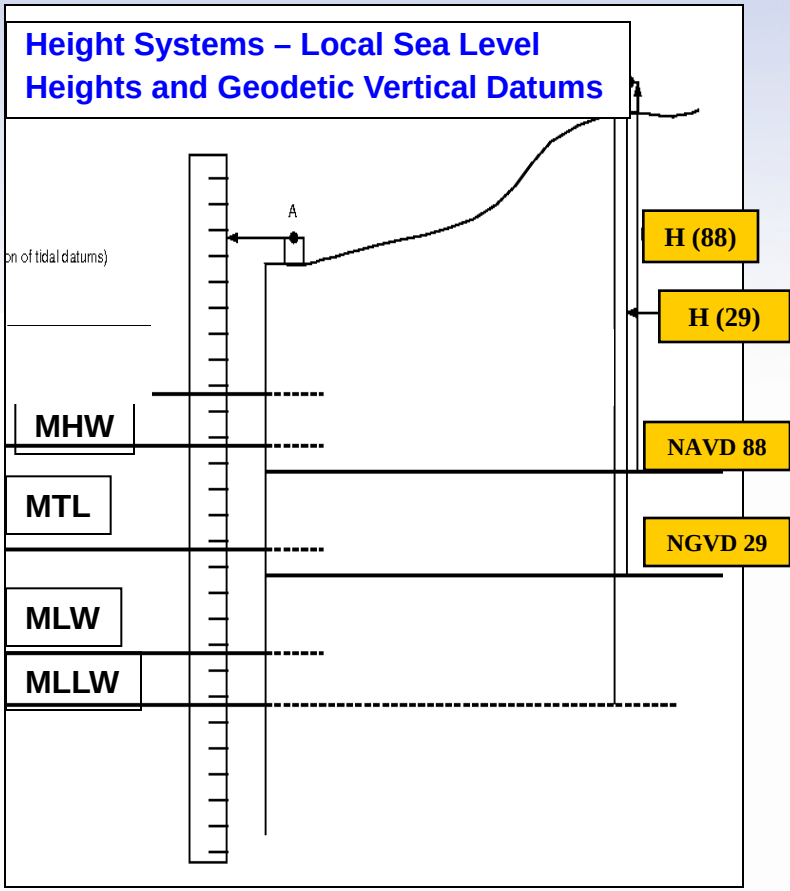
Slide by John Kosovich, USGS

NOAA uses USGS Stream Gages

Issues with USGS Stream Gage Data :

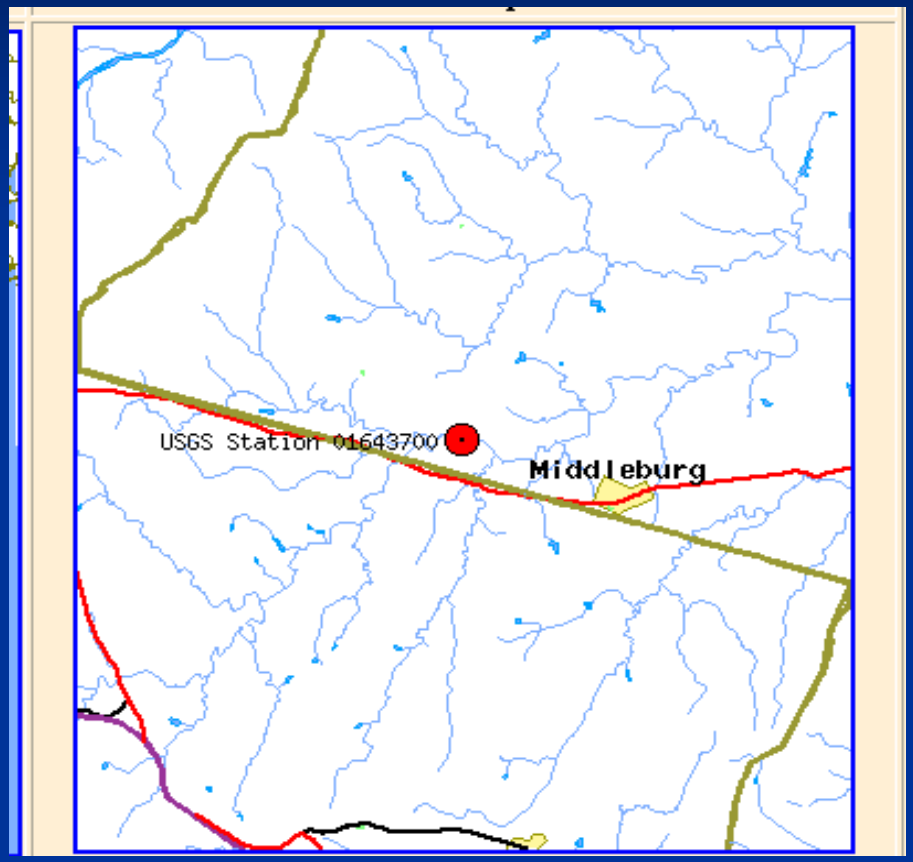
Data are sometimes not referenced to the official national vertical datum

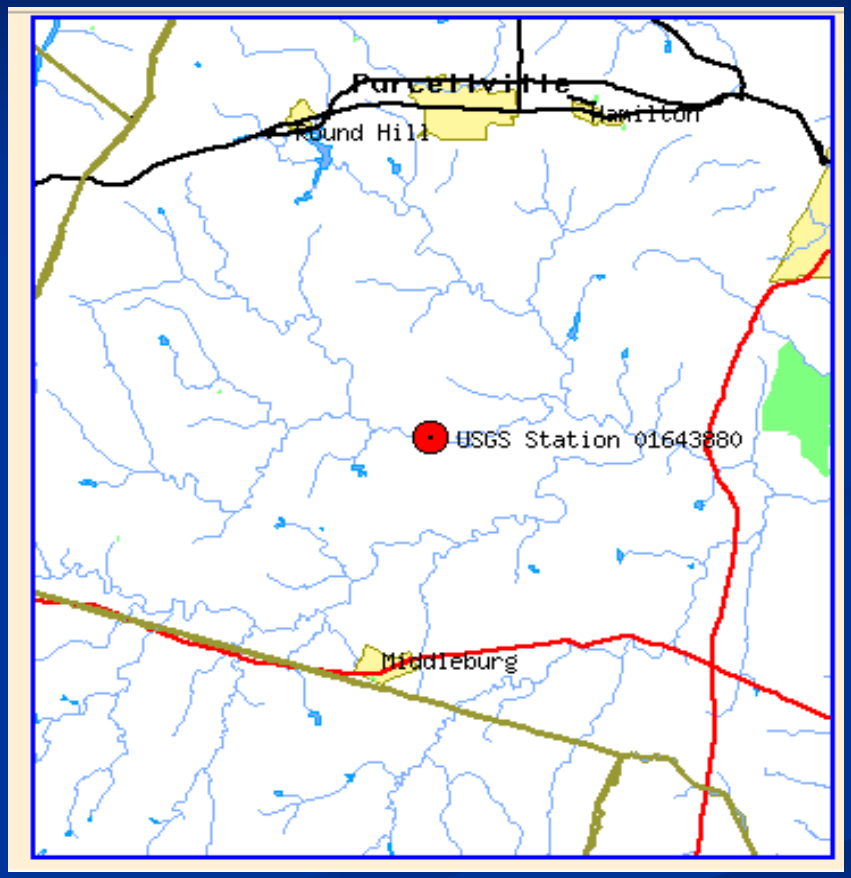




Gages can reference a local datum (even if decades old) **if** the proper conversion is used, **but** a conversion may not be readily available

Problem





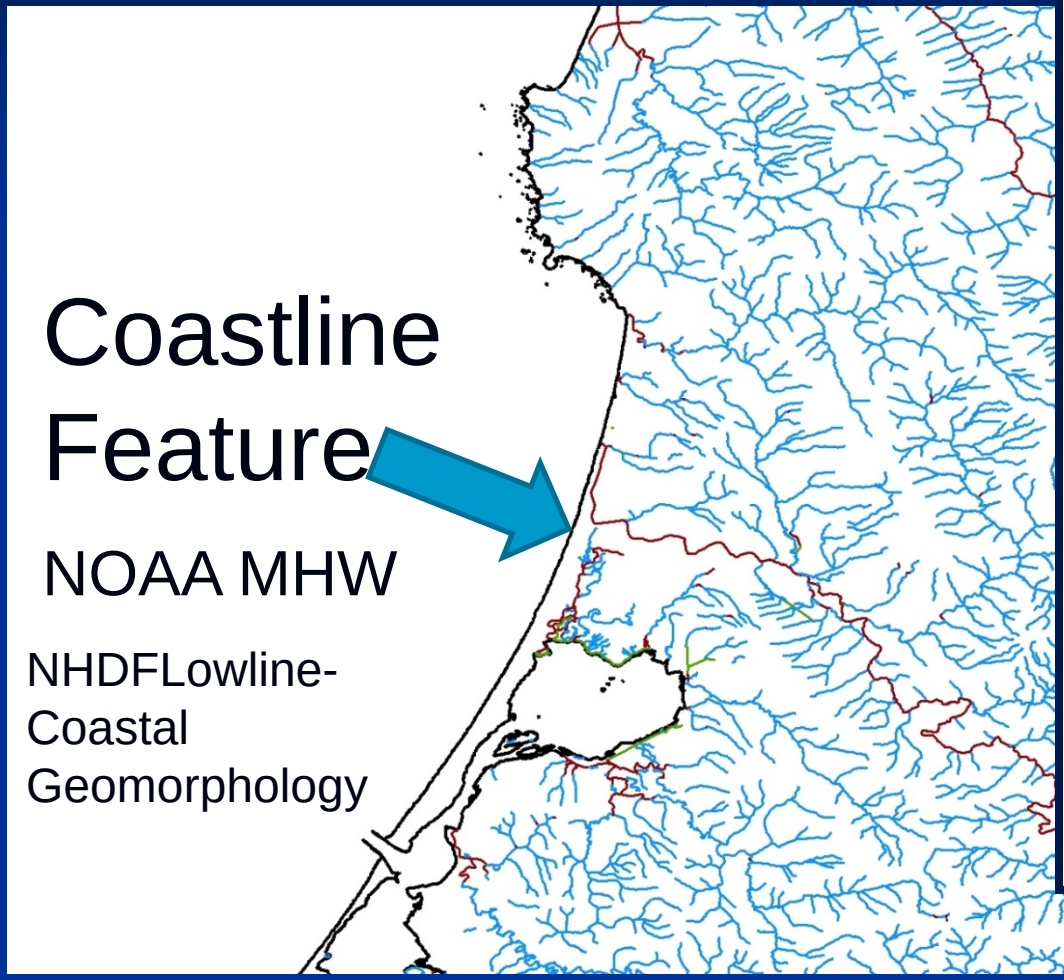
USGS

Wetland Surface Elevation Table Technology guidelines

Don Cahoon (USGS)
Jim Lynch (NPS)
Philippe Hensel (NOAA)

Definitive cross-agency NPS SOP on SET technology
site selection, installation, taking measurements, and analyzing data

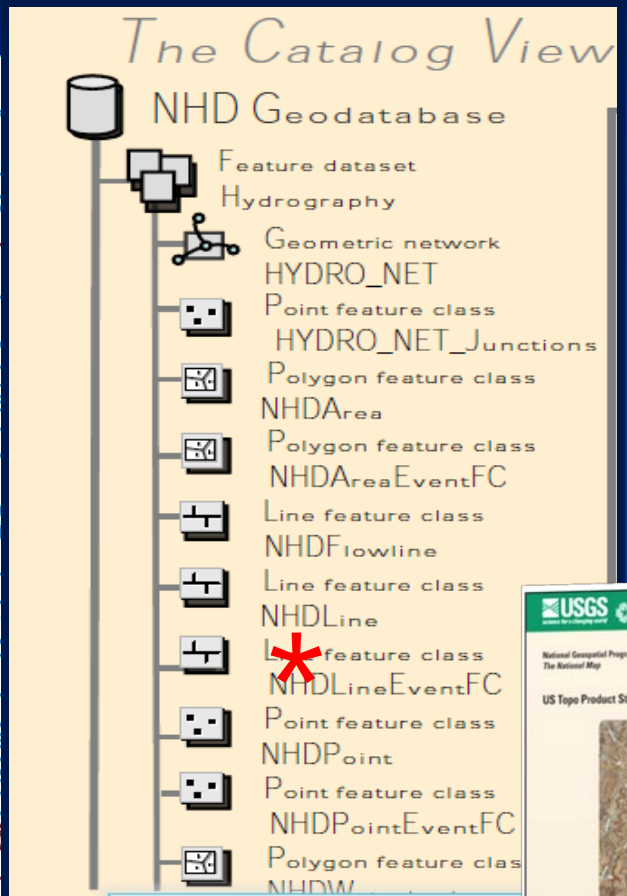
National Hydrography Dataset - NHD

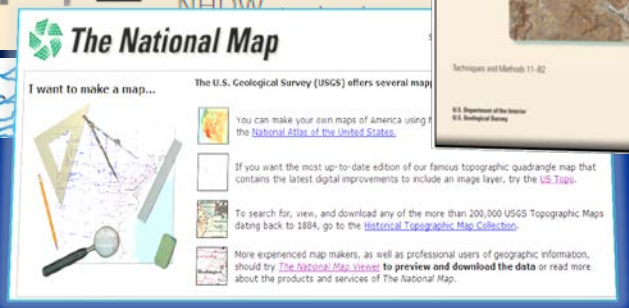


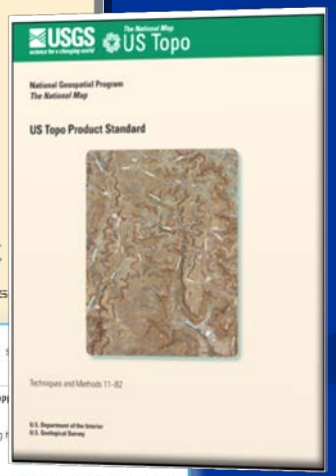
Coastline Feature

NOAA MHW

NHDFLowline-
Coastal
Geomorphology







USGS

Provided by Cynthia Miller-Corbett

National Enhanced Elevation Assessment

About the Project

Sponsor:

- National Digital Elevation Program (NDEP) member agencies

Funding Partners:

