National GPS Interference Detection and Mitigation (IDM)

49th CGSIC Savannah, GA

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Office of Applied Technology Geospatial Management Office

Homeland Security

Discussion

- DHS IDM Mandates
- Central Data Repository
- National Level Operations Plan
- National Sensor Capability

DHS IDM Mandates

1. Collect, analyze, store, & disseminate interference reports from all sources to enable appropriate investigation, notification & enforcement action.
2. Develop & maintain capabilities, procedures & techniques, & routinely exercise civil contingency responses to ensure continuity of operations in the event that access to GPS signal is disrupted or denied.
3. Coordinate domestic capabilities to identify, analyze, locate, attribute, & mitigate sources of interference to the GPS & its augmentations.

Homeland Security

Central Data Repository

1. **Collect, analyze, store, & disseminate interference reports from all sources to enable appropriate investigation, notification & enforcement action.**
   - **Standardized format of reports for analysts**
   - **Central Interference Report (IR) database focal point of all PNT interference**
   - **Encompass process and functions for detection validation, investigation, assessment, corroboration of IR**
   - **Automated dissemination of data and reduce IR information distribution delays for decision support**
   - **Mechanisms for cataloging PNT applications and associated vulnerabilities to interference**

Central Data Repository

- User Authenticated Sign-on – 475
- 150 PNT incident reports (IR) per month (1800 annually)
- Database support 500,000 unique IR entries
- Responses to system queries less than 8 seconds
- New & updated IRs posted immediately visible, available and accessible
- Automatic update to subscribers – Initially working with the TRIAD:
  - USCG Navigation Center, FAA Operations Center, GPS Operations Center.

Central Data Repository

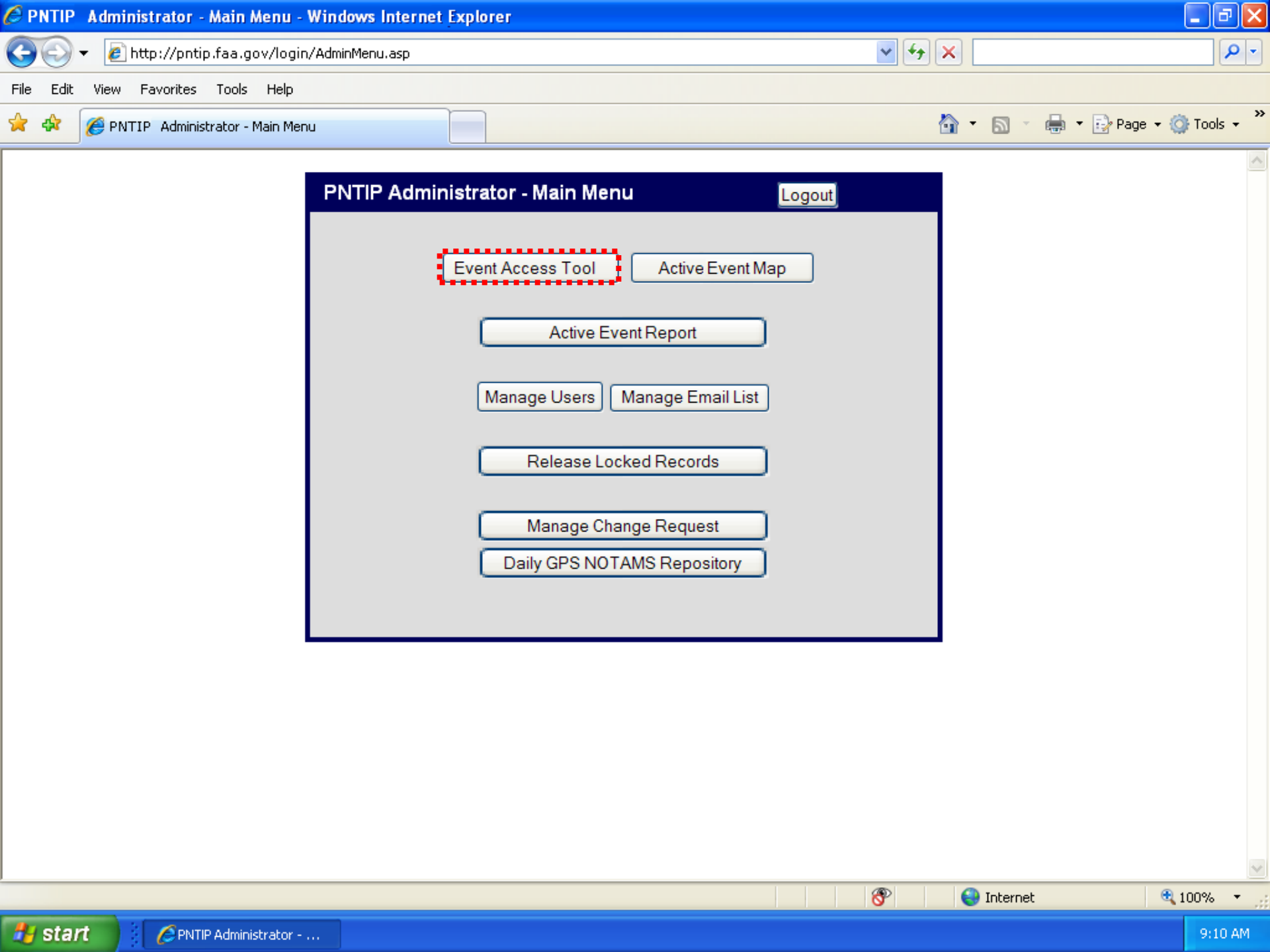
- **PNTIP SETS data fields (1 – 10 mandatory):**
  1. SETS ID # {Record URL}
  2. DATE START - DD/MM/YYYY
  3. DATE STOP - DD/MM/YYYY
  4. EVENT TIME START - #### UTC
  5. EVENT TIME STOP - #### UTC
  6. LATITUDE - +##.######## Degrees
  7. LONGITUDE - +###.######## Degrees
  8. USER EQUIPMENT TYPE
  9. FREQUENCY (L1, L2, L5… etc.) - ####.####
  10. REMARKS & OTHER RELEVENT INFORMATION
  11. EVENT STATUS
  12. SOURCE
  13. JOINT SPECTRUM INTERFERENCE RESOLUTION (JSIR) DTG
  14. ALTITUDE

Conversion factor to US National Grid is now part of this data field.

