FIG Working Week 2012
Rome, Italy 6–10 May
Knowing to: Manage the territory, Protect the environment, Evaluate the cultural heritage

PAPER 5763 - SESSION TS05B
FIG WORKING WEEK
ROME, ITALY
MAY 8, 2012

A TOOL TO VALIDATE RTN IN THE USA

FIG WORKING WEEK 2012
May 6–10 2012
Rome, Italy

"Knowing to manage the territory, protect the environment, evaluate the cultural heritage"

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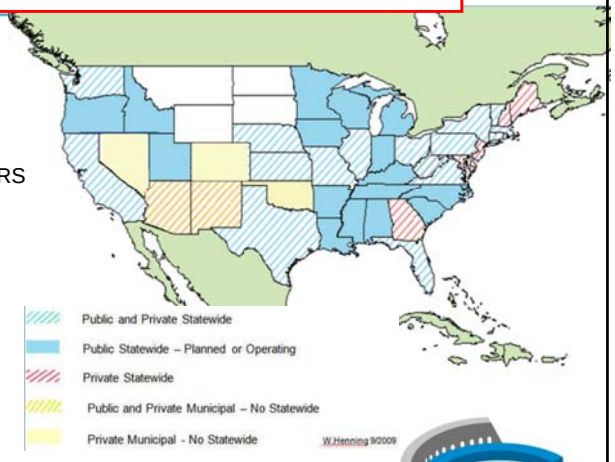
MAJOR RTN IN THE USA
(MARCH 2012)

≥200 RTN WORLDWIDE
≥107 RTN USA
≈35 DOT

- ACADEMIC/SCIENTIFIC
- SPATIAL REFERENCE CENTERS
- VARIOUS DOTS + MACHINE GUIDANCE
- COUNTY
- CITY
- GEODETICSURVEYS(NC,SC)
- MANUFACTURERS
- VENDOR NETWORKS
- AGRICULTURE
- MA & PA NETWORKS



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EXPANDING GNSS MARKETS

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MACHINE GUIDANCE

MOBILE MAPPING SYSTEMS

Advanced Farming Systems

GIS INFRA-STRUCTURE

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CURRENT NGS REAL TIME GNSS POSITIONING POLICY STATEMENT

Goals:

NGS will support real-time GNSS positioning by implementing an action plan to:

1) Provide low-latency access to GNSS data from selected Continuously Operating Reference Stations (CORS) via the Internet. All streaming data from these CORS will be provided, without correctors, in current Radio Technical Commission for Maritime Services (RTCM) formats.
2) Develop standards, specifications, and guidelines to help users obtain optimal results from real-time GNSS positioning technologies. This would include specific documents for users of single-base technology as well as for users of realtime GNSS networks (RTN).
3) Develop standards, specifications, and guidelines for administrating RTN.
4) Provide a service to RTN administrators and users to verify that the positional coordinates obtained from their RTN are consistent with the NSRS.
5) Maintain a strong presence and seek leadership roles at various conferences, meetings and venues where real time positioning is addressed.
6) Participate in education and outreach to both disseminate relevant information as well as to acquire feedback regarding the suitability of guidelines promoted by NGS.
7) Research phenomena affecting accurate positioning, including but not limited to: satellite orbits, refraction, multipath, antenna calibration, and crustal motion.

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NGS GOALS FOR RTN's

- ALL REAL-TIME POSITIONING SERVICES AVAILABLE IN THE U.S. PROVIDE COORDINATES THAT ARE CONSISTENT WITH THE NATIONAL SPATIAL REFERENCE SYSTEM, AND HENCE, WITH EACH OTHER
- USER EQUIPMENT CAN OPERATE WITH SERVICES FROM DIFFERENT RTN'S TO THE GREATEST EXTENT POSSIBLE. PROMOTE THE GENERIC, FREELY AVAILABLE RTCM SC-104 3.X FORMAT DATA THROUGH NTRIP.
- REFERENCE STATIONS CONTAINED IN EACH RTN MEET PRESCRIBED CRITERIA IN TERMS OF STABILITY AND DATA QUALITY
- BEST METHODS FOR RTN USERS MAY BE ADVANCED

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-RTN MAY HAVE DIFFERENT DATUMS, REALIZATIONS OR EPOCHS.
- GNSS POSITIONING SOLUTIONS MAY PRODUCE DIFFERENT RESULTS
- ANTENNA PHASE CENTER MODELS MAY BE DIFFERENT