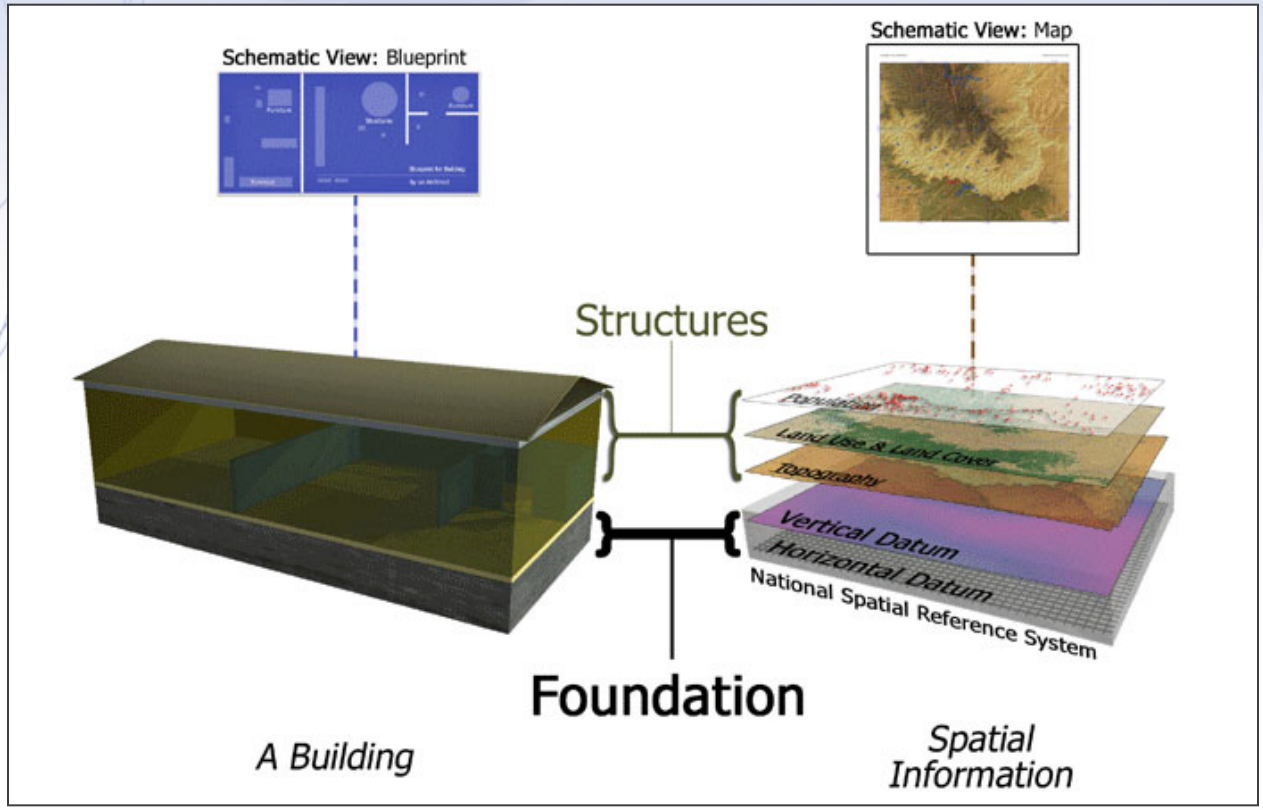
- U.S. Geological Survey (Managing Partner)
- National Geospatial-Intelligence Agency
- Federal Emergency Management Agency
- Natural Resources Conservation Service

In-kind Partners:

- National Oceanic and Atmospheric Administration
- Many Federal agencies, state agencies and other study participants

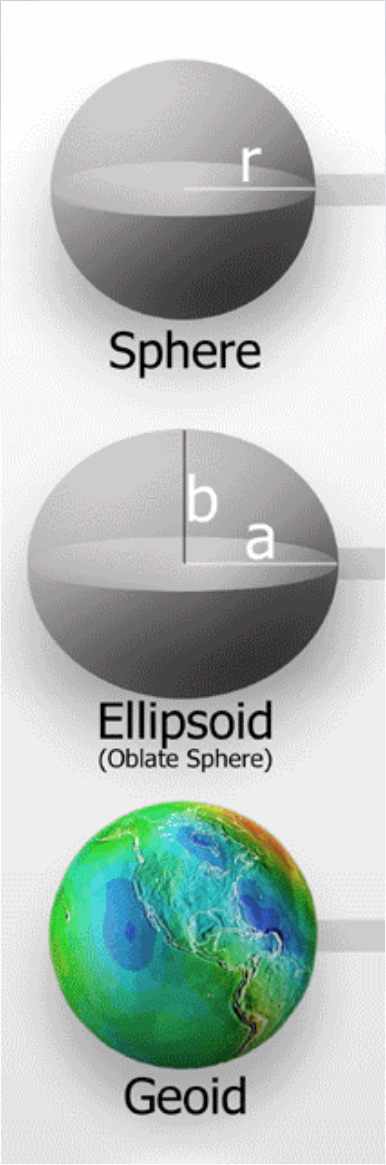
USGS

Datums



A mathematical and geometric concept that serves as a foundation or starting point for mapping, surveying, engineering based on realization of actual geospatial data points.

Geodetic Reference Surfaces



A beachball globe

Mathematical best fit to Earth's surface…

used for defining Latitude and Longitude

Modeled best fit to "sea surface"

equipotential gravity field

used for defining Elevation

Geodetic Datums

Horizontal

2-D (Latitude and Longitude) (e.g. NAD 27, NAD 83 (1986))

Vertical/Geopotential

1-D (Orthometric Height) (e.g. NGVD 29, NAVD 88, Local Tidal)

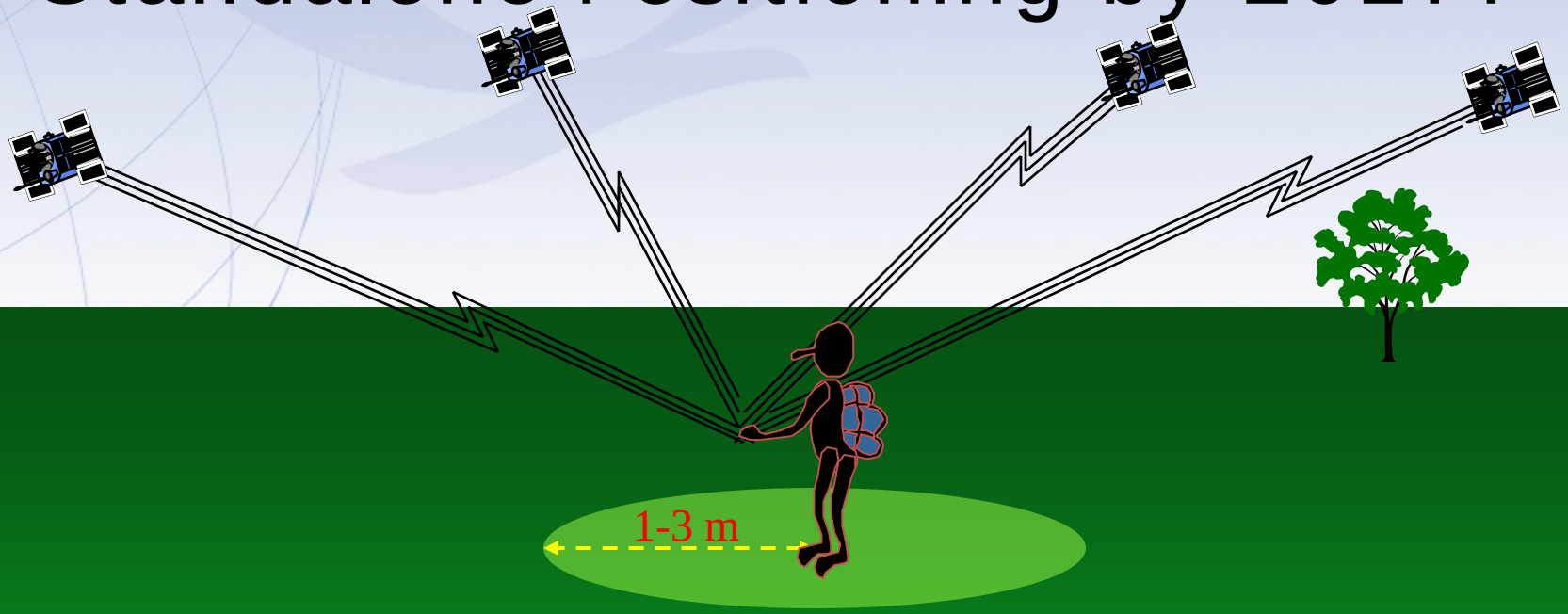
Geometric

3-D (Latitude, Longitude and Ellipsoid Height)
Fixed and Stable(?) - Coordinates seldom change
(e.g. NAD 83 (1993), NAD 83 (2007), NAD83 (2011))

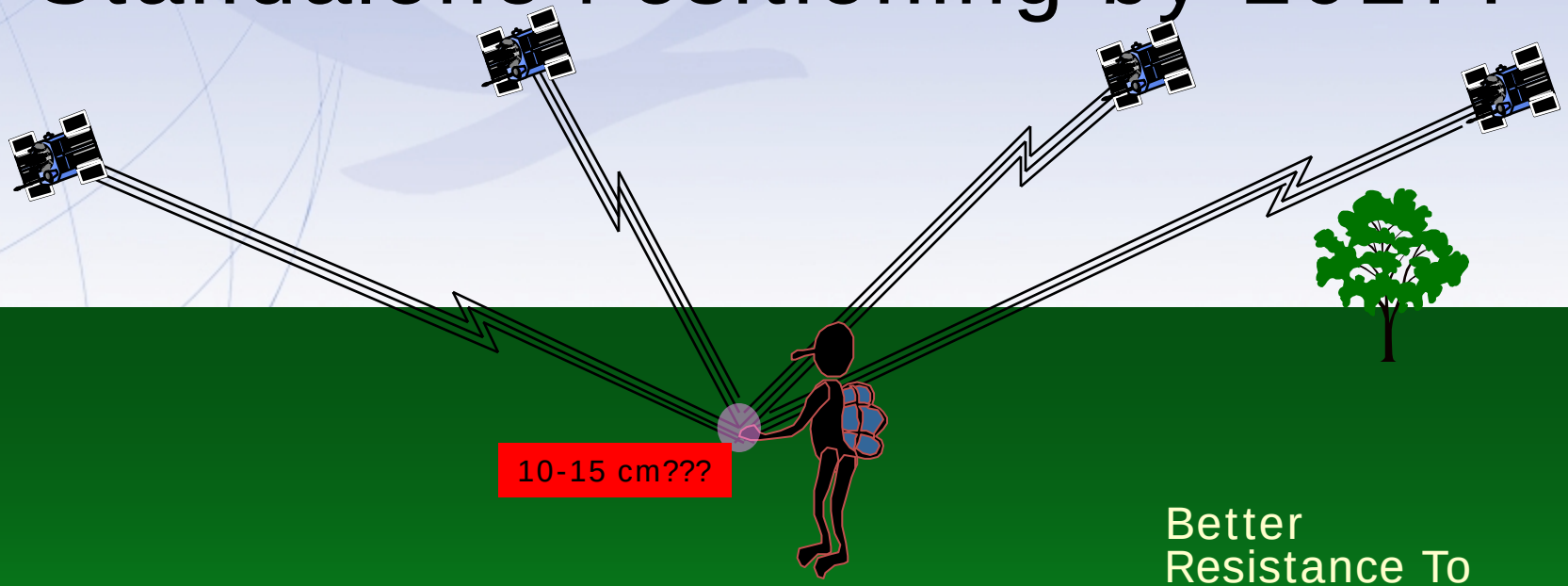
also

4-D (Latitude, Longitude, Ellipsoid Height, Velocities)
Coordinates change with time
(e.g. NAD 83, ITRF00, ITRF05)

Standalone Positioning by 2017?



Standalone Positioning by 2017?



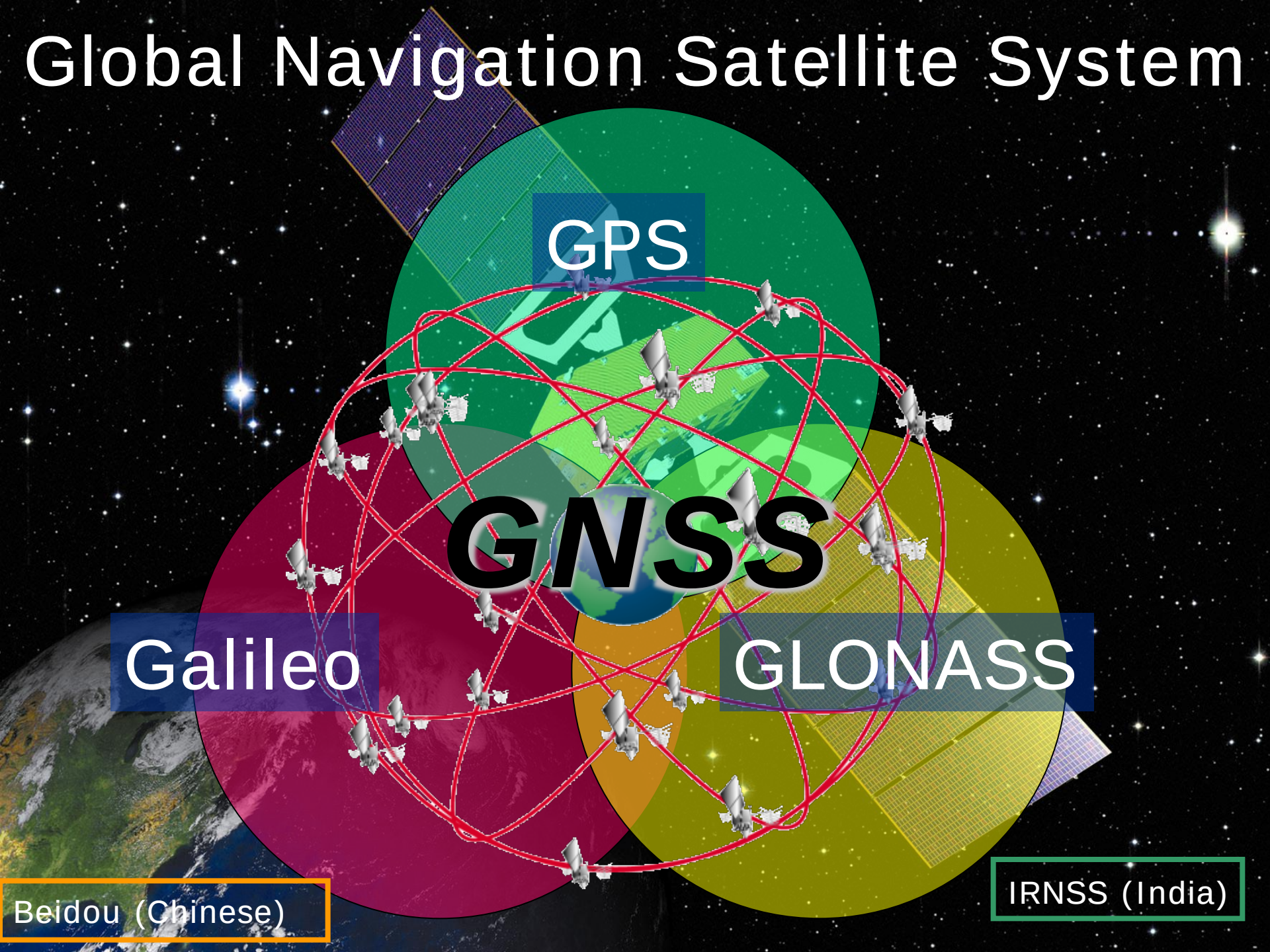
- C/A Code on L1
- C/A Code on L2
- New Code on L5