Central Data Repository

- **Utilize existing, mature systems & applications**
  - **FAA Spectrum Engineering Tracking System (SETS)**
  - **DHS Integrated Common Analytical Viewer (iCAV)**
    - **Geospatial enabling/visualization tool**
    - **Geographic Information System interface that integrates multiple geospatial data sources from a centralized geospatial data warehouse**
    - **Ability to map, analyze, & view information from a mission specific application which assembles and compares data from various sources.**
    - **Ability to exchange data with GIANT, FALCON View**


PNTIP Login Page - Windows Internet Explorer
http://pntip.faa.gov/login/
File Edit View Favorites Tools Help
PNTIP Login Page
Page Tools
PNTIP Application
Login Email: John.Merrill@dhs.gov
Password: ●●●●●●●●●
Logon to PNTIP
Reset
Change password?
Lost password?
Warning:
This computer system, including all the related equipment, networks and network devices (specifically including Internet access) are provided only for authorized U.S. Government use. DHS computer systems may be monitored for all lawful purposes, to ensure that their use is authorized, for management of the system, to facilitate protection against unauthorized access, and to verify the security of this system.
During monitoring, information may be examined, recorded, copied, and used for authorized purposes. All DHS information, including personal information, placed on or sent over this system may be monitored. Use of this computer, authorized or unauthorized, constitutes consent to monitoring of this system.
Unauthorized use may subject you to criminal prosecution. Evidence of unauthorized use collected during monitoring may be used for administrative, criminal or adverse action. Use of this system constitutes consent to monitoring for these purposes.
Internet
100%
start
PNTIP Login Page - Wi...
8:28 AM

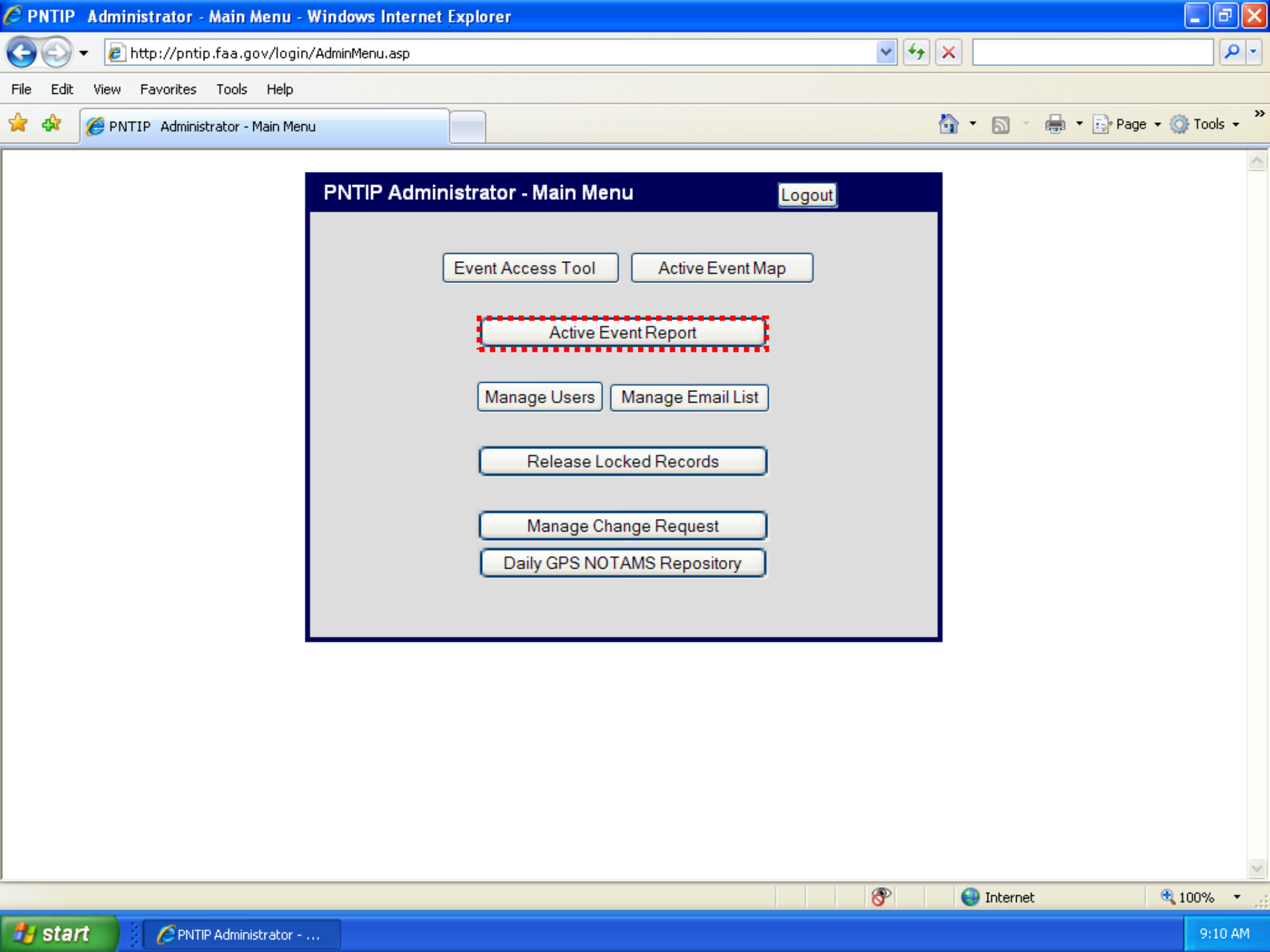

PNTIP Administrator - Main Menu - Windows Internet Explorer
http://pntip.faa.gov/login/AdminMenu.asp
File Edit View Favorites Tools Help
PNTIP Administrator - Main Menu
Page Tools
PNTIP Administrator - Main Menu
Logout
Event Access Tool
Active Event Map
Active Event Report
Manage Users
Manage Email List
Release Locked Records
Manage Change Request
Daily GPS NOTAMS Repository
Internet
100%
start
PNTIP Administrator - ...
9:10 AM