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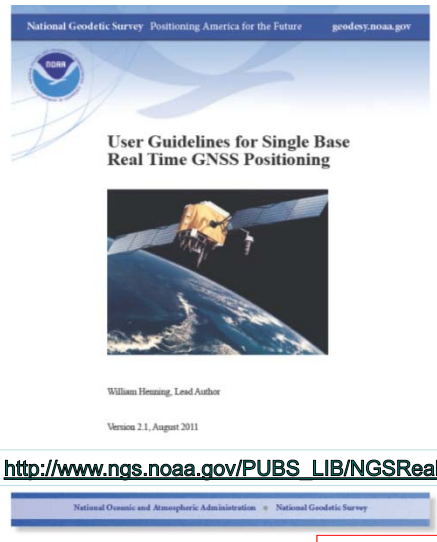
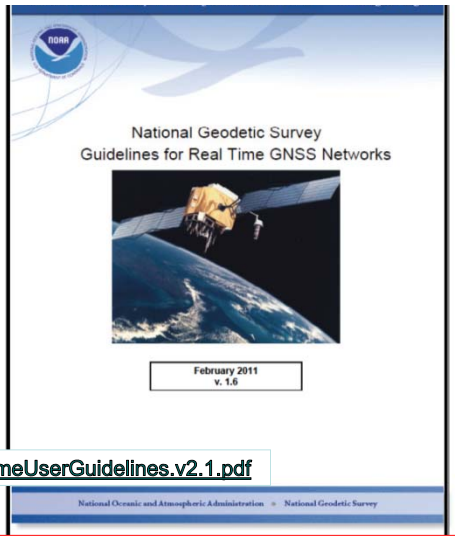
REAL TIME GNSS GUIDELINES





http://www.ngs.noaa.gov/PUBS_LIB/NGSRealTimeUserGuidelines.v2.1.pdf

http://www.ngs.noaa.gov/PUBS_LIB/NGS.RTN.Public.v2.0.pdf

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Manage the territory

NATIONAL SPATIAL REFERENCE SYSTEM (NSRS)

Consistent National Coordinate System

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

and how these values change with time

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PASSIVE/ACTIVE GNSS CONTROL

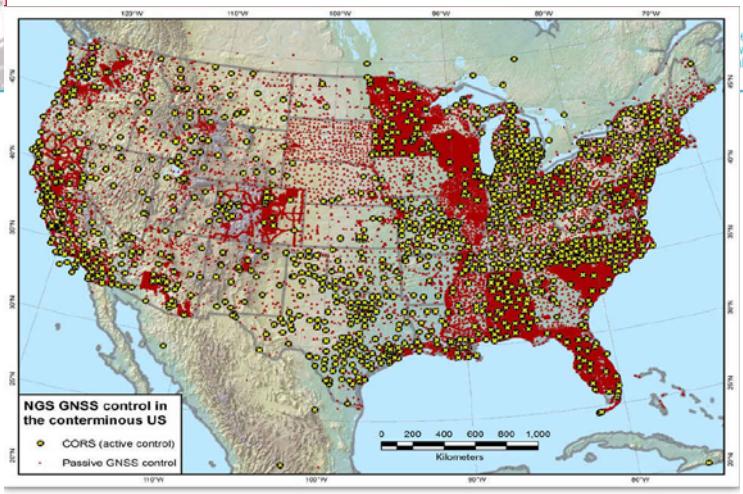

Figure 1 NGS active (CORS) and passive GNSS control stations in the conterminous US. As of December 2011, there were approximately 1800 operational CORS and 79,000 passive GNSS stations.