Better Resistance To Interference

Faster Ambiguity Resolution

GPS Modernization

Global Navigation Satellite System

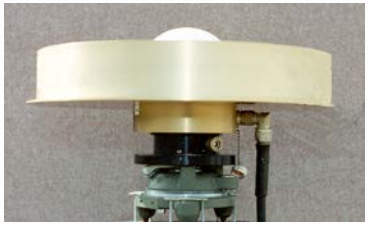


GPS Receiver Grades

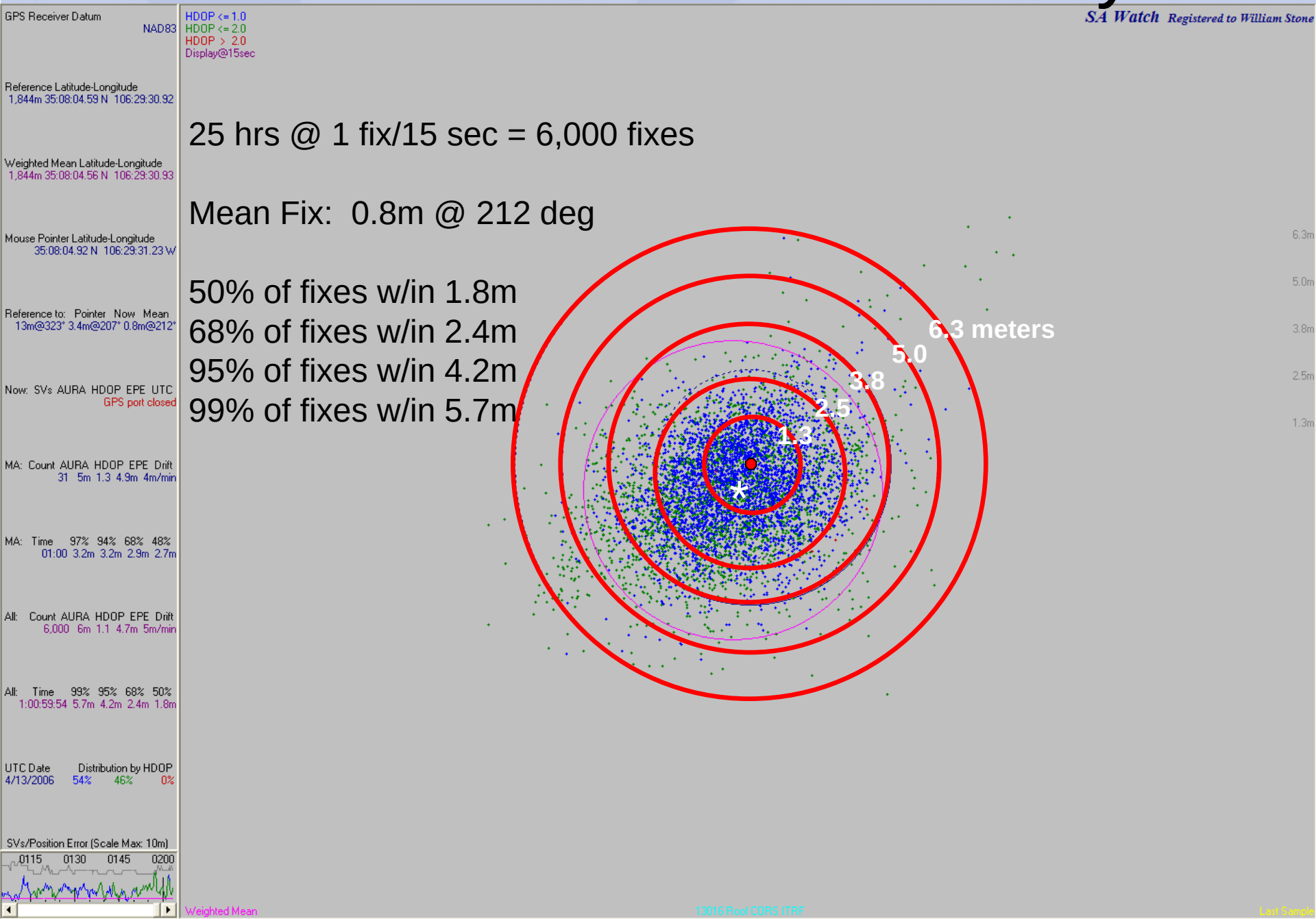
- Recreational Grade
  - $100-$1000 1-10 meters

- Mapping
  - $2,000-$6,000 submeter - 3 meter

- Survey Grade
  - $10,000 + 5mm – 2 cm



Autonomous GPS Accuracy



GPS Receiver Datum
NAD83

Reference Latitude-Longitude
1,844m 35:08:04.59 N 106:29:30.92

Weighted Mean Latitude-Longitude
1,844m 35:08:04.56 N 106:29:30.93

Mouse Pointer Latitude-Longitude
35:08:04.92 N 106:29:31.23 W

Reference to: Pointer Now Mean
13m@323° 3.4m@207° 0.8m@212°

Now: SVs AURA HDOP EPE UTC
GPS port closed

MA: Count AURA HDOP EPE Drift
31 5m 1.3 4.9m 4m/min

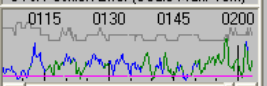
MA: Time 97% 94% 68% 48%
01:00 3.2m 3.2m 2.9m 2.7m

All: Count AURA HDOP EPE Drift
6,000 6m 1.1 4.7m 5m/min

All: Time 99% 95% 68% 50%
1:00:59:54 5.7m 4.2m 2.4m 1.8m

UTC Date Distribution by HDOP
4/13/2006 54% 46% 0%

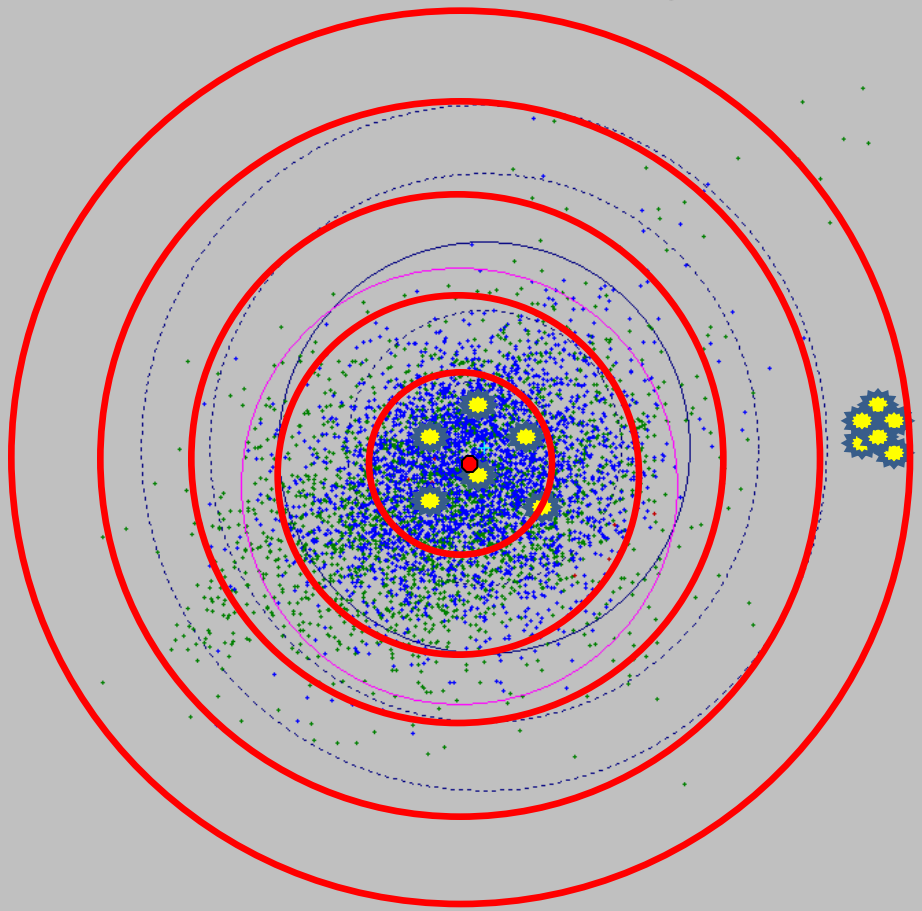
SVs/Position Error (Scale Max: 10m)