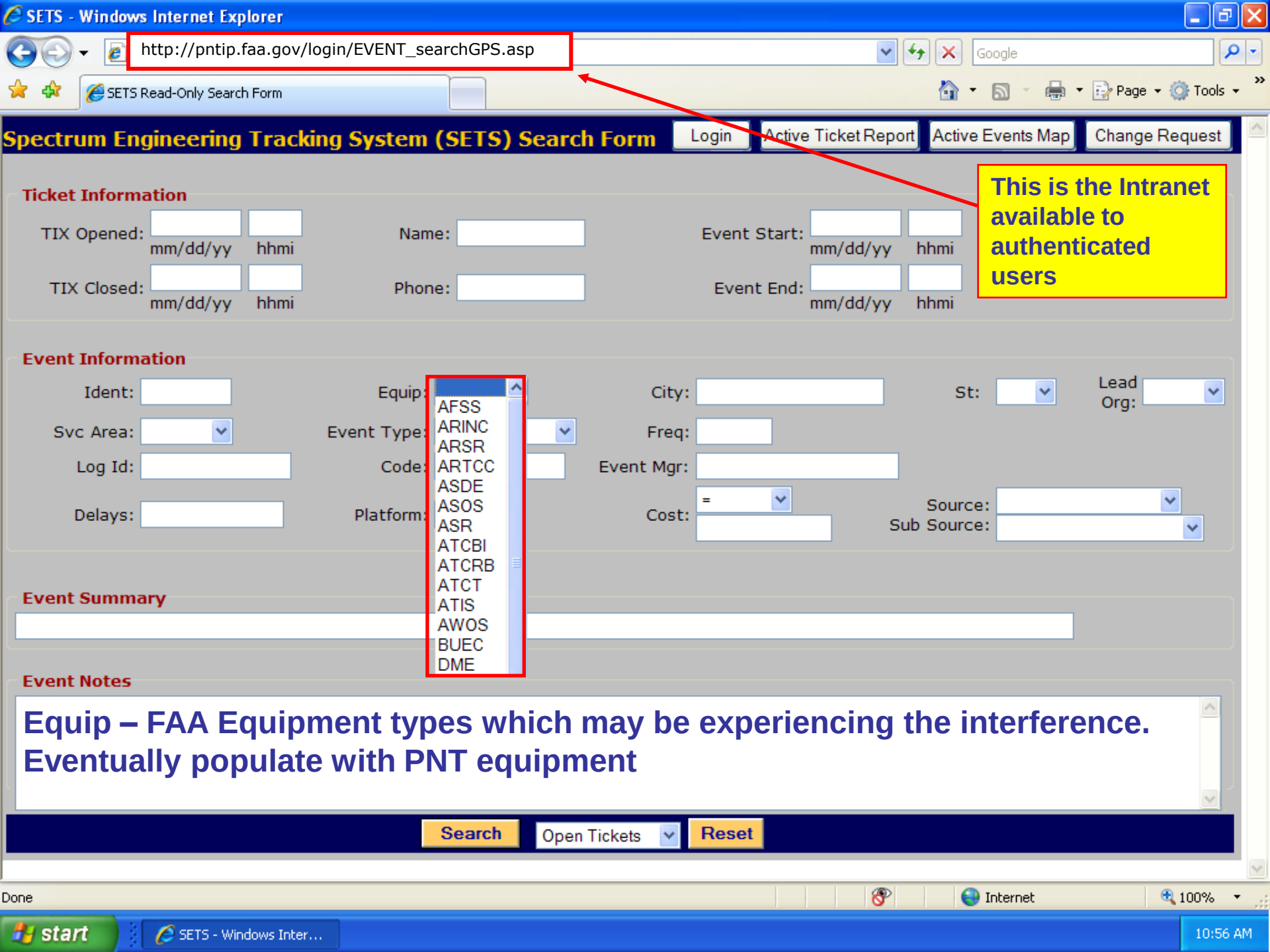
>= (mm/dd/yyyy) Search

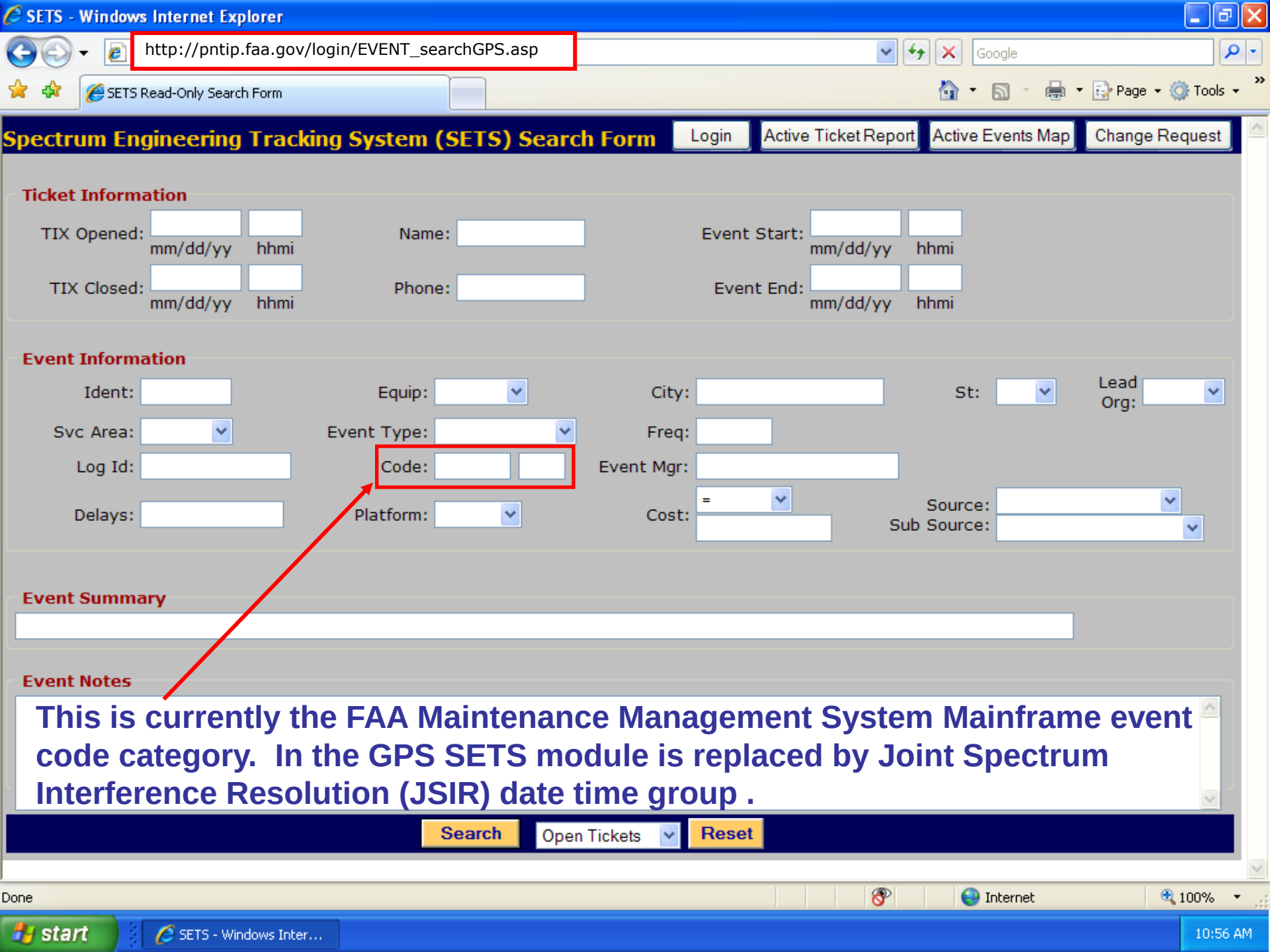
Ident	Equip	City, State	Start	Suspense	Frequency	Summary
ZDC	GPS	LEESBURG, VA	8/19/2003 1724	8/20/2003	1575.42	Wide Area Augmentation System (WAAS) operations personnel report experiencing problems with all three reference station receivers. All receivers are loosing satellite track. Telco circuit checks OK. External interference is suspected. NOCC specialists have been notified.
JNU	GPS	JUNEAU, AK	2/25/2005 2122	2/26/2005	1575.42	Wide Area Augmentation System (WAAS) personnel at the Operations Center reported loss of service due to high solar activity causing satellite signal degradation. WAAS Operators have been notified. NOCC Spectrum Management has been notified.
JNU	GPS	JUNEAU, AK	10/15/2005 2100	10/16/2005	1575.42	Air Traffic personnel at the Juneau Automated Flight Service Station (AFSS) received a GPS Anomaly pilot report from a Cessna C310 (N5806X) about 15 nautical miles west of the airport. WAAS Operators checked their receivers and no problems noted. Notified the FAA National Operations Control Center (NOCC).
MIJ	GPS	UTAH TEST RGE, UT	12/7/2005 1730	12/9/2005	1575.42	Global Positioning System (GPS) will be unreliable and may be unavailable within a 290 NM radius of the Michael (MIJ) Tactical Air Navigation (TACAN) at FL400; decreasing in area with altitude to a circle of 260 NM radius at FL250, and 170 NM radius at FL100 and 4,000ft AGL.
NID	GPS	CHINA LAKE, CA	9/13/2005 1430	2/28/2006	1575.42	Global Positioning System (GPS) will be unreliable and may be unavailable within a 310 NM radius of the NAWS China Lake/Armitage airport (NID) at FL400 ending at 113w longitude and not extending into Oakland oceanic airspace; decreasing in area with altitude to a circle of 260 NM radius at FL250, and 190 NM radius at FL100 and 170 NM radius