NAVD 88 VERTICAL DATUM IS BASED ON PASSIVE MARKS

CURRENT NAD 83 REALIZATION IS BASED ON CORS

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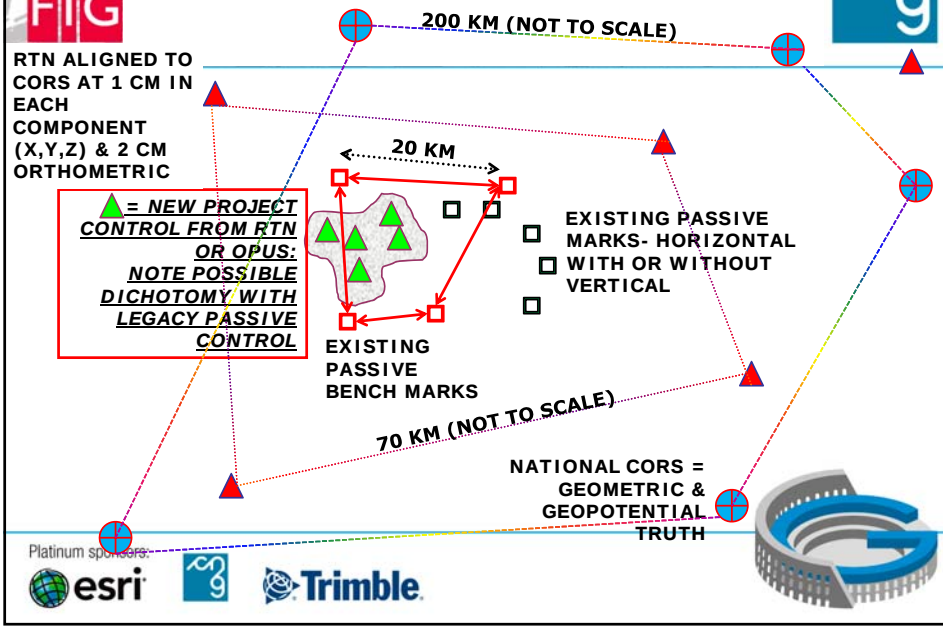
2022 NEW PROJECT CONTROL – ACCESS TO NSRS



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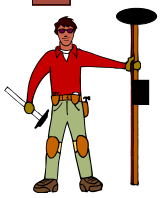
HOW WILL NGS VALIDATE RTN?

NGS 2011 STRATEGIC PLAN / 1.7 & 1.8:

"Develop guidelines for both the administration and use of real-time GNSS networks and especially for ensuring that these networks are compatible with the NSRS."

1. TOP DOWN: OPUS POSITIONS ON RTN REFERENCE STATIONS AT APPROPRIATE INTERVALS COULD PRODUCE GRAPHICS THAT WOULD SHOW BIASES AT A GLANCE.

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



2. USER UP: PHYSICAL MONUMENTATION, ESTABLISHED WITH BEST TECHNOLOGY, COULD BE USED AS *FIDUCIAL STATIONS* TO HELP THE USER VERIFY THAT RTN ARE PRODUCING ACCURATE COORDINATES,

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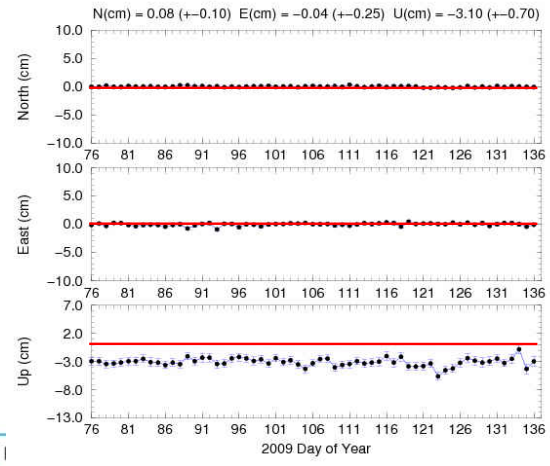