HDOP <= 1.0
HDOP <= 2.0
HDOP > 2.0
Display@15sec

SA Watch Registered to William Stone

Accuracy



6.3m
5.0m
3.8m
2.5m
1.3m

Precision

Weighted Mean

13016 Roof CORS ITRF

Last Sample

Same point

different datum's = different lat/long's

Historical Datums of the United States

Bessel Ellipsoid

New England Datum

U.S. Standard Datum

North American Datum

North American Datum of 1927

Puerto Rico Datum

Old Hawaiian Datum

American Samoa Datum 1962

Guam Datum 1963

Barter Island Datum

Camp Colonna Datum

Flaxman Island Datum

Golofnin Bay Datum

Kripniyuk Datum

Point Barrow Datum

Port Clarence Datum

SE Alaska Datum

St. George Island Datum

St. Lawrence Island Datum

St. Michael Datum

St. Paul Island Datum

Un Alaska Datum

Valdez Datum

Yakutat Datum

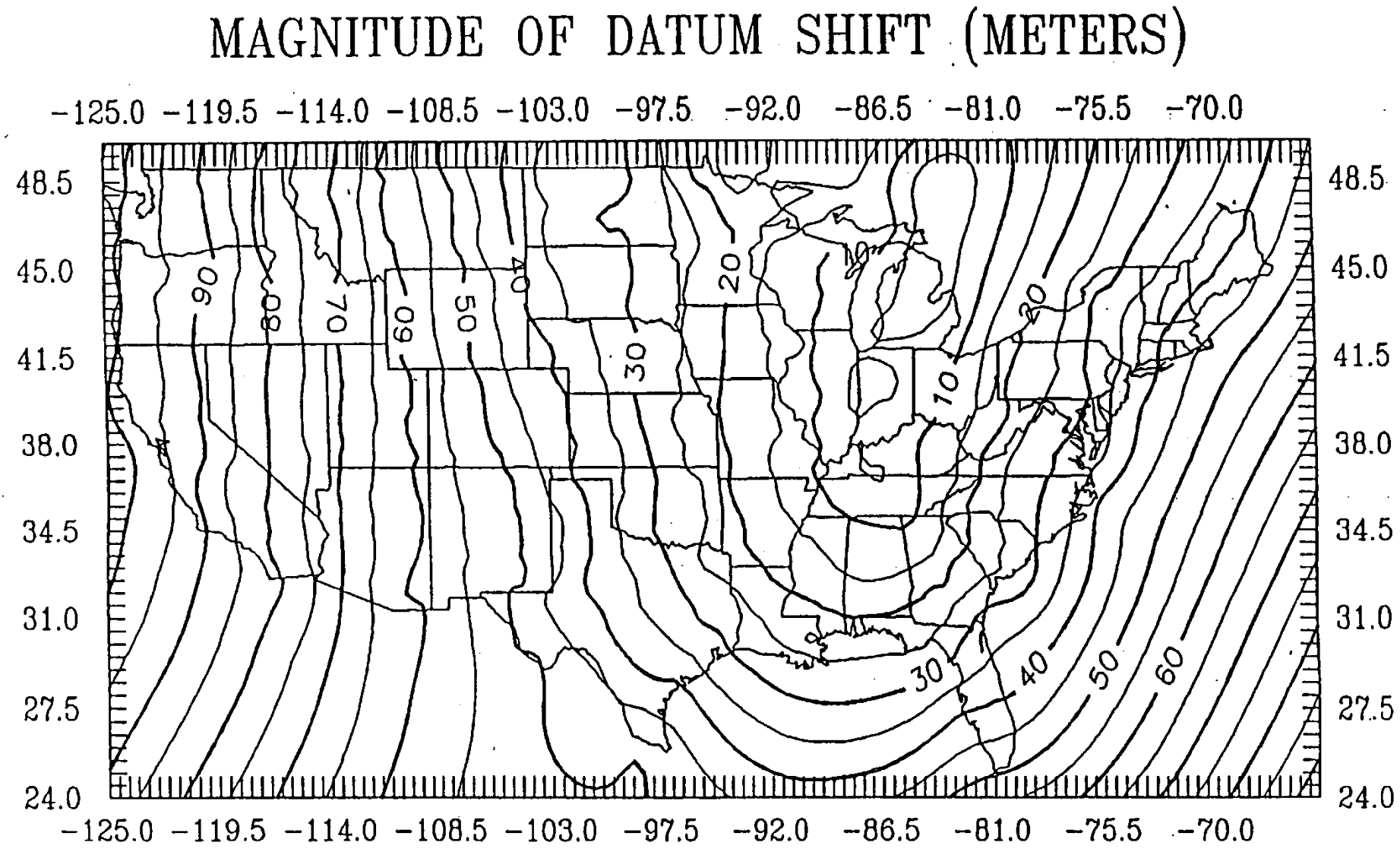
Yukon Datum

Johnson Island 1961

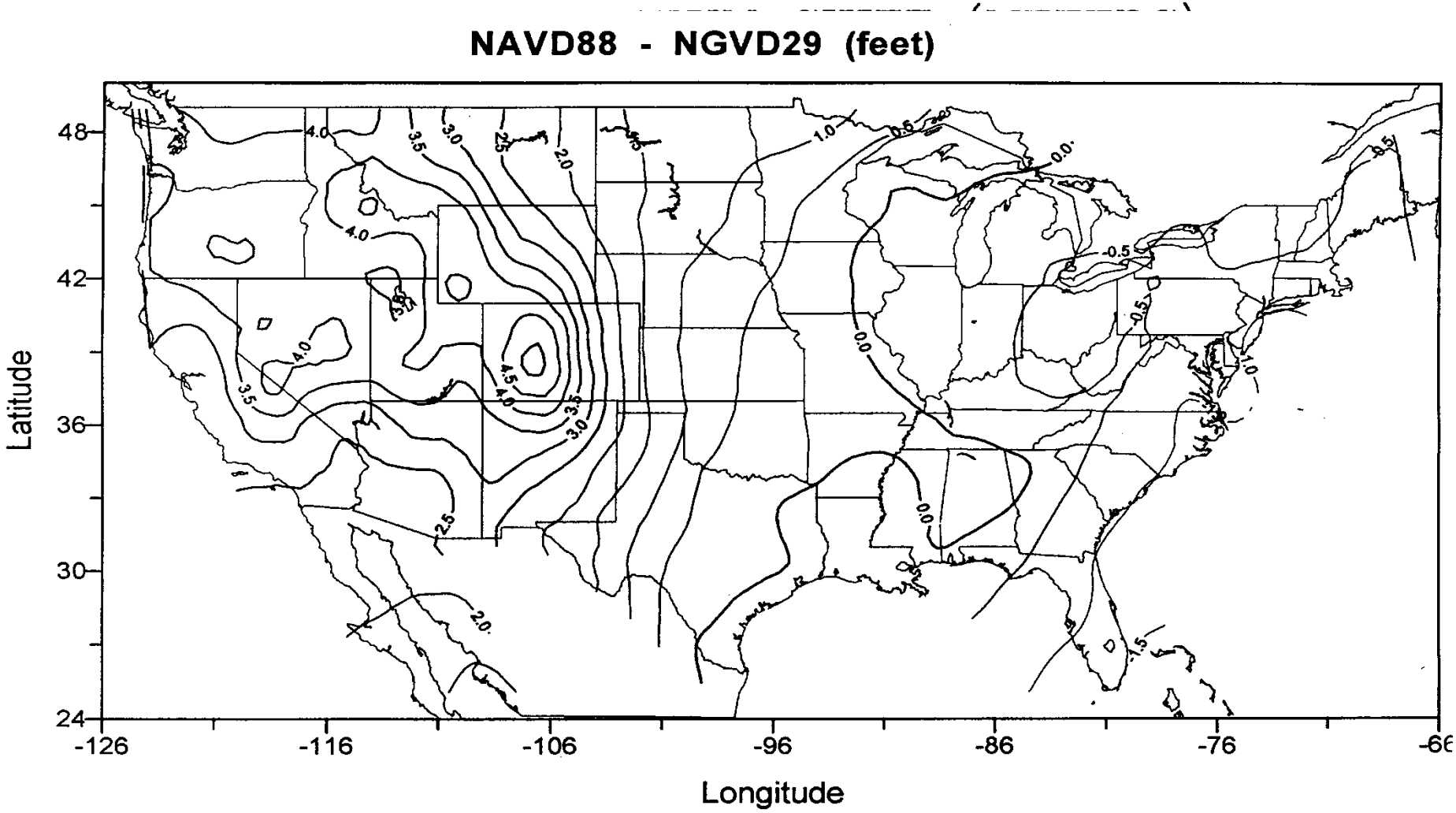
Midway Astro 1961

Wake Island Astro 1952

Datum Differences
NAD 27 – NAD 83



Datum Difference
NGVD 29 – NAVD 88



Datum Differences On Average in COLORADO		
DRAFT		
	Meters	Feet
Horizontal		
NAD 27-NAD 83	40-57	131-187
NAD 83 (1986) - HARN	0.2-0.6	0.66-1.97
HARN - NAD 83 (2007)	0.02	0.06
NAD 83 (2007) - NAD 83 (2011)	0.02-0.04	0.06-0.13
NAD 83 (2011) - New Datum (2022)	1.3 - 1.4	4.3 - 4.6
DRAFT		
Vertical		
Orthometric Heights		
NGVD 29- NAVD 88	0.46 - 1.5	1.5 - 5.0
NAVD 88 - New Datum (2022)	0.5 - 0.75	1.6 - 2.5
DRAFT		
NAVD 88- NAD 83 ellipsoidal height	18	60
DRAFT		
Geoid Models		
Geoid 96 - Geoid 99		
Geoid 99 - Geoid 03	0.02-1.3	0.06-4.3
Geoid 03 - Geoid 09	-0.05-(+)0.05	-0.16-(+) 0.16
Geoid 09- Geoid 12		

Are NAD 83 & WGS 84 The Same?

NO

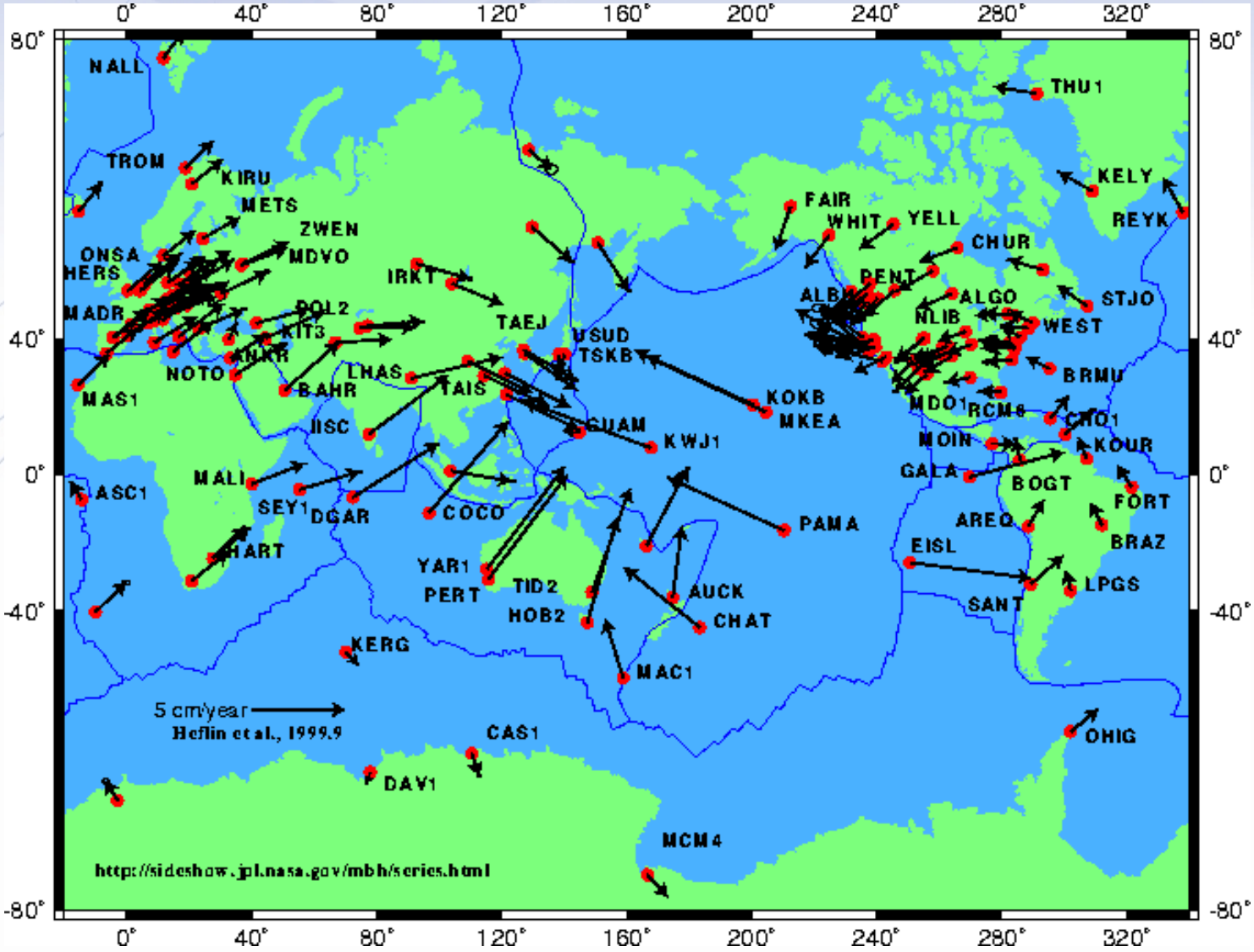
but for your application is it significant?

If requirements are *greater* than 3m then *Yes*

If requirements are *less* than 3m then *No*

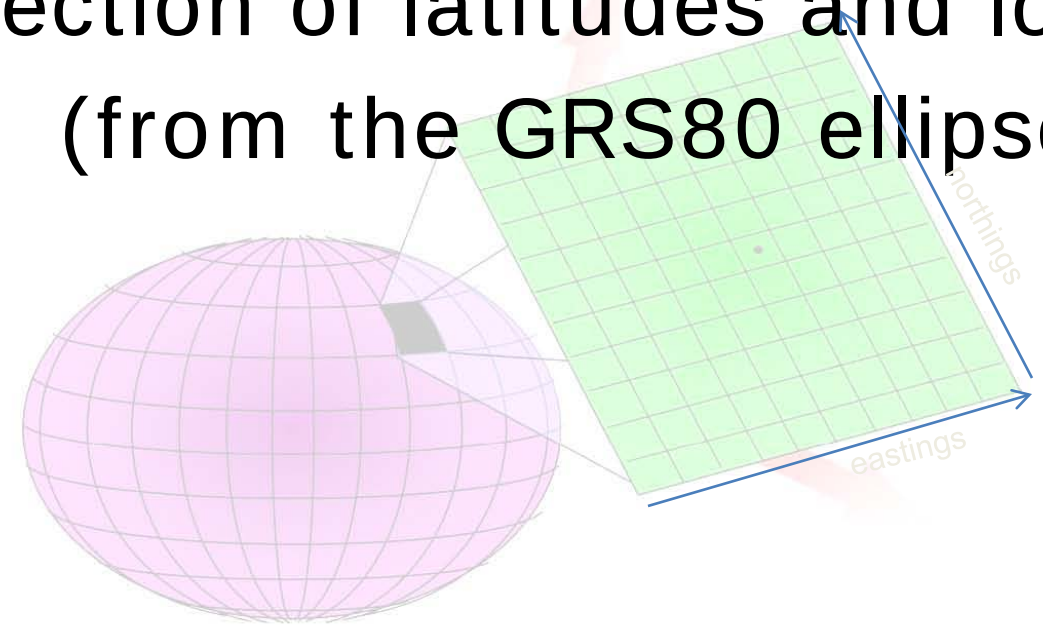
Federal Register Notice: Vol. 60, No. 157, August 15, 1995, pg. 42146
"Use of NAD 83/WGS 84 Datum Tag on Mapping Products"

Tectonic Motions



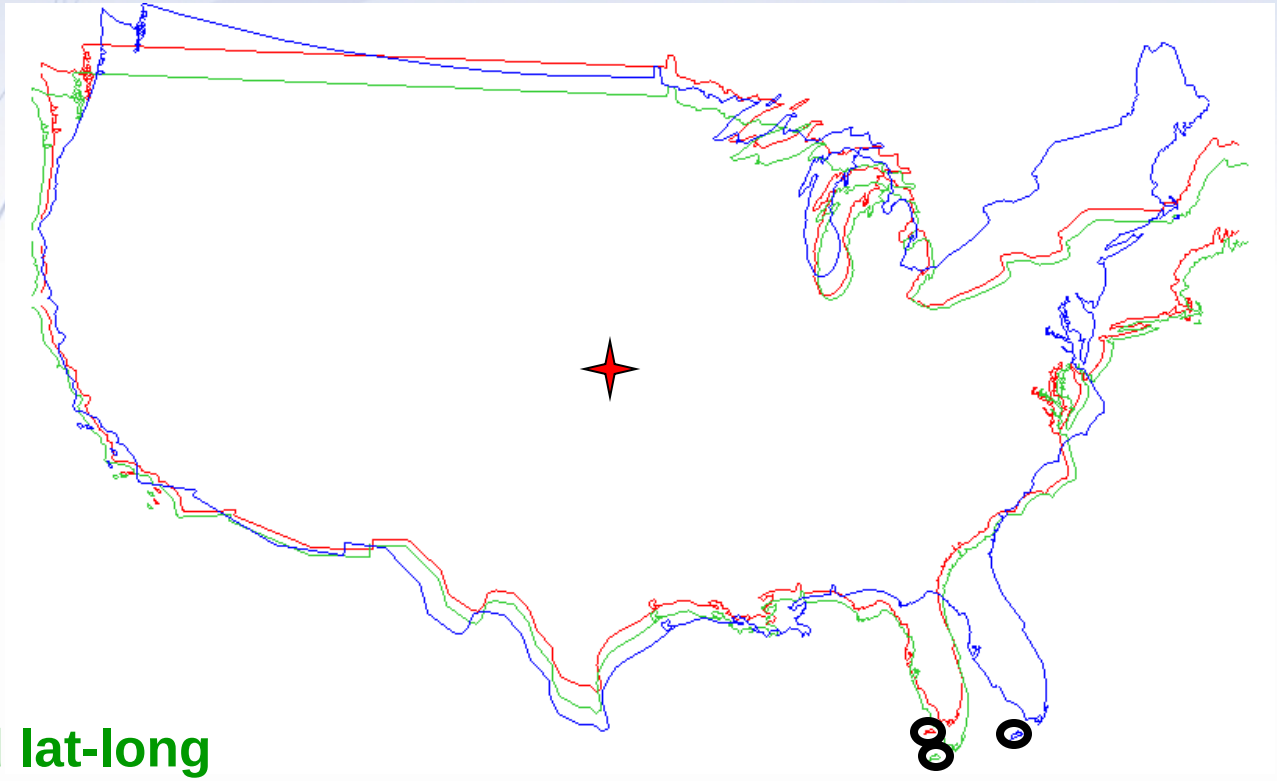
State Plane Coordinates

State plane coordinates are the projection of latitudes and longitudes (from the GRS80 ellipsoid)



To a flat mapping surface that is usually defined by state law

Three projections centered at 39° N, 96 ° W



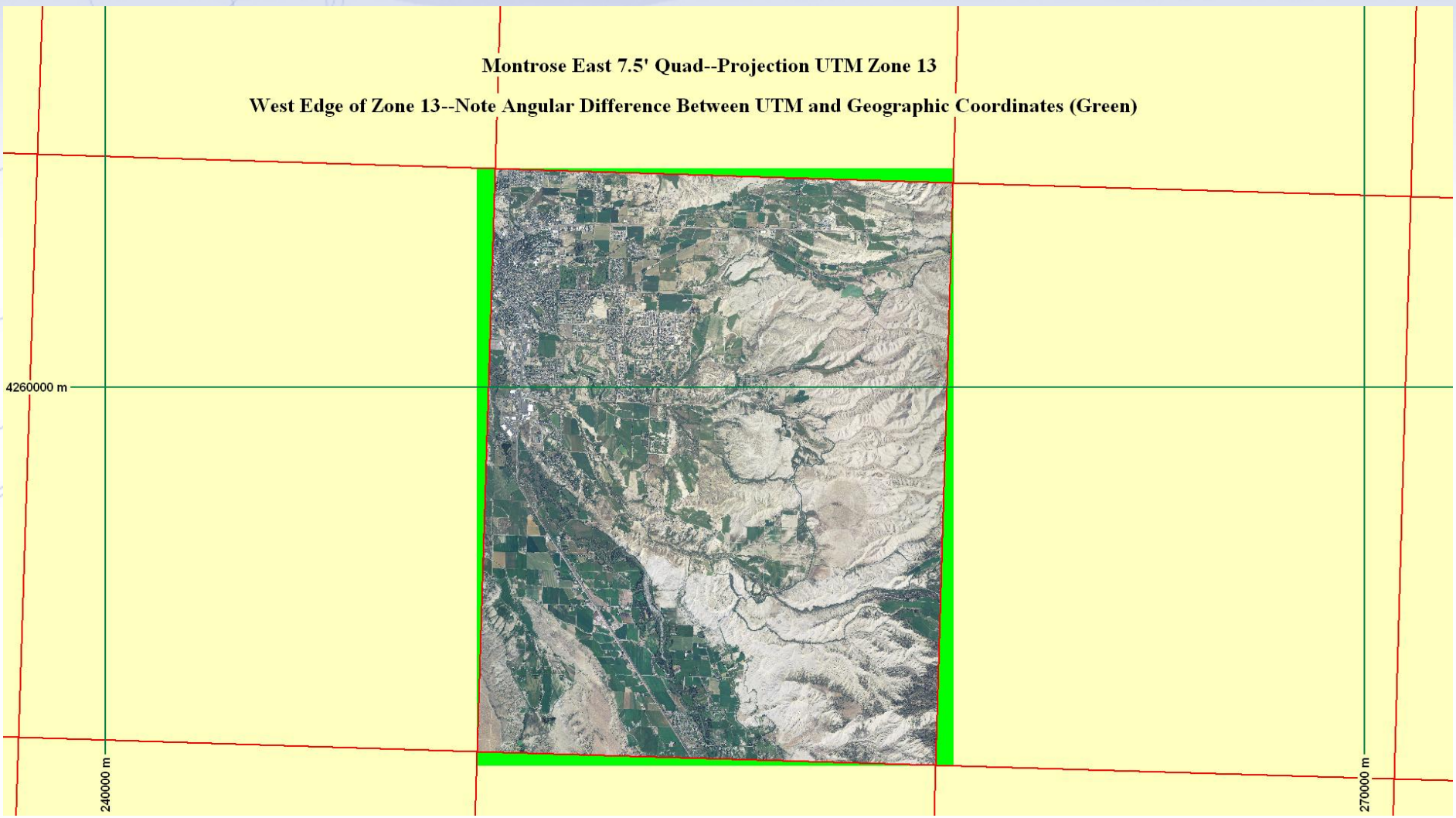
Unprojected lat-long

Lambert Conformal Conic

Mercator

What is the x,y of Key West, FL?