http://pntip.faa.gov/login/EVENT_listGPS.asp

Record Count: 141 Back to Event List Page [Download This Listing]


PNTIP Administrator - Main Menu - Windows Internet Explorer
http://pntip.faa.gov/login/AdminMenu.asp
File Edit View Favorites Tools Help
PNTIP Administrator - Main Menu
Page Tools
PNTIP Administrator - Main Menu
Logout
Event Access Tool
Active Event Map
Active Event Report
Manage Users
Manage Email List
Release Locked Records
Manage Change Request
Daily GPS NOTAMS Repository
Internet
100%
start
PNTIP Administrator - ...
9:10 AM


SETS - Windows Internet Explorer
http://pntip.faa.gov/login/EVENT_searchGPS.asp
SETS Read-Only Search Form
Spectrum Engineering Tracking System (SETS) Search Form
Login
Active Ticket Report
Active Events Map
Change Request
This is the Intranet available to authenticated users
Ticket Information
TIX Opened:
mm/dd/yy
hhmi
Name:
Event Start:
TIX Closed:
Phone:
Event End:
Event Information
Ident:
Equip:
AFSS
ARINC
ARSR
ARTCC
ASDE
ASOS
ASR
ATCBI
ATCRB
ATCT
ATIS
AWOS
BUEC
DME
City:
St:
Lead Org:
Svc Area:
Event Type:
Freq:
Log Id:
Code:
Event Mgr:
Delays:
Platform:
Cost:
Source:
Sub Source:
Event Summary
Event Notes
Equip – FAA Equipment types which may be experiencing the interference. Eventually populate with PNT equipment
Search
Open Tickets
Reset
Done
Internet
100%
start
SETS - Windows Inter...
10:56 AM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Spectrum Engineering Tracking System (SETS) Search Form
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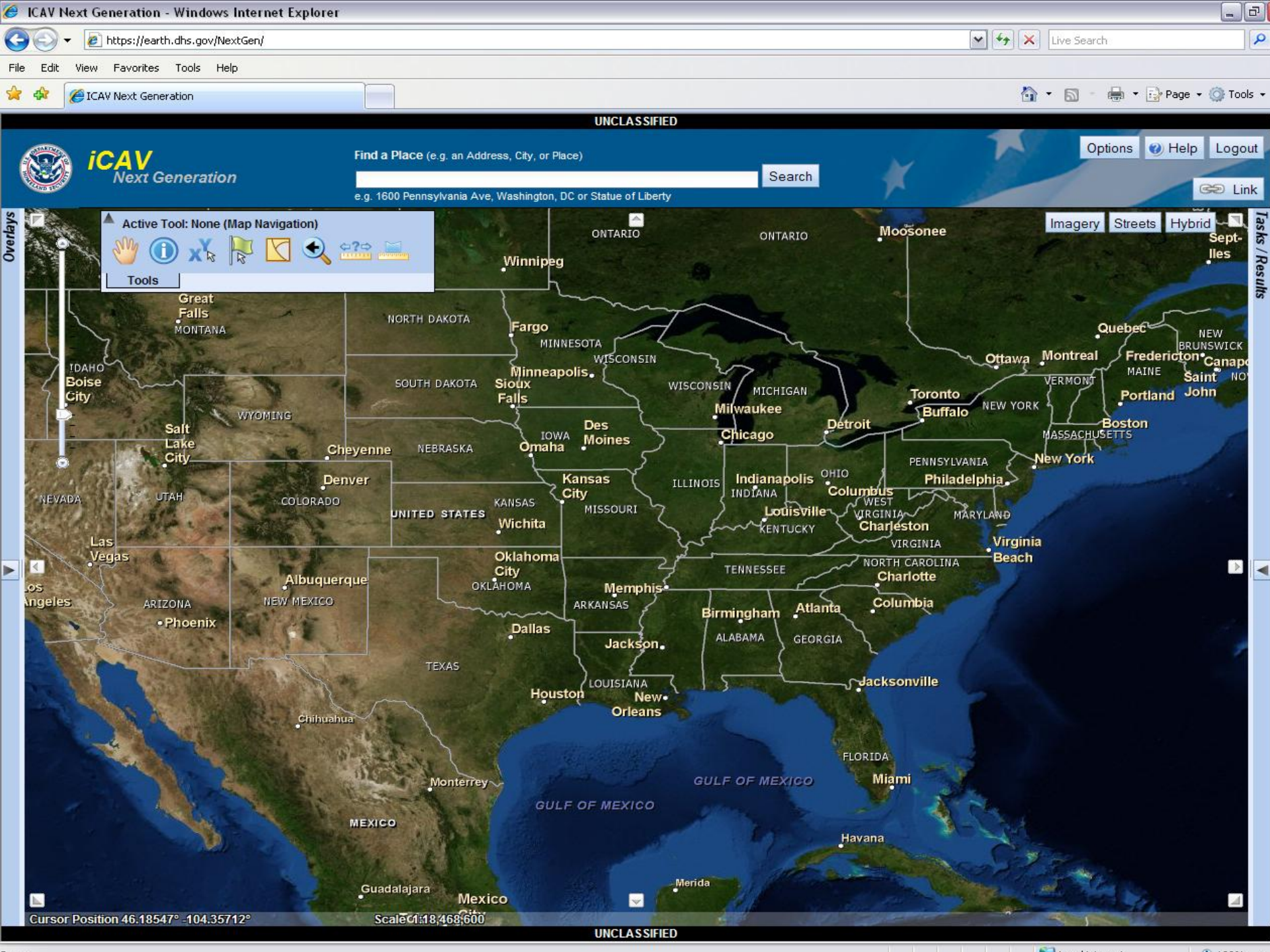
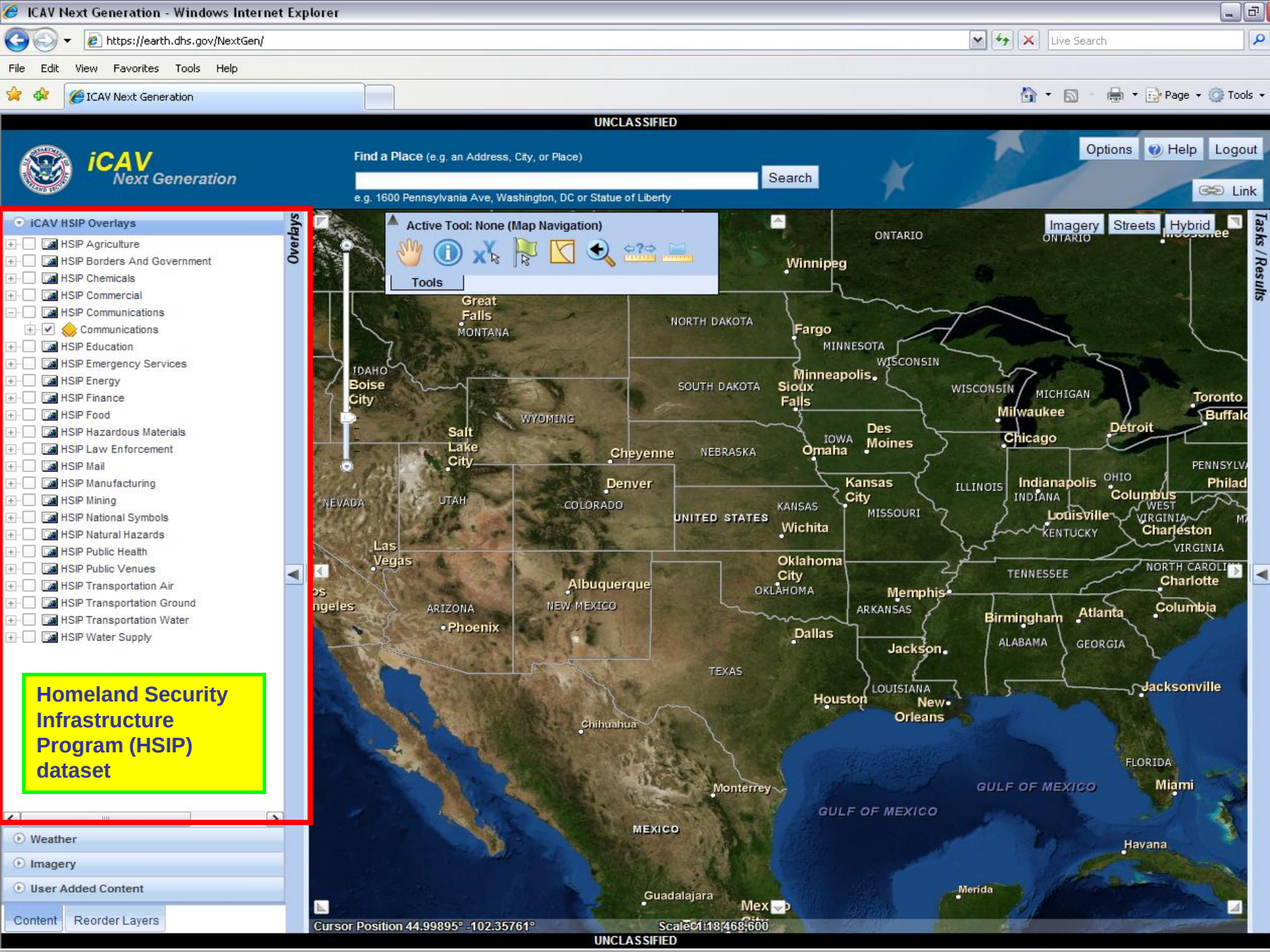
Active Ticket Report
Active Events Map
Change Request
Ticket Information
TIX Opened:
mm/dd/yy
hhmi
Name:
Event Start:
TIX Closed:
Phone:
Event End:
Event Information
Ident:
Equip:
City:
St:
Lead Org:
Svc Area:
Event Type:
Freq:
Log Id:
Code:
Event Mgr:
Delays:
Platform:
Cost:
Source:
Sub Source:
Event Summary
Event Notes
This is currently the FAA Maintenance Management System Mainframe event code category. In the GPS SETS module is replaced by Joint Spectrum Interference Resolution (JSIR) date time group .
Search
Open Tickets
Reset
Done
Internet
100%
start
SETS - Windows Inter...
10:56 AM


