



Future of U.S. NDGPS



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Future of U.S. NDGPS



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- Current system utilizes 84 broadcast sites to provide positioning accuracy of 1-3 meters across 92% of CONUS
 - Few users of the NDGPS broadcast
 - USCG, DOT, and US Army Corps of Engineers Plans:
 - Retain NDGPS at 21 sites for single station near-shore coverage
 - Decommission 62 sites
 - One US Army Corps of Engineers (USACE) site to remain
 - Termination of NDGPS broadcast at 62 proposed sites planned for Jan. 15, 2016*

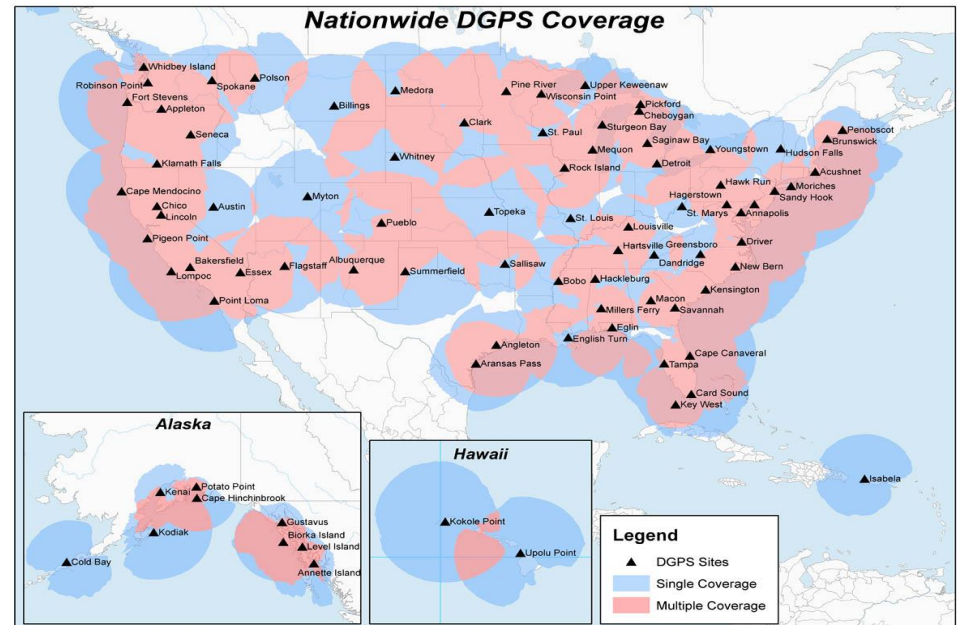


Nationwide Differential GPS (NDGPS)



System Description

- 84 Nationwide Remote Broadcast Sites throughout the United States and territories
 - 92% nationwide signal coverage
 - Better than 10 meter accuracy
 - 10 second integrity alarm to the user
 - Satisfies Harbor/Harbor Approach requirements
 - 99.7% availability requirement



Operations

- Redundant equipment at sites
- Redundant controls stations at NAVCEN

Stakeholders

- U.S. Army Corps of Engineers (USACE)
- Department of Transportation (DOT)
- U. S. Coast Guard (USCG)



Contributing Factors



- Discontinuation of Selective Availability
 - Intentional signal degradation, known as SA, was disabled in 2000 allowing full signal accuracy to civil users
- Lack of USCG requirements
- Widespread use of the Federal Aviation Administration (FAA) Wide Area Augmentation System (WAAS)
- Continued GPS modernization
 - Additional civil frequencies allow for correction of ionospheric error
- Reduced availability of consumer grade DGPS receivers
- Federal Railroad Administration has no NDGPS requirement for Positive Train Control
- Agriculture sector uses commercial DGPS services



2013 Federal Register Notice



- Joint DHS/USCG and DOT/RITA Federal Register Notice (FRN) Request for Public Comments [78 FR 22554; April 16, 2013]
- Targeted Outreach to User Community
- USG Requirements Assessed
- Direct Questions:
 - (1) Do you use NDGPS in its current form for positioning, navigation, and timing?
 - (2) What would be the impact if the NDGPS were to be discontinued?
 - (3) Are there alternatives that could be used to meet your PNT requirements?
 - (4) Are there alternative uses for the existing NDGPS infrastructure?
- Responses were few.....