UTM
Grid to Ground Differences



Provided by Dale Benson

Plane Coordinate Conversion Tools

State Plane Coordinates

GPPCGP (NAD 27 only)

SPCS83 (NAD 83 only)

http://www.ngs.noaa.gov/TOOLS/spc.shtml

UTM

UTMS (Both NAD 27 & NAD 83)

http://www.ngs.noaa.gov/TOOLS/utm.shtml

Both

CORPSCON (Both NAD 27 & NAD 83)

http://crunch.tec.army.mil/software/corpscon/corpscon.html

www.ngs.noaa.gov

www.geodesy.noaa.gov

www.ngs.noaa.gov

National Geodetic Survey

Positioning America for the Future

NGS Home | About NGS | Data & Imagery | Tools | Surveys | Science & Education | Search

June 18, 2012

Announcements

Trial Version of the New NGS Map Tool is now Available:
http://beta.ngs.noaa.gov/googletest/NGSMap/NGSMap.shtml

2012 Geospatial Summit
NOAA's National Geodetic Survey (NGS) will host the second **Geospatial Summit on Improvements to the National Spatial Reference System** at the Survey Summit and Esri User Conference in San Diego, California in July 2012...more

NGS recently released a new web utility titled "Leveling Online Computations User Service" (LOCUS)
The purpose of LOCUS is to do a preliminary adjustment of geodetic leveling...more

Notice: The updates to NGS Datasheet Format are now in effect as of 5/01/2012
In response to stakeholder and NGS staff concerns, NGS has developed several modifications to the format of the NGS datasheet—the primary method for accessing the passive control network of the National Spatial Reference System (NSRS)...more

NGS Announces New Photo Submission Guidelines:
http://geodesy.noaa.gov/web/surveys/photo_submissions/

NGS Releases Final Report for Floodplain Mapping Pilot Project
As NGS moves closer to 2022 and replacing the North American Datum of 1983 (NAD 83) and the North American Vertical Datum of 1988 (NAVD 88), NGS is interacting closely with agencies that use the datums to assist in the transition...more

Trial Version of the New NOAA Shoreline Data Explorer Available:
http://beta.ngs.noaa.gov/shoreline_raster

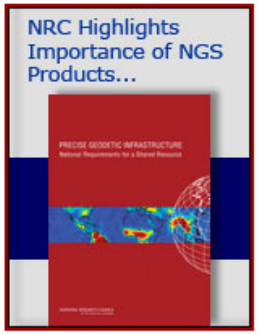
A 2009 independent study shows the benefits to the U.S. economy from NOAA's positioning products and services are in the billions of dollars.
Click here for a one page overview of the study
Click here for a copy of the full report

In The News

Most Popular

- Contact Us
- CORS
- Survey Mark Datasheets
- Geodetic Tool Kit
- NA2011
- OPUS
- LOCUS
- Publications
- Geodetic Advisors
- Storm Imagery
- UFCORS

Upcoming Events



www.geodesy.noaa.gov

Height Modernization

Height Modernization
-faster
-cheaper

Differential Leveling (Orthometric HT)

GNSS (Ellipsoid Ht)

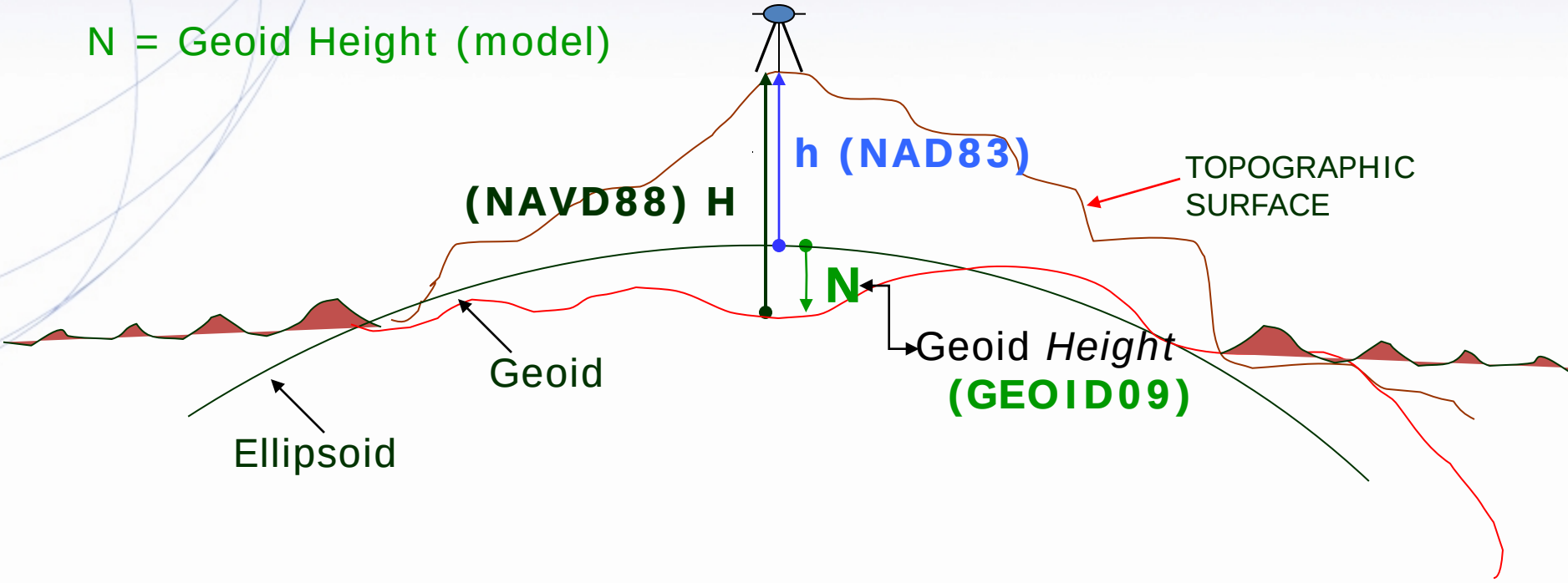
Ellipsoid, Geoid, and Orthometric Heights

H = Orthometric Height (leveling)

h = Ellipsoidal Height (GPS)

N = Geoid Height (model)

$$H = h - N$$



Ellipsoid, Geoid, and Orthometric Heights

H = Orthometric Height (leveling)

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N = Geoid Height (model)

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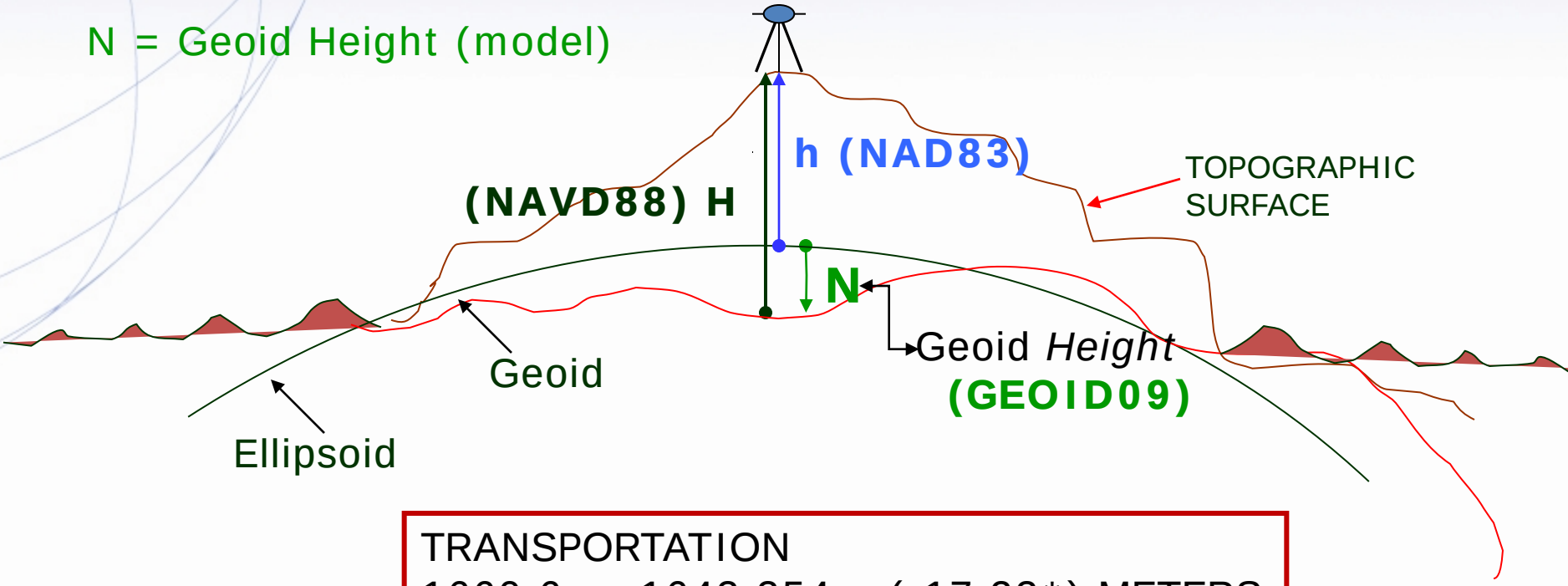
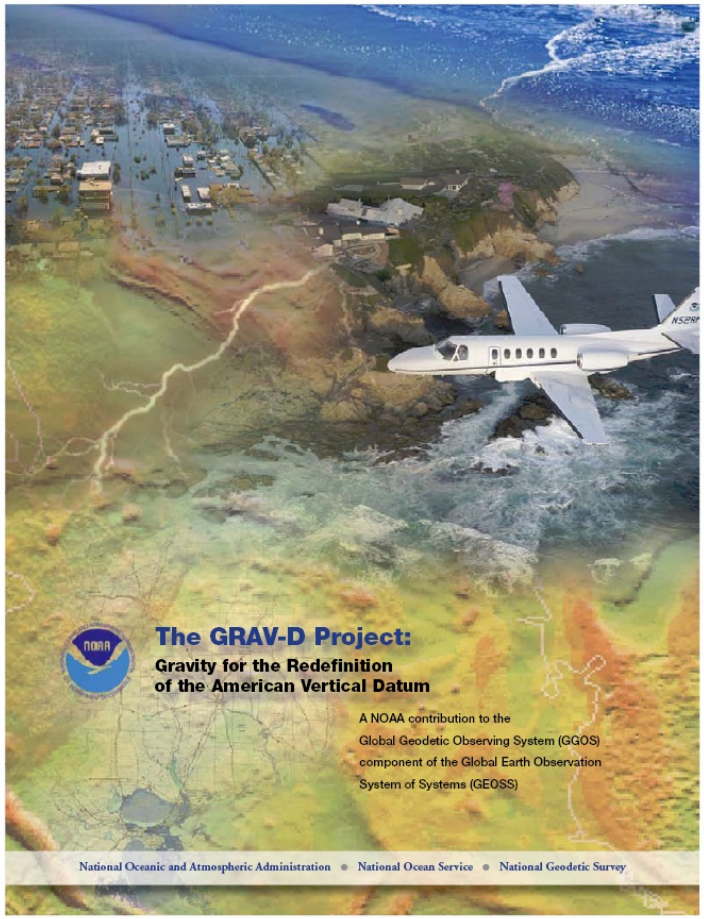


TRANSPORTATION
1660.6 = 1643.354 – (-17.23*) METERS
1660.6 = 1643.4 + 17.2

*56.53 feet

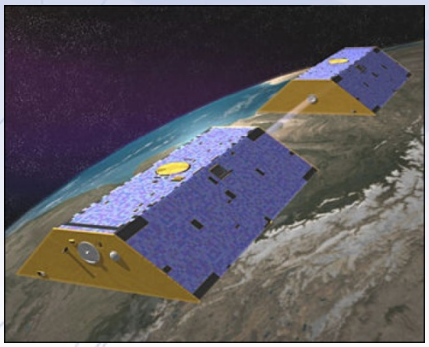
Gravity for the Redefinition of the American Vertical Datum (GRAV-D)



Gravity *and* ***Heights*** *are inseparably connected*

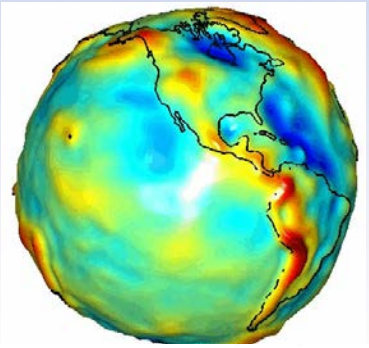
- Replace the Vertical Datum of the USA by 2022 (at today's funding) with a **gravimetric geoid accurate to 1 cm**
- Orthometric heights accessed via GNSS accurate to 2 cm
- Three components of project:
  - Airborne gravity survey of entire country and its holdings
  - Long-term monitoring of geoid change
  - Partnership surveys
- Working to launch a collaborative effort with the USGS for simultaneous magnetic measurement

Building a Gravity Field



GRACE and GOCE (not shown)