ICAV Next Generation - Windows Internet Explorer
https://earth.dhs.gov/NextGen/
Live Search
File Edit View Favorites Tools Help
ICAV Next Generation
Page Tools
UNCLASSIFIED
iCAV
Next Generation
Find a Place (e.g. an Address, City, or Place)
Search
e.g. 1600 Pennsylvania Ave, Washington, DC or Statue of Liberty
Options
Help
Logout
Link
Active Tool: None (Map Navigation)
Tools
Overlays
Tasks / Results
Imagery
Streets
Hybrid
ONTARIO
Moosonee
Winnipeg
Great Falls
MONTANA
NORTH DAKOTA
Fargo
MINNESOTA
WISCONSIN
Minneapolis
Sioux Falls
SOUTH DAKOTA
IDAHO
Boise City
WYOMING
Salt Lake City
Cheyenne
NEBRASKA
Omaha
IOWA
Des Moines
Chicago
Milwaukee
MICHIGAN
Detroit
Toronto
Buffalo
NEW YORK
Ottawa
Montreal
Quebec
Fredericton
MAINE
VERMONT
Portland
Boston
MASSACHUSETTS
New York
PENNSYLVANIA
Philadelphia
Denver
COLORADO
UTAH
NEVADA
Kansas City
MISSOURI
ILLINOIS
Indianapolis
INDIANA
OHIO
Columbus
Louisville
KENTUCKY
WEST VIRGINIA
Charleston
MARYLAND
VIRGINIA
Virginia Beach
NORTH CAROLINA
Charlotte
Columbia
Atlanta
Birmingham
ALABAMA
GEORGIA
Jacksonville
Wichita
KANSAS
UNITED STATES
Las Vegas
Oklahoma City
OKLAHOMA
TENNESSEE
Memphis
ARKANSAS
Albuquerque
NEW MEXICO
ARIZONA
Phoenix
Dallas
Jackson
TEXAS
LOUISIANA
Houston
New Orleans
Chihuahua
Monterrey
MEXICO
GULF OF MEXICO
FLORIDA
Miami
Havana
Merida
Guadalajara
Mexico
Cursor Position 46.18547° -104.35712°
Scale 1:18,468,600
UNCLASSIFIED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https://earth.dhs.gov/NextGen/
File Edit View Favorites Tools Help
ICAV Next Generation
UNCLASSIFIED
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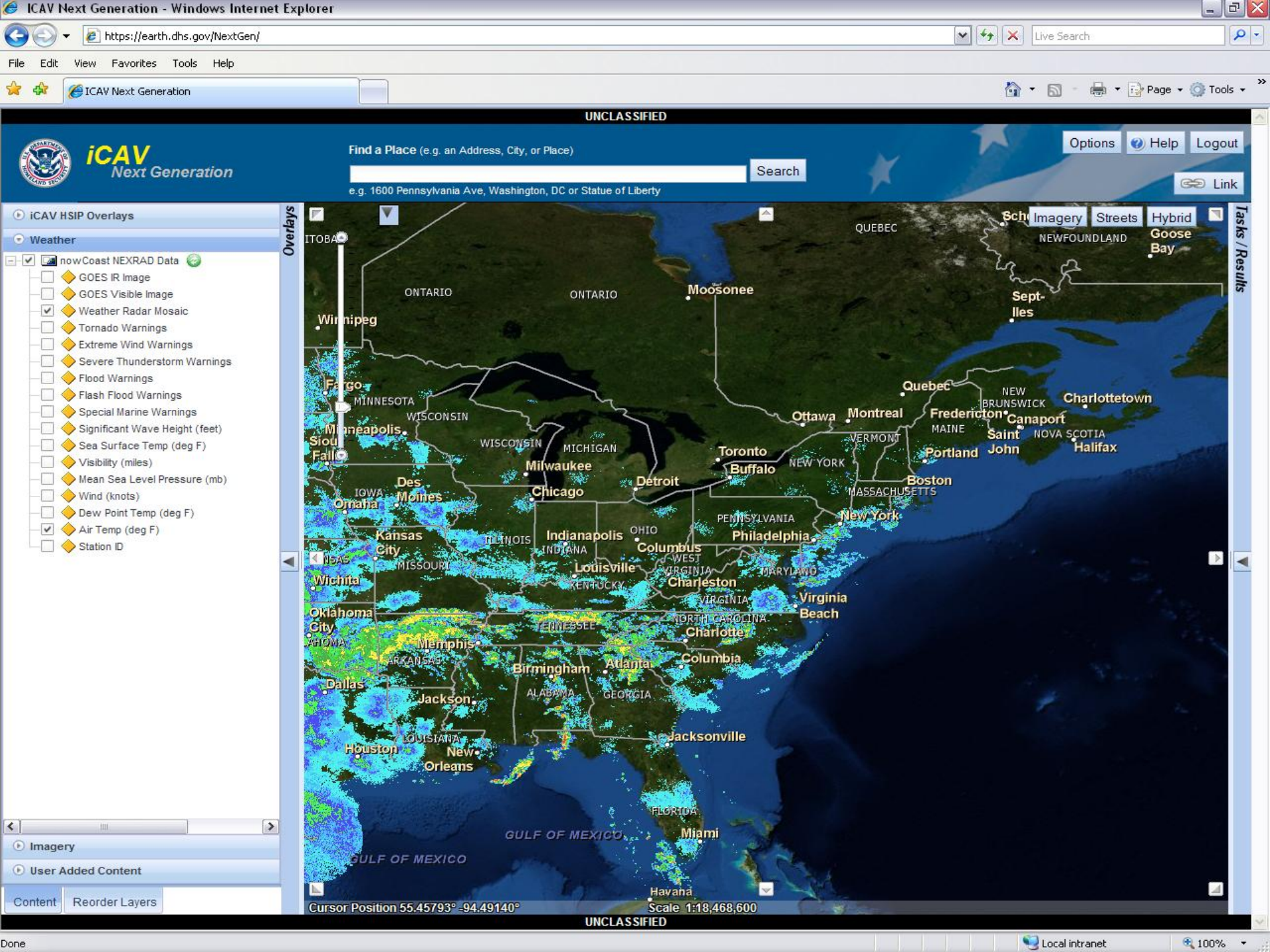
e.g. 1600 Pennsylvania Ave, Washington, DC or Statue of Liberty
Options
Help
Logout
Link
Overlays
iCAV HSIP Overlays
HSIP Agriculture
HSIP Borders And Government
HSIP Chemicals
HSIP Commercial
HSIP Communications
Communications
HSIP Education
HSIP Emergency Services
HSIP Energy
HSIP Finance
HSIP Food
HSIP Hazardous Materials
HSIP Law Enforcement
HSIP Mail
HSIP Manufacturing
HSIP Mining
HSIP National Symbols
HSIP Natural Hazards
HSIP Public Health
HSIP Public Venues
HSIP Transportation Air
HSIP Transportation Ground
HSIP Transportation Water
HSIP Water Supply
Homeland Security Infrastructure Program (HSIP) dataset
Weather
Imagery
User Added Content
Content
Reorder Layers
Active Tool: None (Map Navigation)