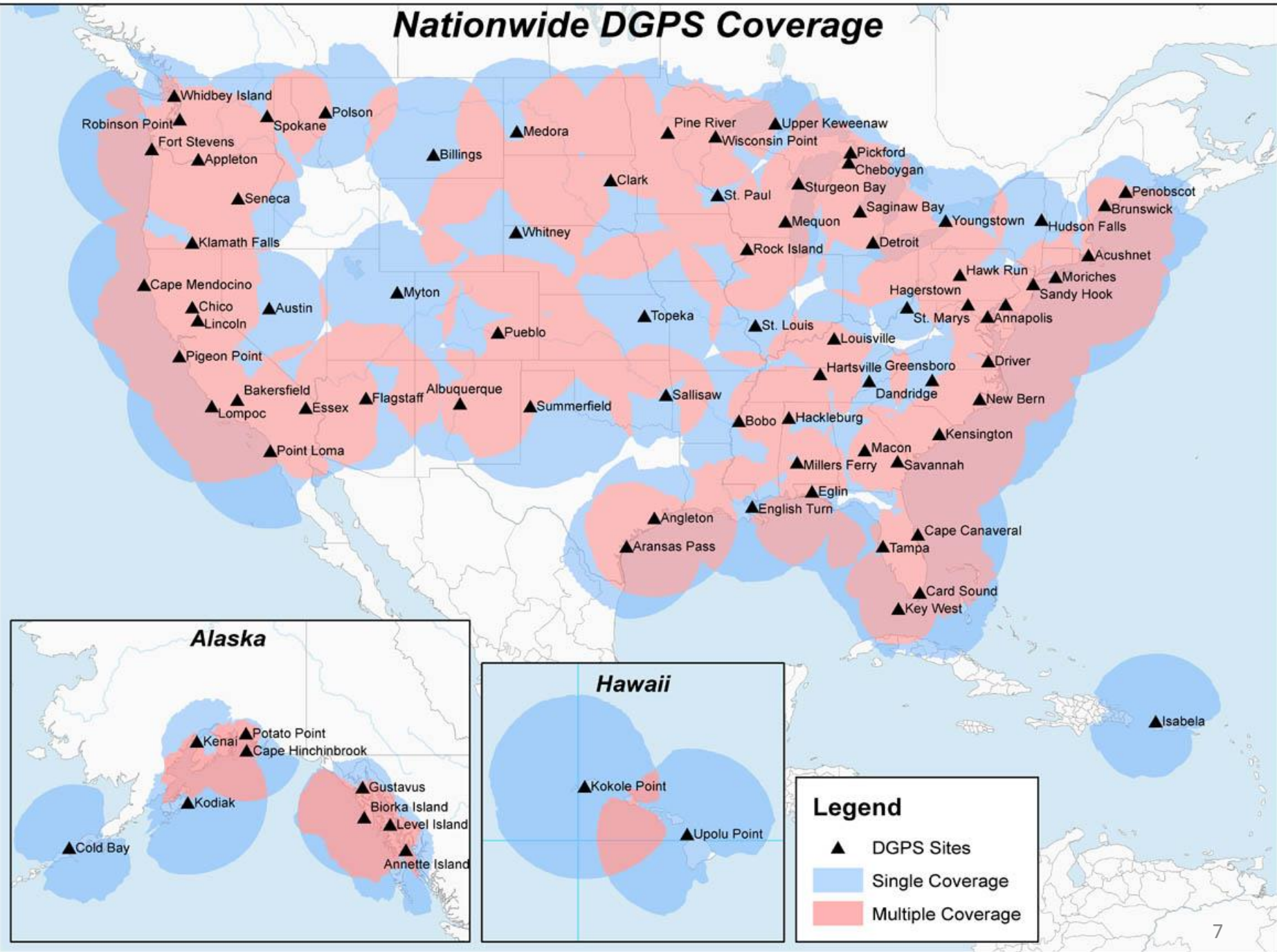
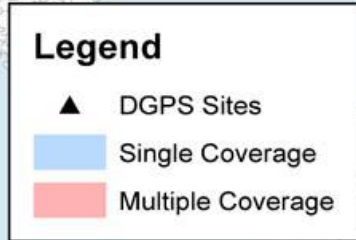
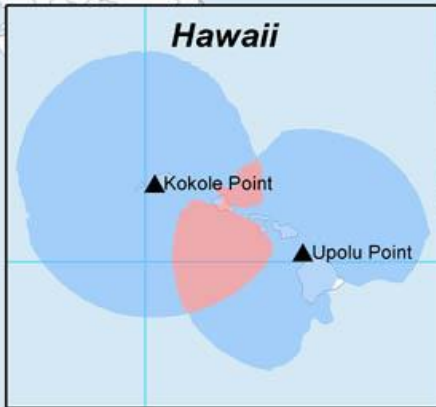
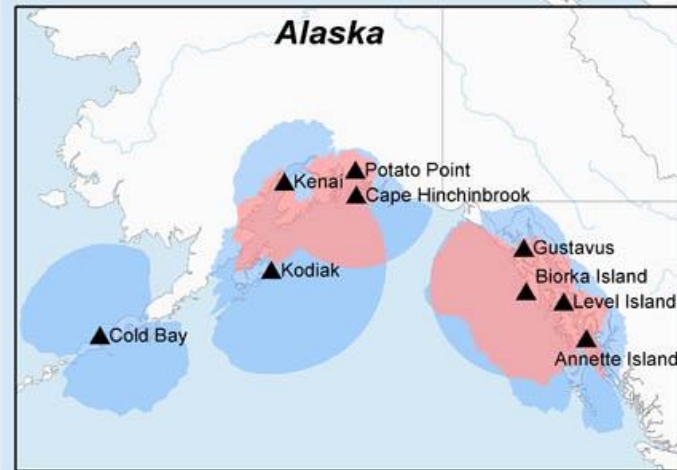