"OPUS-LIKE" GENERATED GRAPHIC OF RTN STATIONS- SIMILAR TO CORS 60-DAY PLOT

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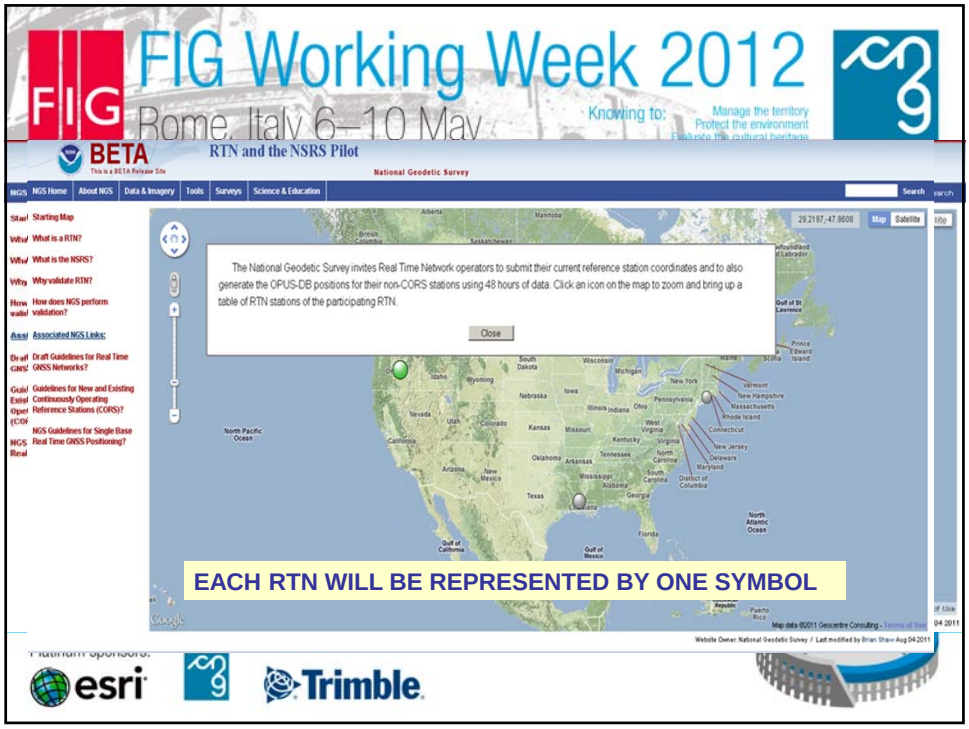
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Knowing to:
Manage the territory
Protect the environment
BETA
RTN and the NSRS Pilot
National Geodetic Survey
NGS Home
About NGS
Data & Imagery
Tools
Surveys
Science & Education
Search
Starting Map
What is a RTN?
What is the NSRS?
Why validate RTN?
How does NGS perform validation?
Associated NGS Links:
Draft Guidelines for Real Time GNSS Networks?
Guidelines for New and Existing Continuously Operating Reference Stations (CORS)?
NGS Guidelines for Single Base Real Time GNSS Positioning?
The National Geodetic Survey invites Real Time Network operators to submit their current reference station coordinates and to also generate the OPUS-DB positions for their non-CORS stations using 48 hours of data. Click an icon on the map to zoom and bring up a table of RTN stations of the participating RTN.
Close
EACH RTN WILL BE REPRESENTED BY ONE SYMBOL
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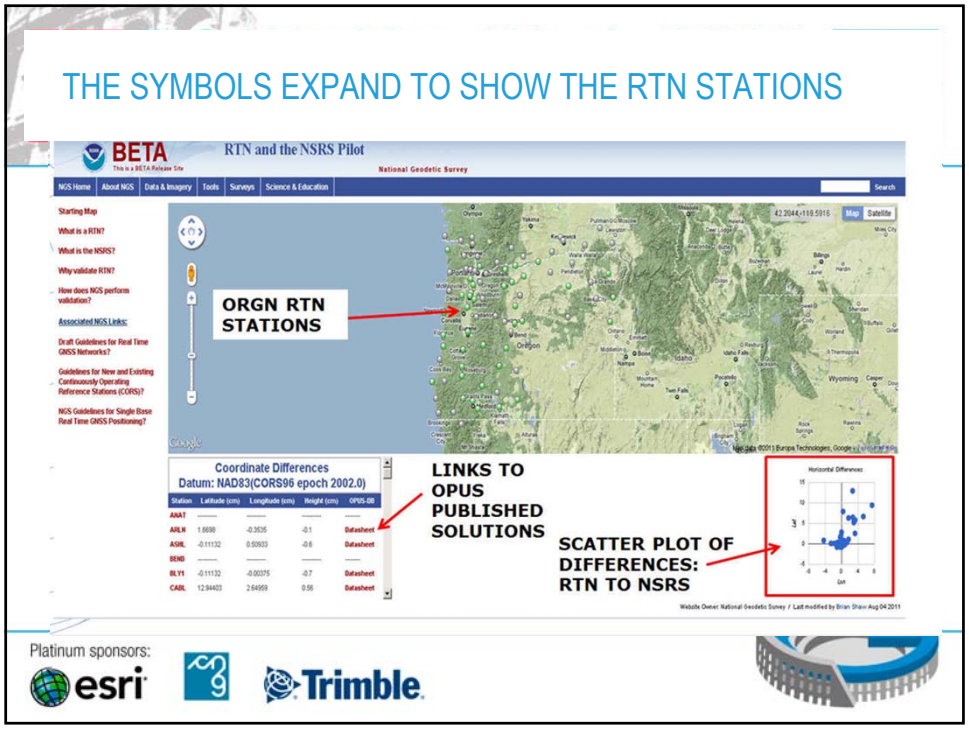
THE SYMBOLS EXPAND TO SHOW THE RTN STATIONS
BETA
RTN and the NSRS Pilot
National Geodetic Survey
ORGN RTN STATIONS
Coordinate Differences
Datum: NAD83(CORS96 epoch 2002.0)
LINKS TO OPUS PUBLISHED SOLUTIONS
SCATTER PLOT OF DIFFERENCES: RTN TO NSRS
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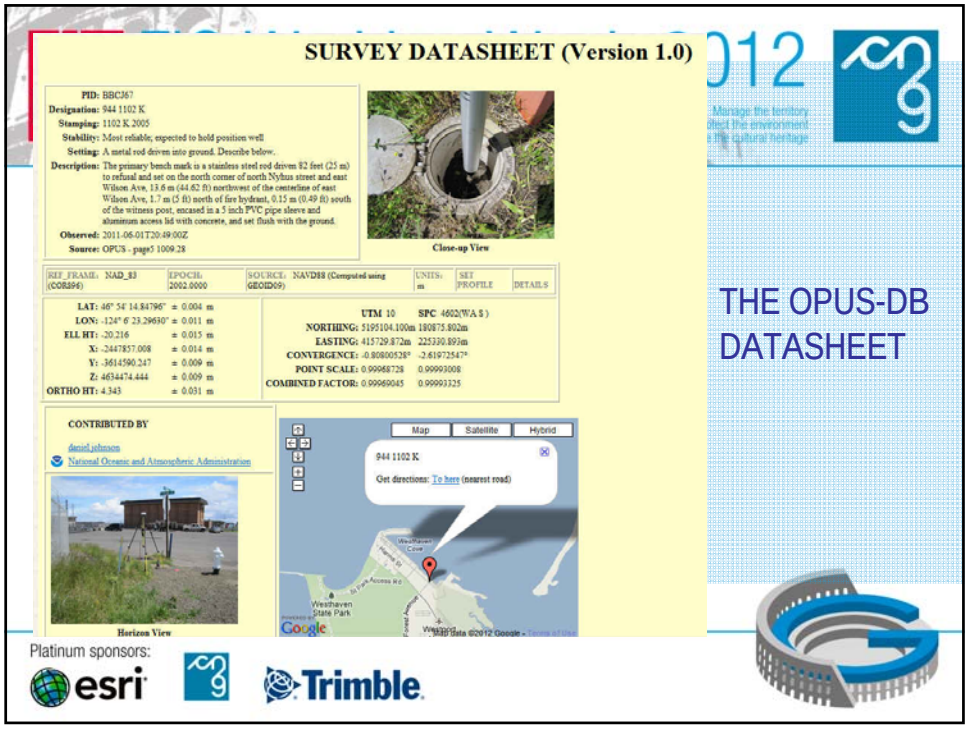