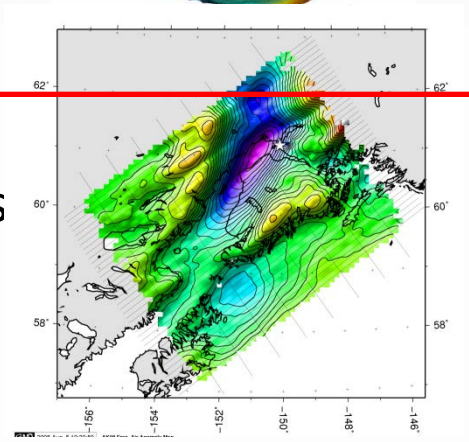
Long Wavelengths:
(≥ 350 km)



+

Airborne Measurement

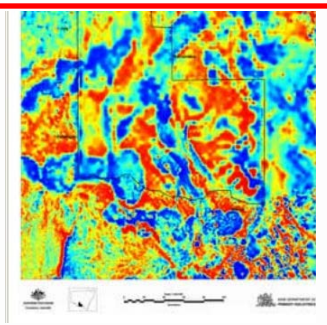
Intermediate Wavelengths
(500 km to 20 km)



+

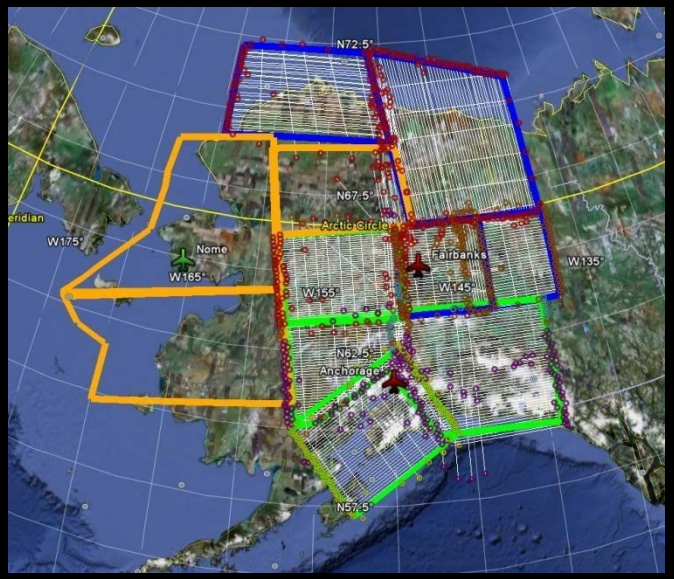
Surface Measurement

Short Wavelengths
(< 100 km)



GRAV-D Update

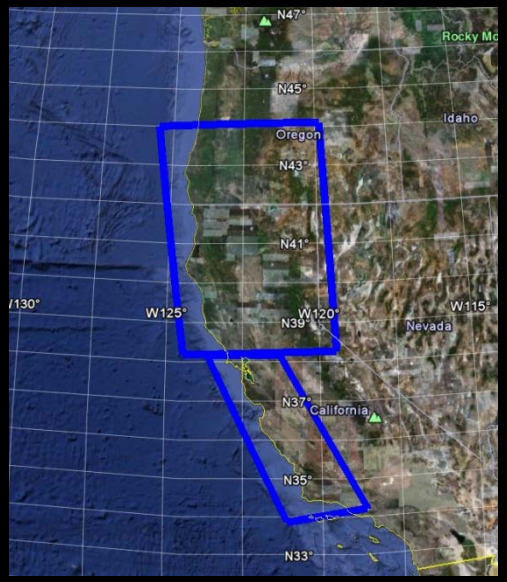
Alaska FY10-13



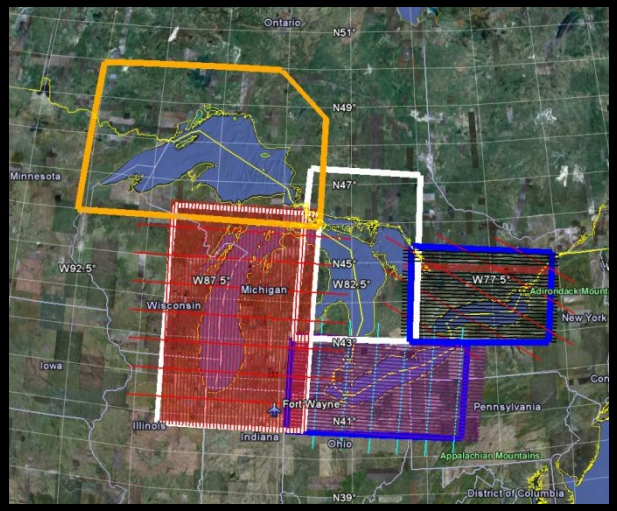
15.6% of total area is surveyed (as of 11-23-11)

FY10 = Green
FY11 = Blue
FY12 = Orange
FY13 = White

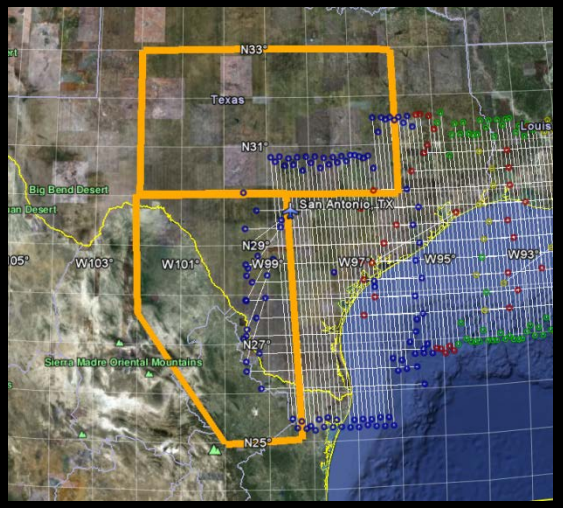
West Coast FY11



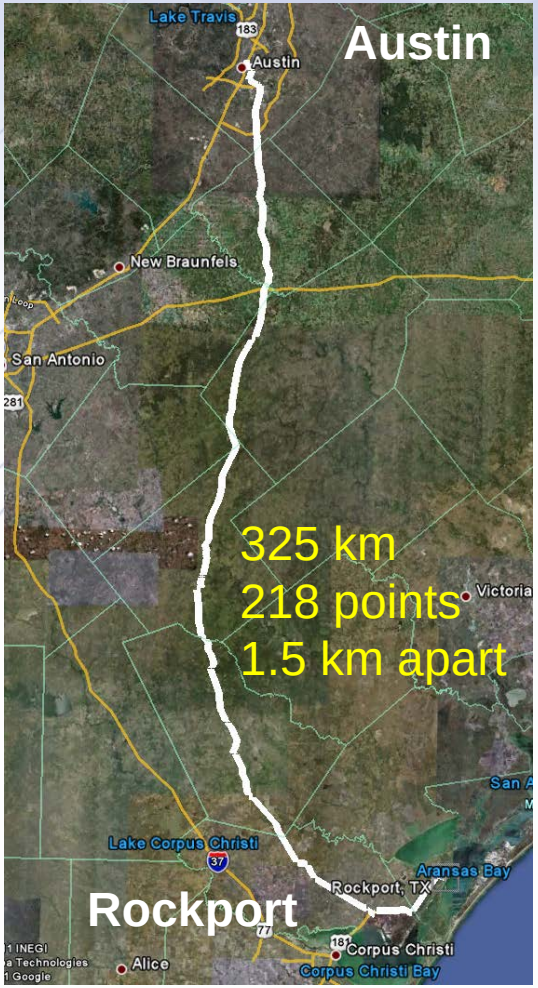
Great Lakes FY11-13



FY12 Texas



Geoid Slope Validation Survey



- Observe geoid shape (slope) using multiple independent terrestrial survey methods
  - GPS + Leveling
  - Deflections of the Vertical
- Compare ***observed*** slopes (from terrestrial surveys) to ***modeled*** slopes (from gravimetry or satellites)
  - With/without new GRAV-D airborne gravity

Geoid Slope Validation Project Components

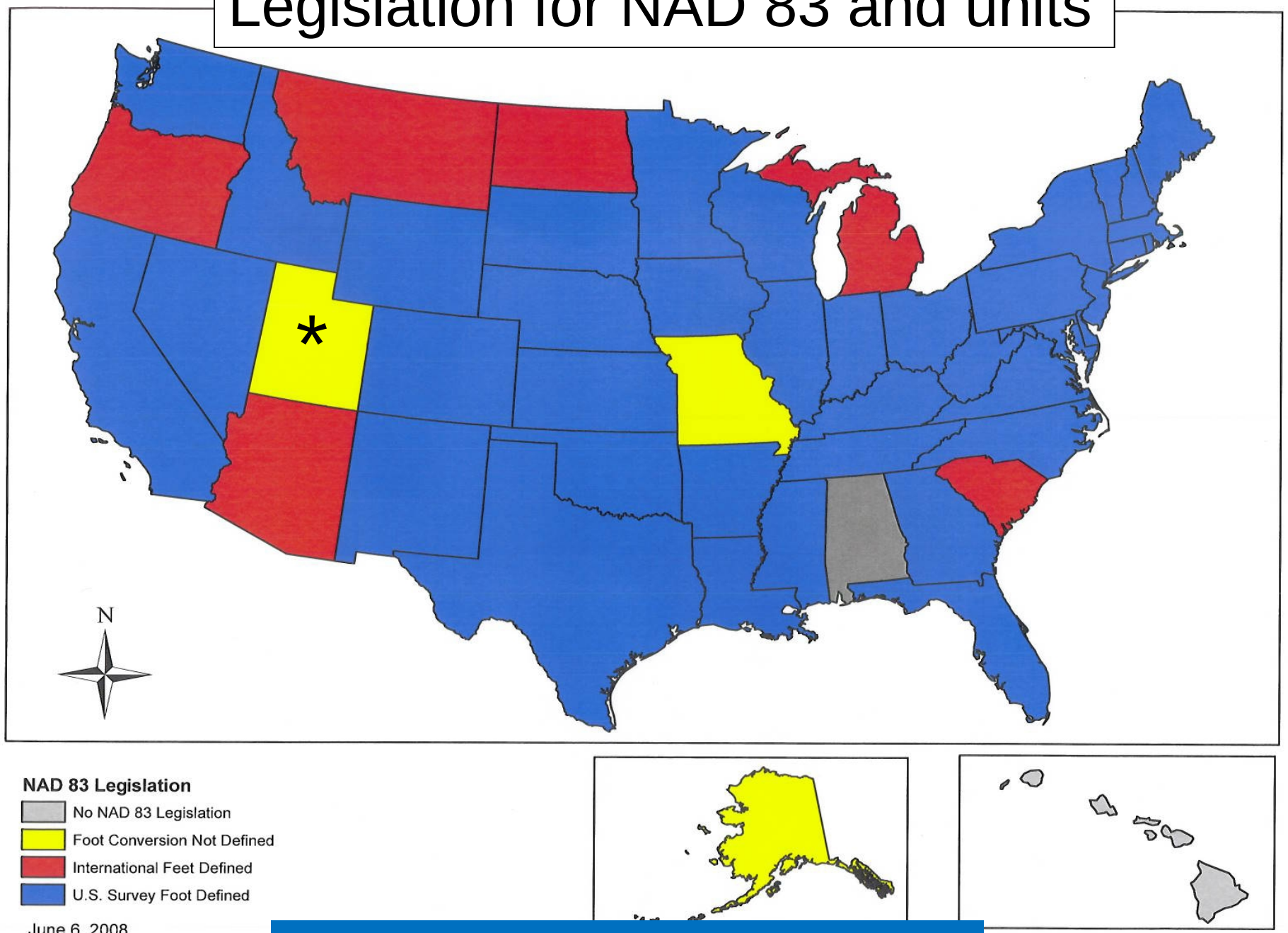
- Differential Leveling
- Campaign GPS
- RTN-based GPS
- Absolute Gravity
- Gravity Gradients
- Deflections of the Vertical
- Airborne LIDAR
- Airborne Imagery

Metadata

For instance:

- ✓ What is the Source of the Data?
- ✓ What is the Datum/Adjustment Epoch?
- ✓ What is the projection?
- ✓ What are the units?
- ✓ Is it decimal degree or decimal, minutes, seconds?
- ✓ What are the Field Conditions?
- ✓ What Equipment was used, especially what Antenna?
- ✓ What firmware was in the receiver and collector?
- ✓ What redundancy, if any, was used?

Legislation for NAD 83 and units

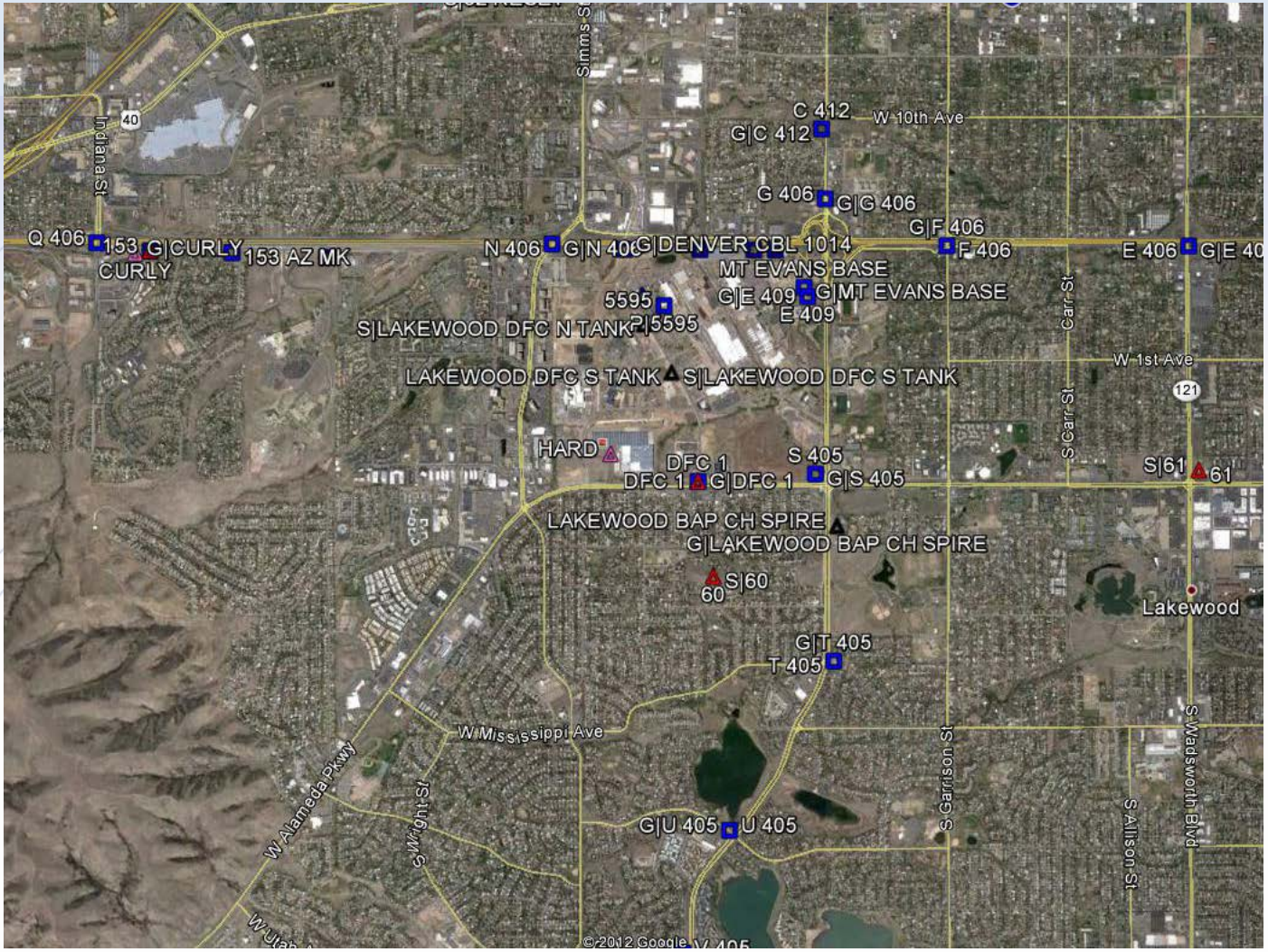


*Utah is now a U.S. Survey Foot State(Blue)