Assessment on Comments in Docket



- Few users of the NDGPS broadcast
 - Majority of use is for maritime sector
 - Primarily Pilots for precision shiphandling
- Bottom Line:
 - Insufficient users to justify a nationwide live broadcast

Nationwide DGPS Coverage







Next Steps



- November 16th, 2015: 90-day FRN commentary period closes
- November 20th, 2015: Impact analysis report assesses commentary
- December 15th, 2015: Local Notice to Mariner message released with notification of sites decommissioning
- January 15th, 2015:
 - Sites will be decommissioned
 - Decommissioning may be delayed for those sites with unmitigated impacts identified in the analysis of public comment
- Alternative uses for decommissioned DGPS sites will be examined



Summary



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- Few users of the NDGPS broadcast
 - USCG, DOT, and USACE Plans:
 - Retain NDGPS at 21 sites for single station near-shore coverage
 - Decommission 62 sites
 - One USACE site to remain
 - Termination of NDGPS broadcast at 62 proposed sites planned for Jan. 15, 2016*

BACKUP SLIDES

Overview of FRN Responses 1 of 3

Category	Respondents	Summary Comments
<u>Maritime-Related (U.S.)</u>	<ul style="list-style-type: none"> • 9 Pilots' Organizations + 2 individual members 	<ul style="list-style-type: none"> • Universally opposes DGPS reduction/removal in pilotage areas; several technical/safety concerns • Universal negativity to WAAS as substitute augmentation system in pilotage and navigation • Most correspond to USCG Vessel Traffic Service (VTS) areas (e.g., Houston, New York, Seattle)
	<ul style="list-style-type: none"> • 2 private industry partners 	<ul style="list-style-type: none"> • Quotes IALA R-121 that removal of SA does not remove requirement for augmentation • Uses data acquisition for underwater investigations
<u>Non-Maritime (U.S.)</u>	<ul style="list-style-type: none"> • 3 State DOTs • 2 Local DOT/DPW 	<ul style="list-style-type: none"> • Uses for highway design and monument integrity • Uses CORS data for RTN; not use broadcast • Uses DGPS-based CORS for project control, post-processing, automated survey and construction • Uses DGPS – critical for survey, mapping, GIS and data sets, coastal and maritime navigation and environmental applications • Suggests use in GPS+GLONASS streaming RTK applications