Tools
Imagery
Streets
Hybrid
Tasks / Results
ONTARIO
Winnipeg
Great Falls
MONTANA
NORTH DAKOTA
Fargo
MINNESOTA
WISCONSIN
IDAHO
Boise City
SOUTH DAKOTA
Sioux Falls
Minneapolis
WISCONSIN
MICHIGAN
Toronto
Milwaukee
Detroit
Chicago
WYOMING
Salt Lake City
Cheyenne
NEBRASKA
IOWA
Omaha
Des Moines
Denver
COLORADO
NEVADA
UTAH
Kansas City
ILLINOIS
Indianapolis
INDIANA
OHIO
Columbus
WEST VIRGINIA
Louisville
KENTUCKY
Charleston
VIRGINIA
UNITED STATES
KANSAS
MISSOURI
Wichita
Las Vegas
Oklahoma City
OKLAHOMA
TENNESSEE
Charlotte
Albuquerque
NEW MEXICO
ARIZONA
Phoenix
Memphis
ARKANSAS
Birmingham
Atlanta
Columbia
Dallas
ALABAMA
GEORGIA
Jackson
TEXAS
Jacksonville
LOUISIANA
Houston
New Orleans
Chihuahua
FLORIDA
Miami
Monterrey
GULF OF MEXICO
GULF OF MEXICO
MEXICO
Havana
Guadalajara
Merida
Cursor Position 44.99895° -102.35761°
Scale 1:18,468,600
UNCLASSIFIED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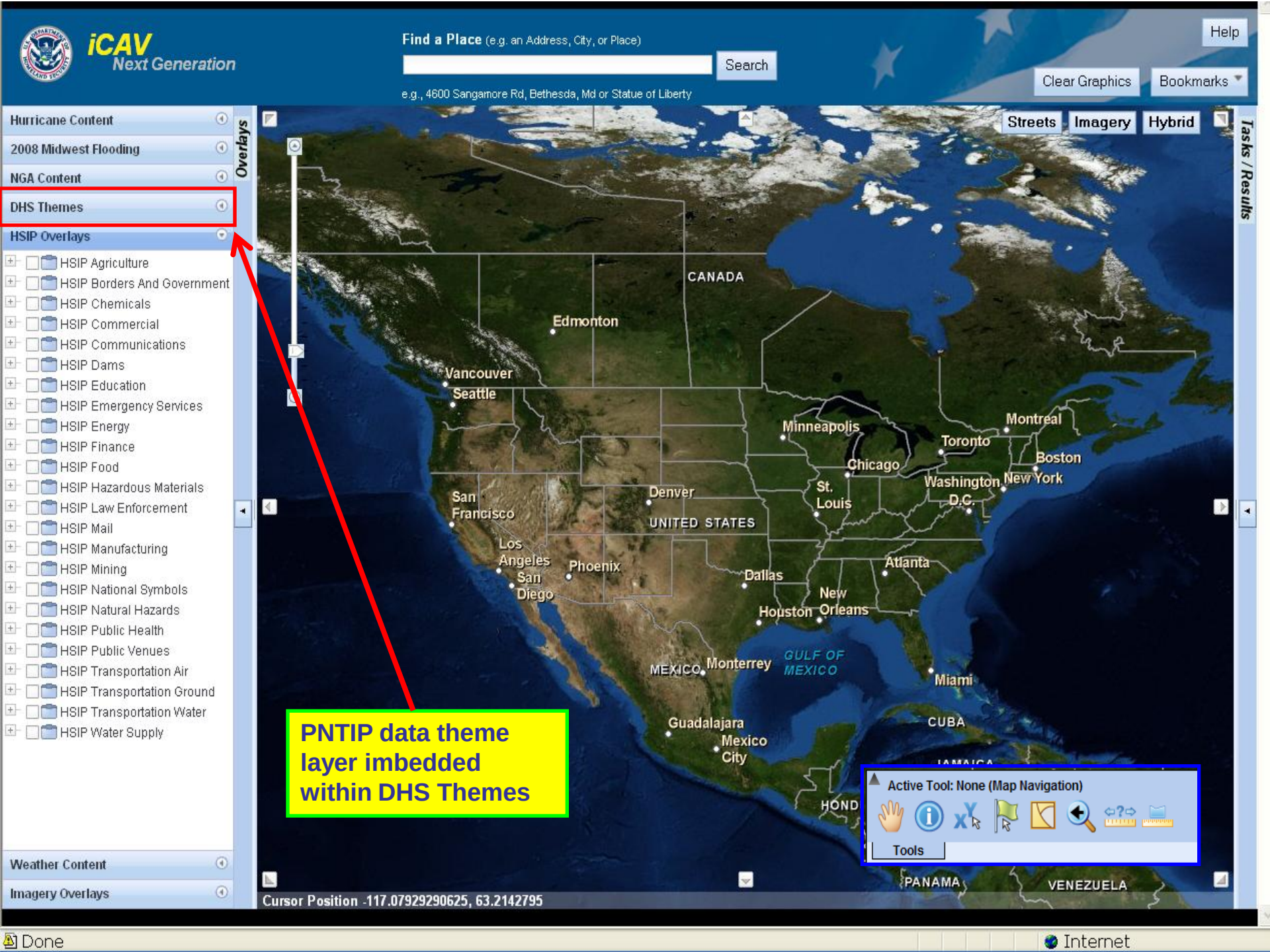
e.g. 1600 Pennsylvania Ave, Washington, DC or Statue of Liberty
Options Help Logout
Link
iCAV HSIP Overlays
Weather
nowCoast NEXRAD Data
GOES IR Image
GOES Visible Image
Weather Radar Mosaic
Tornado Warnings
Extreme Wind Warnings
Severe Thunderstorm Warnings
Flood Warnings
Flash Flood Warnings
Special Marine Warnings
Significant Wave Height (feet)
Sea Surface Temp (deg F)
Visibility (miles)
Mean Sea Level Pressure (mb)
Wind (knots)
Dew Point Temp (deg F)
Air Temp (deg F)
Station ID
Imagery
User Added Content
Content
Reorder Layers
Overlays
Tasks / Results
Imagery
Streets
Hybrid
QUEBEC
NEWFOUNDLAND
Goose Bay
ONTARIO
Moosonee
Sept-Iles
Winnipeg
Fargo
MINNESOTA
WISCONSIN
Minneapolis
Sioux Falls
Quebec
NEW BRUNSWICK
Charlottetown
Ottawa
Montreal
Fredericton
Canaport
MAINE
Saint John
NOVA SCOTIA
Halifax
VERMONT
Portland
Toronto
Buffalo
NEW YORK
Milwaukee
MICHIGAN
Detroit
Chicago
Boston
MASSACHUSETTS
IOWA
Des Moines
Omaha
PENNSYLVANIA
New York
Philadelphia
Kansas City
ILLINOIS
Indianapolis
INDIANA
OHIO
Columbus
MISSOURI
Louisville
WEST VIRGINIA
MARYLAND
Wichita
KENTUCKY
Charleston
Virginia Beach
Oklahoma City
TENNESSEE
NORTH CAROLINA
Charlotte
Memphis
ARKANSAS
Columbia
Atlanta
Birmingham
Dallas
ALABAMA
GEORGIA
Jackson
Jacksonville
LOUISIANA
Houston
New Orleans
FLORIDA
Miami
GULF OF MEXICO
Havana
Cursor Position 55.45793° -94.49140°
Scale 1:18,468,600
UNCLASSIFIED
Done
Local intranet
100%