"DSWorld" Software Program

- Highly rated new NGS software tool
- Developed to search the NGS database
- Easy to learn/use
- Multiple search options available
- Displays search results using Google Earth

Geodetic Control

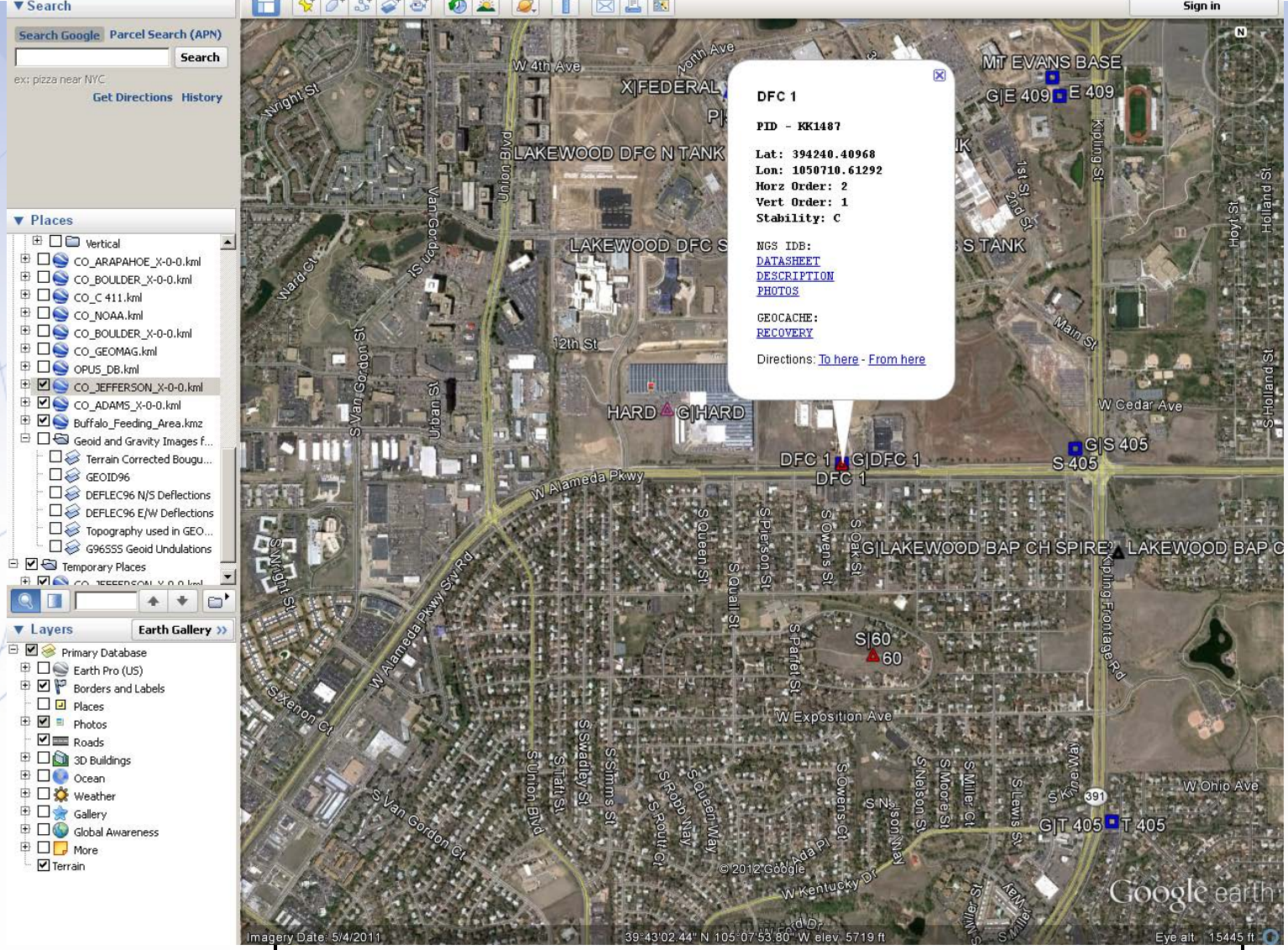


Triangles – Horizontal Control

Squares – Vertical Control

Blue – First Order

Red – Second Order



Datasheets Recovery

Photos Directions

Descriptions

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DATABASE = NGSIDB , PROGRAM = datasheet95, VERSION = 7.88.3
1         National Geodetic Survey,   Retrieval Date = JUNE 19, 2012
 KK1487 ***********************************************************************
 KK1487  DESIGNATION -  DFC 1
 KK1487  PID         -  KK1487
 KK1487  STATE/COUNTY-  CO/JEFFERSON
 KK1487  COUNTRY     -  US
 KK1487  USGS QUAD   -  FORT LOGAN (1994)
 KK1487
 KK1487                        *CURRENT SURVEY CONTROL
 KK1487
 KK1487* NAD 83(1992) POSITION- 39 42 40.40968(N) 105 07 10.61292(W)    ADJUSTED
 KK1487* NAVD 88 ORTHO HEIGHT -  1723.435  (meters)     5654.30  (feet) ADJUSTED
 KK1487
 KK1487  LAPLACE CORR    -        -15.94  (seconds)                      DEFLEC09
 KK1487  GEOID HEIGHT    -        -16.30  (meters)                       GEOID09
 KK1487  DYNAMIC HEIGHT  -       1721.732 (meters)     5648.72  (feet) COMP
 KK1487  MODELED GRAVITY -    979,577.8   (mgal)                        NAVD 88
 KK1487
 KK1487  HORZ ORDER      -  SECOND
 KK1487  VERT ORDER      -  FIRST     CLASS II
 KK1487
 KK1487 The horizontal coordinates were established by classical geodetic methods
 KK1487 and adjusted by the National Geodetic Survey in January 1993.
 KK1487.
 KK1487.The orthometric height was determined by differential leveling and
 KK1487.adjusted in June 1991.
 KK1487
 KK1487.Photographs are available for this station.
 KK1487
 KK1487.The Laplace correction was computed from DEFLEC09 derived deflections.
 KK1487
 KK1487.The dynamic height is computed by dividing the NAVD 88
 KK1487.geopotential number by the normal gravity value computed on the
 KK1487.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
 KK1487.degrees latitude (g = 980.6199 gals.).
 KK1487
 KK1487.The modeled gravity was interpolated from observed gravity values.
 KK1487
 KK1487. The following values were computed from the NAD 83(1992) position.
 KK1487
 KK1487;                    North         East      Units Scale Factor Converg.
 KK1487;SPC CO C      -   513,335.126   947,020.476   MT  0.99999256   +0 14 23.7
 KK1487;SPC CO C      -  1,684,166.99  3,107,016.35   sFT 0.99999256   +0 14 23.7
```

```
DATABASE = NGSIDB , PROGRAM = datasheet95, VERSION = 7.88.3
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```

CORS

National Geodetic Survey

Data & Imagery | Tools | Surveys | Science & Education

Sampling Rate (clickable legend icons)

Non-Operational

250 km radius

1 sec | 5 sec | 10 sec | 15 sec | 30 sec | All Active | Decom


Laramie
Cheyenne
Sidney
Ashley
National Forest
Roosevelt
National Forest
Fort Collins
Sterling
Greeley
Boulder
Brighton
Denver
Ken Caryl
Parker
Colorado
Gunnison
National Forest
Colorado
Springs
Canon City
Pueblo
Blanding
San Juan
National Forest
Cortez
Durango
Trinidad
Shiprock
Bloomfield
Farmington
Carson
National Forest
Comanche
National
Grassland

OPUS
Online Positioning User Service

- OPUS – S (2 hrs)
- OPUS – RS (15 minutes)
- OPUS – DB (Publish)
- OPUS – Projects (Network)

NGS Data Sheets

Traditional blue booking

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SE =  ,PROGRAM = datasheet, VERSION = 7.86
   National Geodetic Survey,   Retrieval Date = APRIL 20, 2011
4 ***********************************************************************
4  DESIGNATION -  C 281
4  PID         -  DO0454
4  STATE/COUNTY-  TX/THROCKMORTON
4  USGS QUAD   -  THROCKMORTON NE (1965)
4
4                      *CURRENT SURVEY CONTROL
4 ______________________________________________________________________
4* NAD 83(2007)-  33 11 10.75472(N)     099 06 11.86433(W)      NO CHECK
4* NAVD 88      -       383.465  (meters)     1258.08   (feet)  ADJUSTED
4 ______________________________________________________________________
4  EPOCH DATE  -        2002.00
4  X           -    -845,419.278 (meters)                      COMP
4  Y           -  -5,276,185.563 (meters)                      COMP
4  Z           -   3,471,464.429 (meters)                      COMP
4  LAPLACE CORR-          0.24  (seconds)                     DEFLEC09
4  ELLIP HEIGHT-        353.943 (meters)          (02/10/07) NO CHECK
4  GEOID HEIGHT-        -28.98  (meters)                     GEOID09
4  DYNAMIC HT  -        383.004 (meters)    1256.57  (feet)  COMP
4
4  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
4  Type     PID    Designation                      North    East   Ellip
4  ----------------------------------------------------------------------
4  NETWORK DO0454 C 281                             1.10    1.47    2.14
4  ----------------------------------------------------------------------
4  MODELED GRAV-     979,426.2   (mgal)                       NAVD 88
4
4  VERT ORDER  -  SECOND    CLASS 0
4
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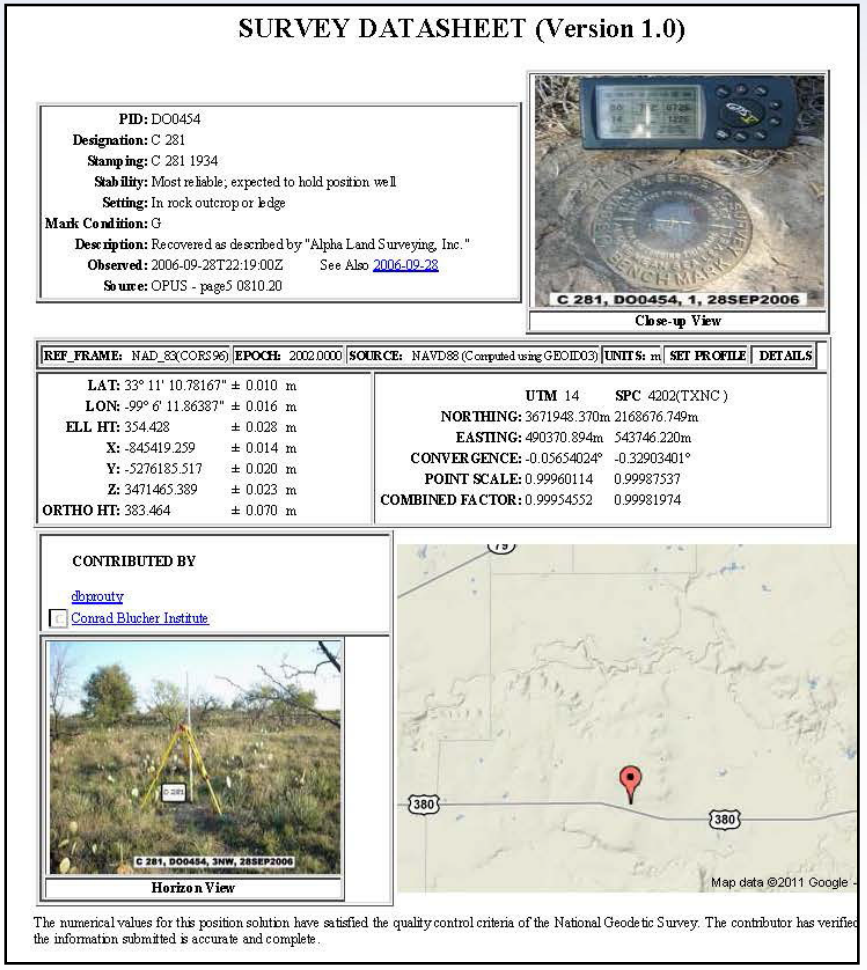
New OPUS-DB



OPUS Submission Webpage

OPUS: the Online Positioning User Service, process your GNSS data in the National Spatial Refer - Windows Internet Explorer

http://www.ngs.noaa.gov/OPUS/

File Edit View Favorites Tools Help

OPUS: the Online Positioning User Service, process yo...

OPUS: Online Positioning User Service

National Geodetic Survey

NGS Home | About NGS | Data & Imagery | Tools | Surveys | Science & Education | Search

OPUS Menu

- Upload
- About OPUS
- Published Solutions
- Contact OPUS

Upload your data file.

Tie your GPS observation to the National Spatial Reference System.
What is OPUS? FAQs

* Email address - your solution will be sent here.

Your email address

Browse...

* Data file of dual-frequency GPS observations. sample

Location of your data file

Sample Solutions

NONE no antenna selected

Antenna type - choosing wrong may degrade your accuracy.

Your antenna type

0.0 meters above your mark.
Antenna height of your antenna's reference point.

Antenna height

Options to customize your solution.

Customize your solution - details on next slide

Upload to Rapid-Static
for data > 15 min. < 2 hrs.

Upload to Static
for data > 2 hrs. < 48 hrs.