Overview of FRN Responses 2 of 3

Category	Respondents	Summary Comments
<u>Associations (U.S.)</u>	<ul style="list-style-type: none"> • 1 Shipping Association 	<ul style="list-style-type: none"> • Seeks measurement on relative position fixing capability of DGPS signal v. uncorrected GPS
	<ul style="list-style-type: none"> • 1 PNT Association 	<ul style="list-style-type: none"> • Cites 30,000 daily navigation users in CONUS + tens of thousands at sea • Suggests NDGPS as most reliable augmentation for surface applications, and as backup for power, IT and other critical infrastructure outages; and natural disaster recovery
	<ul style="list-style-type: none"> • 1 Conservation Assn. 	<ul style="list-style-type: none"> • Uses for GIS, emergency response
<u>Private Sector</u>	<ul style="list-style-type: none"> • 2 private industry partners 	<ul style="list-style-type: none"> • Concerns for loss of critical accurate/reliable CORS stations for research, survey and mapping • Limits integration with SBAS and diversity of high integrity PNT services; suggests integration into national PNT network • Suggests integration with wide area nationwide Network RTK, and ubiquitous nationwide high accuracy location and timing

Overview of FRN Responses 3 of 3

<u>Category</u>	<u>Respondents</u>	<u>Summary Comments</u>
<u>Individuals</u>	<ul style="list-style-type: none"> • 4 individuals 	<ul style="list-style-type: none"> • Uses for remote sensing elevation data/coastal management decisionmaking • Concerns for loss of realtime NAD83 data, WAAS accuracy insufficient • Most accurate system for obstructed areas • Specific concerns for NDGPS broadcast and CORS loss in Alaska, Hawaii, Puerto Rico
<u>International</u>	<ul style="list-style-type: none"> • 3 international organizations 	<ul style="list-style-type: none"> • Increasing use of Portable Pilot Navigation Systems/ Personal Pilot Units requiring reliable signal input • Concerns for loss of DGPS attributes and impact on broader aims of e-Navigation • Limits integration with SBAS, diversity of high integrity PNT services • No use in Canadian cadastral surveying
<u>Federal Agencies</u>	<ul style="list-style-type: none"> • 5 Federal agencies 	<ul style="list-style-type: none"> • CORS at DGPS sites critical; not use broadcast (2) • Concerns for accuracy impacts on OPUS • Can replace with WAAS, but not RAIM (accuracy) • No impact (2)

Proposed Maritime Sites for Decommissioning - USCG (27)

- Appleton, WA
- Biorka, AK
- Bobo, MS
- Brunswick, ME
- Cape Hinchinbrook, AK
- Cheboygan, MI
- Cold Bay, AK
- Driver, VA
- Eglin, FL
- Gustavus, AK
- Isabela, PR
- Key West, FL
- Kodiak, AK
- Kokole Point, HI
- Level Island, AK
- Lompoc, CA
- Mequon, MI
- New Bern, NC
- Penobscot, ME
- Pigeon Point, CA
- Robinson Pt, WA
- Saginaw, MI
- Sandy Hook, NJ
- Sturgeon Bay, WI
- Upper Keweenaw, MI
- Wisconsin Point, WI
- Youngstown, NY

Proposed Inland Sites for Decommissioning – DOT (29)

- Albuquerque, NM
- Austin, NV
- Bakersfield, CA
- Billings, MT
- Chico, CA
- Clark, SD
- Dandridge, TN
- Essex, CA
- Flagstaff, AZ
- Greensboro, NC
- Hackleburg, AL
- Hagerstown, MD
- Hartsville, TN
- Hawk Run, PA
- Hudson Falls, NY
- Klamath Falls, OR
- Macon, GA
- Medora, ND
- Myton, UT
- Pine River, MN
- Polson, MT
- Pueblo, CO
- Savannah, GA
- Seneca, OR
- Spokane, WA
- St. Marys, WV
- Summerfield, TX
- Topeka, KS
- Whitney, NE

Proposed Inland Sites for Decommissioning - USACE (6)

- Louisville, KY
- Millers Ferry, AL
- Rock Island, IA
- Sallisaw, OK
- St. Louis, MO
- St. Paul (Alma), MN