iCAV
Next Generation
Find a Place (e.g. an Address, City, or Place)
Search
e.g., 4600 Sangamore Rd, Bethesda, Md or Statue of Liberty
Help
Clear Graphics
Bookmarks
Overlays
Hurricane Content
2008 Midwest Flooding
NGA Content
DHS Themes
HSIP Overlays
HSIP Agriculture
HSIP Borders And Government
HSIP Chemicals
HSIP Commercial
HSIP Communications
HSIP Dams
HSIP Education
HSIP Emergency Services
HSIP Energy
HSIP Finance
HSIP Food
HSIP Hazardous Materials
HSIP Law Enforcement
HSIP Mail
HSIP Manufacturing
HSIP Mining
HSIP National Symbols
HSIP Natural Hazards
HSIP Public Health
HSIP Public Venues
HSIP Transportation Air
HSIP Transportation Ground
HSIP Transportation Water
HSIP Water Supply
Weather Content
Imagery Overlays
Streets
Imagery
Hybrid
Tasks / Results
CANADA
Edmonton
Vancouver
Seattle
Minneapolis
Montreal
Toronto
Boston
Chicago
New York
Washington D.C.
St. Louis
Denver
San Francisco
UNITED STATES
Los Angeles
San Diego
Phoenix
Dallas
Atlanta
New Orleans
Houston
GULF OF MEXICO
MEXICO
Monterrey
Miami
CUBA
Guadalajara
Mexico City
PANAMA
VENEZUELA
Active Tool: None (Map Navigation)
Tools
PNTIP data theme layer imbedded within DHS Themes
Cursor Position -117.07929290625, 63.2142795
Done
Internet