* required fields

Internet 100%

start 10:45 AM

Introducing…
NAD 83(2011) epoch 2010.00

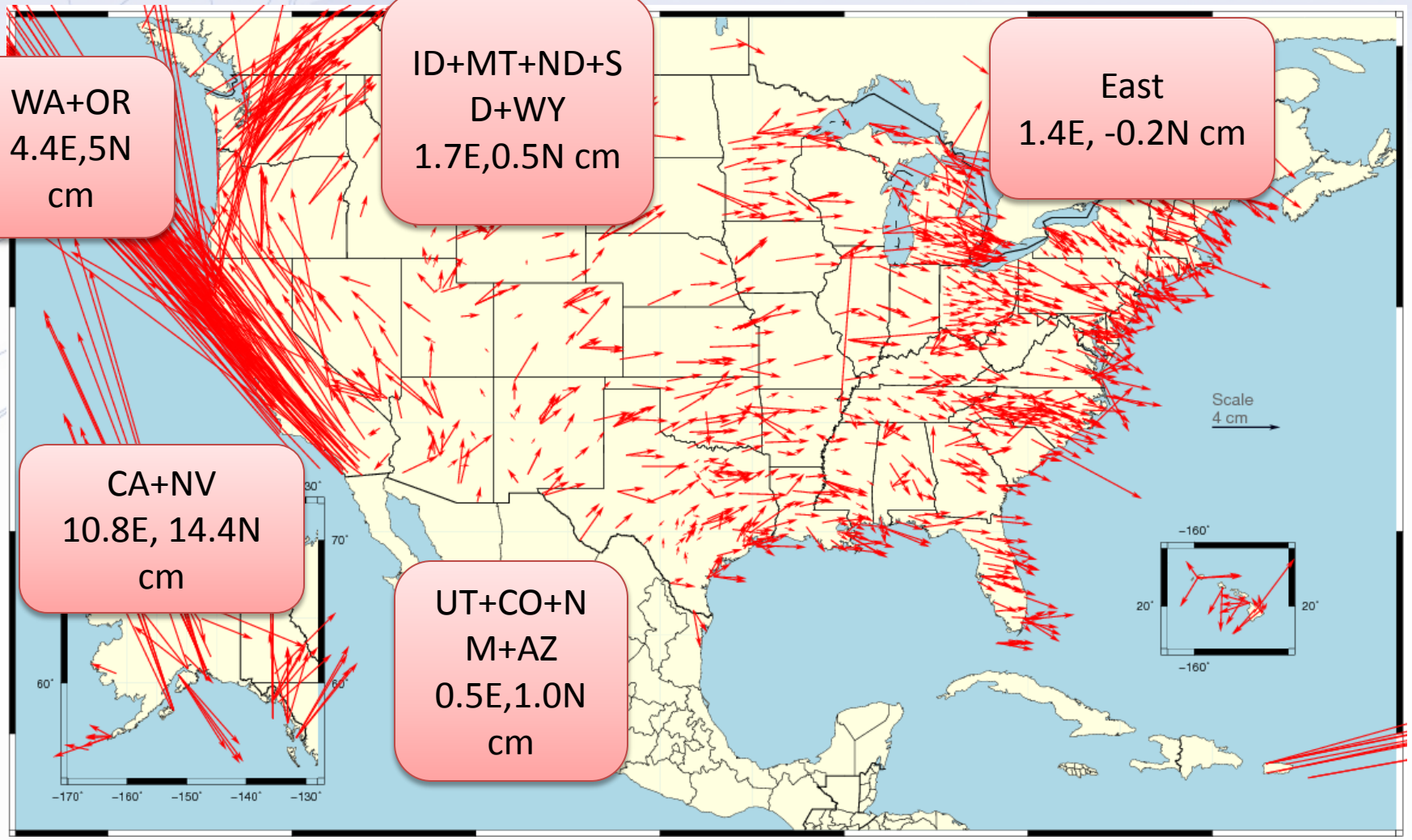
- **Multi-Year CORS Solution (MYCS)**
  - Reprocessed all CORS GPS data Jan 1994-Apr 2011
  - 2264 CORS & global stations
  - NAD 83 computed by *transformation* from IGS08

- **National Adjustment of 2011 (NA2011)**
  - New adjustment of GNSS passive control
  - GNSS vectors tied (and constrained) to CORS NAD 83(2011) epoch 2010.00
  - Approximately 80,000 stations and more than 400,000 GNSS vectors

Changes in *Horizontal* NAD 83 Positions

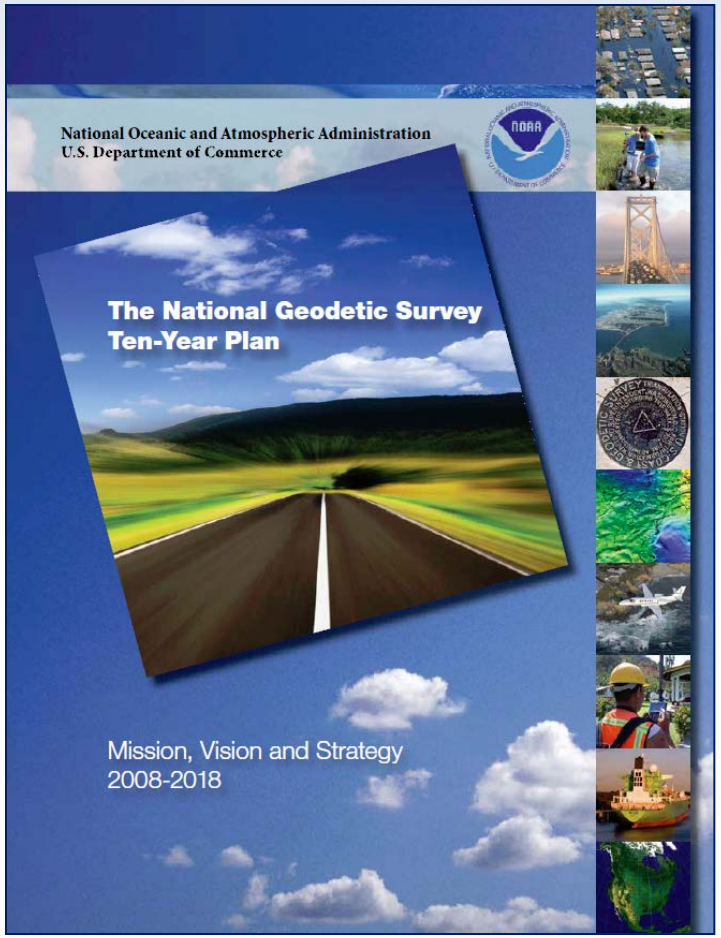
Different Epochs

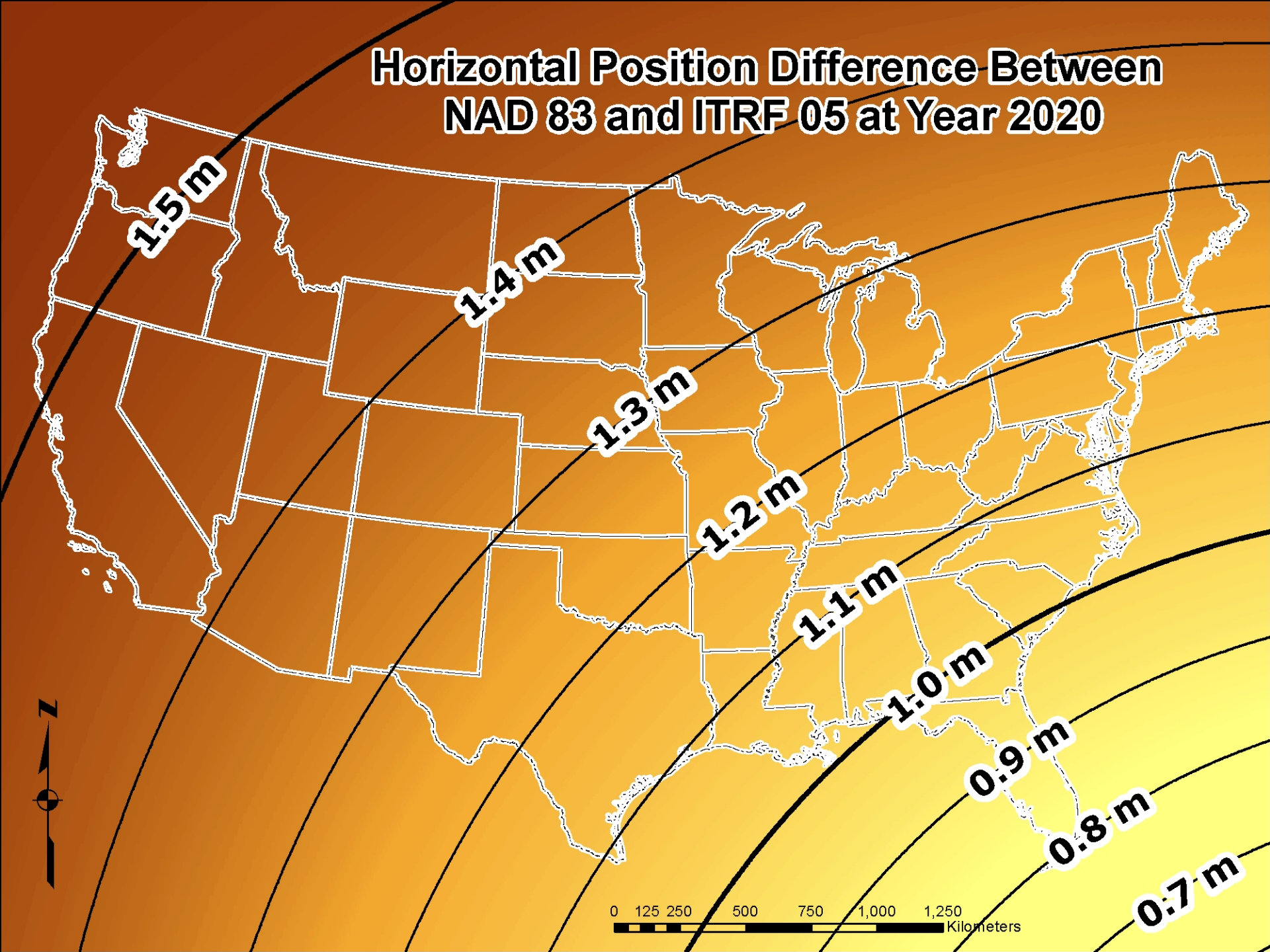
NAD 83(2011) epoch 2010.0 – NAD 83(CORS96) epoch 2002.0



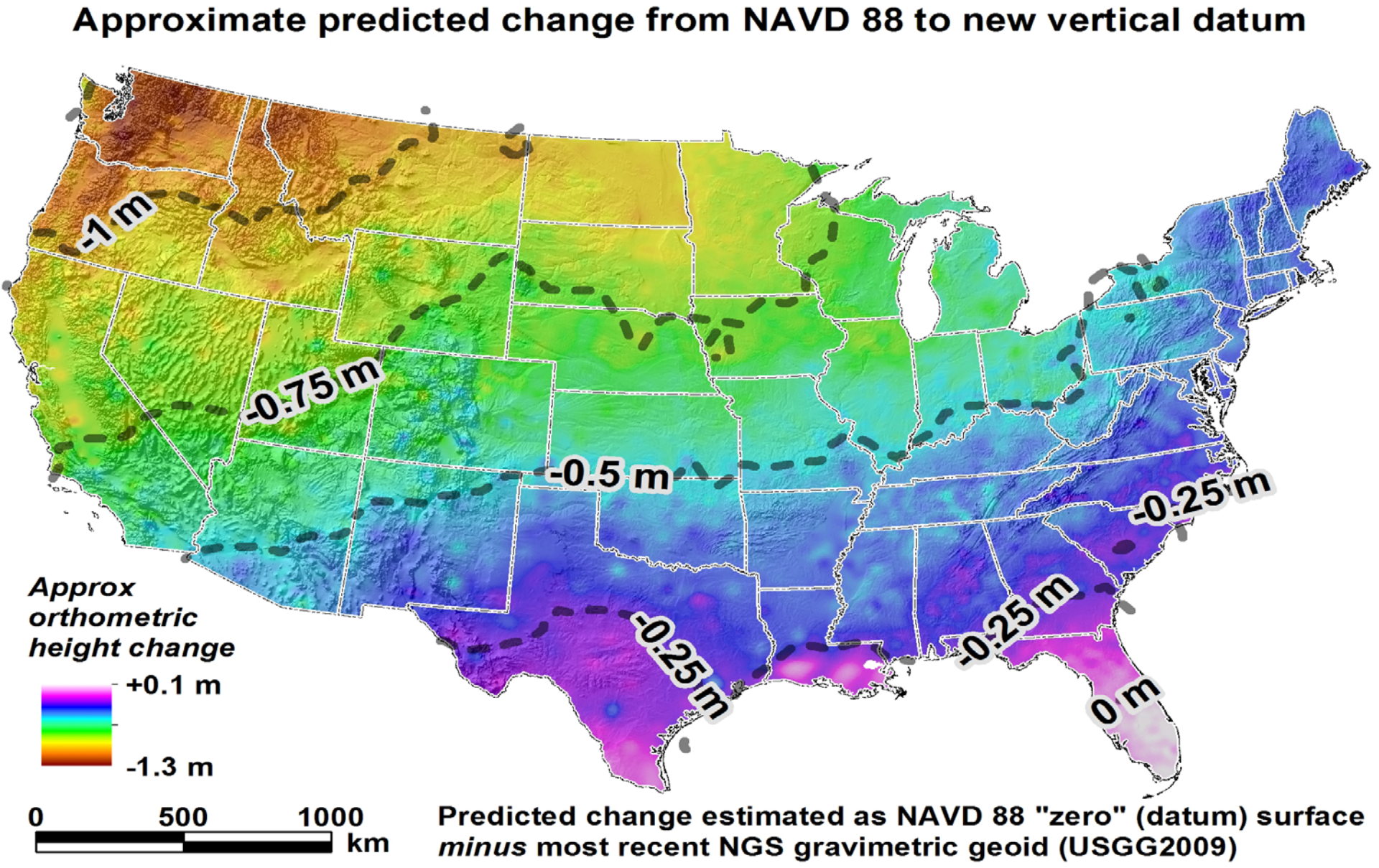
National Geodetic Survey Ten-Year Plan

- Official NGS policy as of January 2008
- Replace NAVD 88 with a GPS/geoid datum
- Replace NAD 83 with a geocentric GPS based datum




Horizontal Position Difference Between
NAD 83 and ITRF 05 at Year 2020
1.5 m
1.4 m
1.3 m
1.2 m
1.1 m
1.0 m
0.9 m
0.8 m
0.7 m
N
0 125 250 500 750 1,000 1,250
Kilometers

New Vertical Datum



NGS Training Center

Webinars!

http://www.ngs.noaa.gov/corbin/

More information…

NGS Home Page: http://www.geodesy.noaa.gov

geodesy.noaa.gov

CORS Webpage: http://www.ngs.noaa.gov/CORS/

CORS newsletter

OPUS Webpage: http://www.ngs.noaa.gov/OPUS/

Find Your Advisor:
www.ngs.noaa.gov/ADVISORS/AdvisorsIndex.shtml

This presentation will be uploaded to:
http://www.ngs.noaa.gov/web/science_edu/presentations_archive/

FAQs on the various webpages

Questions

GOOD COORDINATION BEGINS WITH
GOOD COORDINATES

GEOGRAPHY WITHOUT GEODESY IS A FELONY

pamela.fromhertz@noaa.gov
303-202-4082
240-988-6363