SURVEY DATASHEET (Version 1.0)
PID: BBCJ67
Designation: 944 1102 K
Stamping: 1102 K 2005
Stability: Most reliable, expected to hold position well
Setting: A metal rod driven into ground. Describe below.
Description: The primary bench mark is a stainless steel rod driven 82 feet (25 m) to refusal and set on the north corner of north Nyhus street and east Wilson Ave, 13.6 m (44.62 ft) northwest of the centerline of east Wilson Ave, 1.7 m (5 ft) north of fire hydrant, 0.15 m (0.49 ft) south of the witness post, encased in a 5 inch PVC pipe sleeve and aluminum access lid with concrete, and set flush with the ground.
Observed: 2011-06-01T20:49:00Z
Source: OPUS - page5 1009.28
Close-up View
REF_FRAME: NAD_83 (CORS96)
EPOCH: 2002.0000
SOURCE: NAVD88 (Computed using GEOID09)
UNITS: m
SET PROFILE
DETAILS
LAT: 46° 54' 14.84795" ± 0.004 m
LON: -124° 6' 23.29630" ± 0.011 m
ELL HT: -20.216 ± 0.015 m
X: -2447857.008 ± 0.014 m
Y: -3614590.247 ± 0.009 m
Z: 4634474.444 ± 0.009 m
ORTHO HT: 4.343 ± 0.031 m
UTM 10 SPC 4602(WA S)
NORTHING: 5195104.100m 180875.802m
EASTING: 415729.872m 225330.893m
CONVERGENCE: -0.80800528° -2.61972547°
POINT SCALE: 0.99968728 0.99993008
COMBINED FACTOR: 0.99969045 0.99993325
CONTRIBUTED BY
daniel.johnson
National Oceanic and Atmospheric Administration
Horizon View
Map
Satellite
Hybrid
944 1102 K
Get directions: To here (nearest road)
Westhaven State Park
Google
Map data ©2012 Google
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