National Level Operations Plan

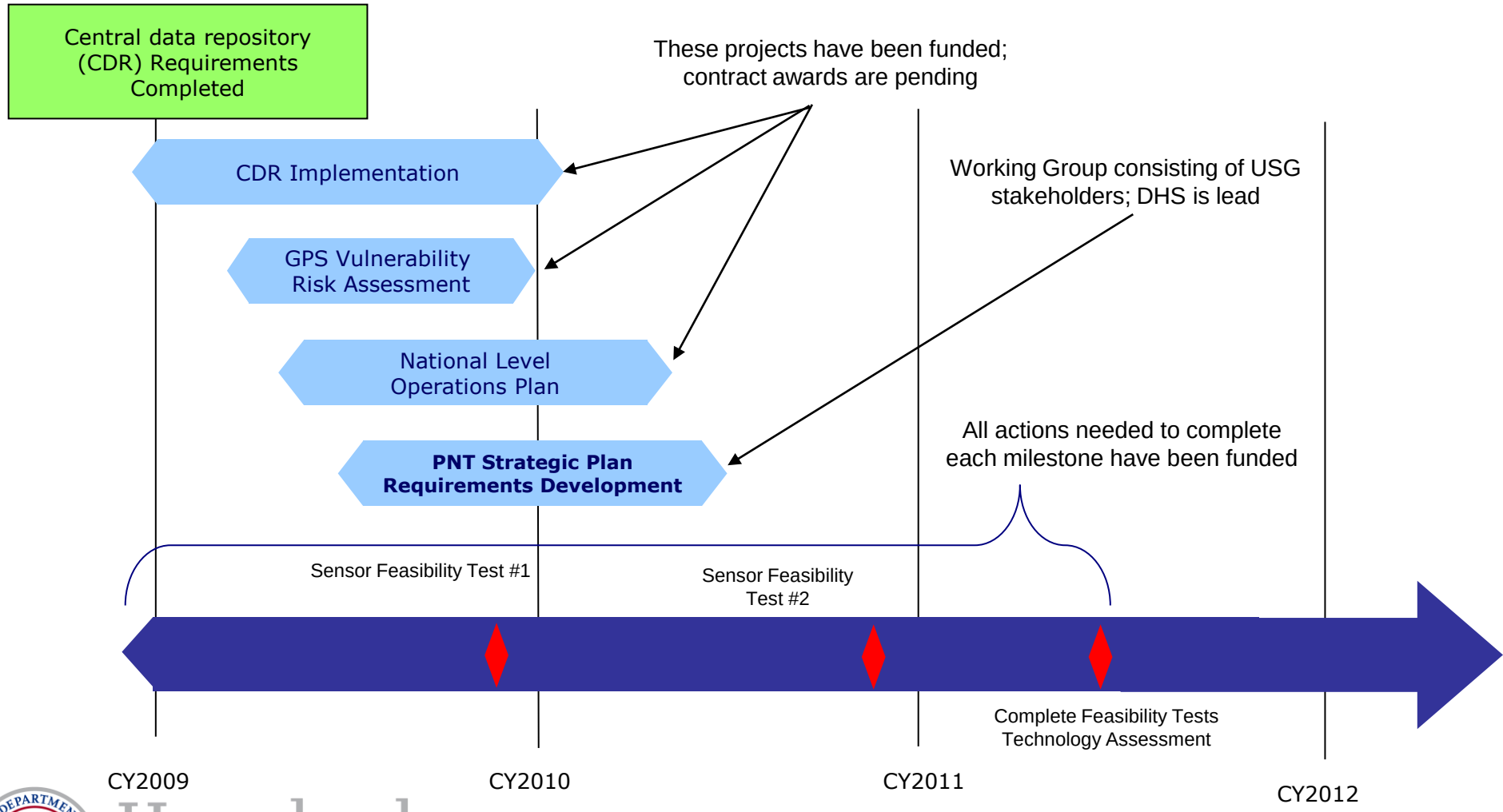
2. Develop & maintain capabilities, procedures & techniques, & routinely exercise civil contingency responses to ensure continuity of operations in the event that access to GPS signal is disrupted or denied.
   - National Security Council – Chartered Purposeful Interference Response Team & DOT-DOD Information Dissemination & Coordination Team sponsored events
   - CPX exercises to test/evaluate supporting authorities, multi-agency collaborative environment for shared situational awareness, roles/responsibilities… etc…
   - Evaluate effects on the Critical Infrastructure and Key Resource (CIKR) sectors

National Sensor Capability

3. Coordinate domestic capabilities to identify, analyze, locate, attribute, & mitigate sources of interference to the GPS & its augmentations.
   - System-of-Systems approach to provide real-time monitoring (preparedness), location & notification (response) of GPS interference for protecting the Nation's CIKR sectors.
     - Designed with government & commercial hardware
     - Persistent monitoring yields situational awareness
     - Timely response to anomalies
     - Sensor placement based on PNT CIKR Criticality
     - Remains operational when GPS systems is "stressed"
   - Collective Effort by various USG entities
   - Significant Cost & Risk reduction by taking full advantage of mature, existing systems

Path to a National Sensor Capability

CIKR National Level Protection



QUESTIONS?

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202-447-3731

Homeland Security