GeoNOVA

Nova Scotia Coordinate Referencing System

June 2024 Update

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NOVA SCOTIA

Topics

1. NSHPN Adjustments
2. NSACS Updates
3. Adopt a Monument
4. Coordinate Referencing Viewer
5. NATRF2022
6. NRTK Best Practices
7. Vendor Demonstrations/Details

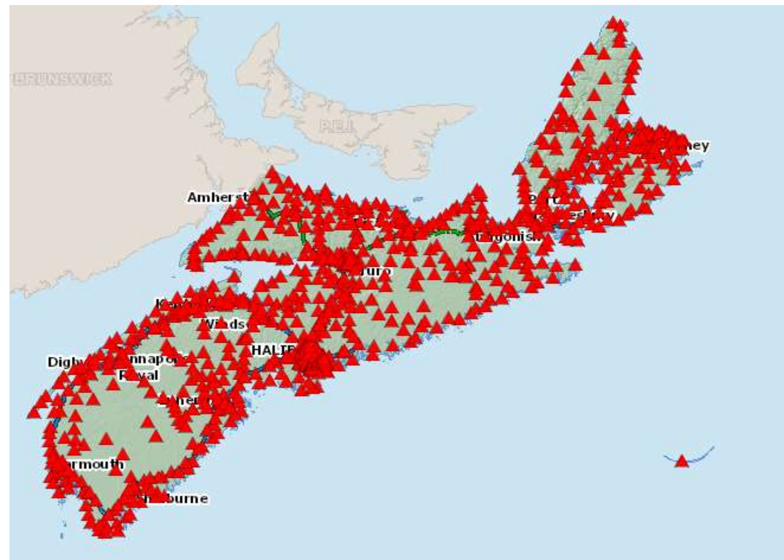
NSHPN Adjustments

- Used to upgrade former NSCCS (ATS77) monuments to NSHPN (NAD83(CSRS)2010.0 v6)

- Spring 2024 adjustment is ongoing and data has been submitted for update of Coordinate Reverencing Viewer.

- Spring 2024 adjustment should add approximately 100+ new NSHPNs to the existing network.

- Observations came primarily from municipal and government surveyors



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NSACS Updates

- Completion of procurement for replacement of geodetic grade GNSS receivers for NSACS. Winning company was Septentrio for receivers and antennas.
- Purchase of new GNSS management software. GEO++ was the winning company to provide software.
  - Will allow GNS to stream data to service providers.
  - Potential to stream our own NRTK corrections to government users.
  - Will allow all service providers to receive 4 constellation data.
- Analysis will be conducted during that time to see if any areas of the province would benefit from infill with new NSACS sites.

Geo++®

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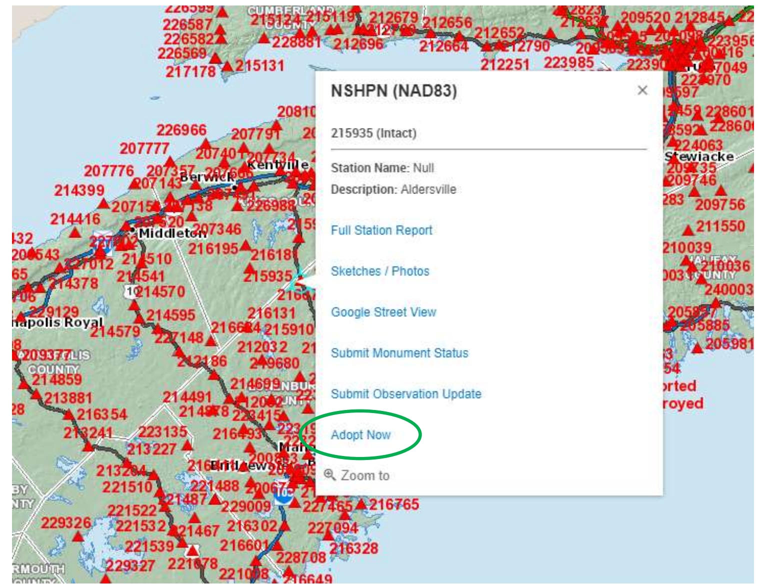
NSACS Updates (con't)

- 11 New GNSS receivers (11X Septentrio Polar Rx5 and 3X Septentrio Verachoke antennas) have been purchased in Spring of 2024. Can receive all four constellations (GPS, GLONASS, Galileo, BeiDou) and will be installed during the yearly maintenance campaign. Locations will be determined after consultation with service providers.

- GATZ ACS will be moved in the next coming months due to the existing school being replaced/moved.

Adopt a Monument

- Crowdsourcing initiative that allows qualified surveyors to maintain NSHPN's around the province
- Surveyors are required to provide observations (2 per year), maintain monument and surrounding area and provide photos and condition updates to the Coordinate Referencing Viewer
- Data submissions can still be provided to upgrade ATS77 coordinates at NSCCS's to NAD83(CSRS)2010.0 v6 to upgrade to NSHPN status
    - Require 3 observations sets at a minimum of 10 minutes (1 second update rate) with NRTK (1 submission must be using different surveyor, equipment and day).
    - Photos need to be provided (equipment setup, general site, monument condition)
    - Outside of NRTK, static observation sets must be minimum of 30 minutes at 1 second update rate.



Adopt a Monument (cont.)

CompassView and Camera Angle Apps

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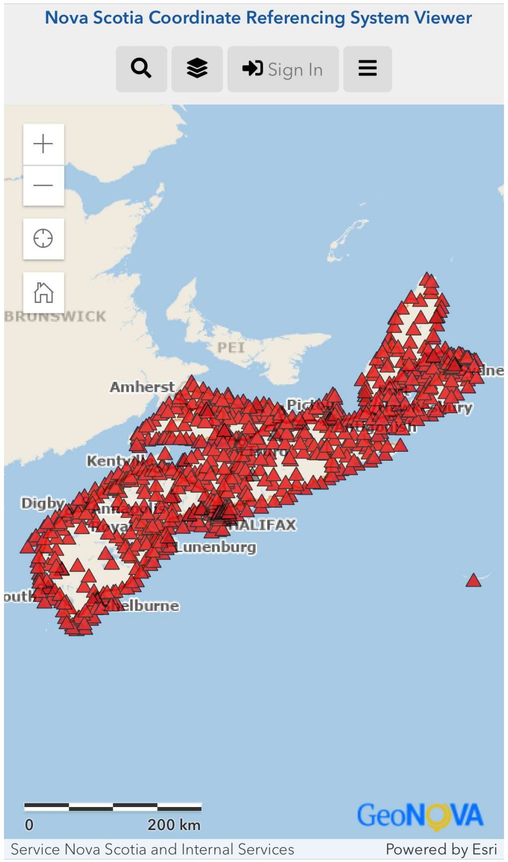
Adopt a Monument (cont.)

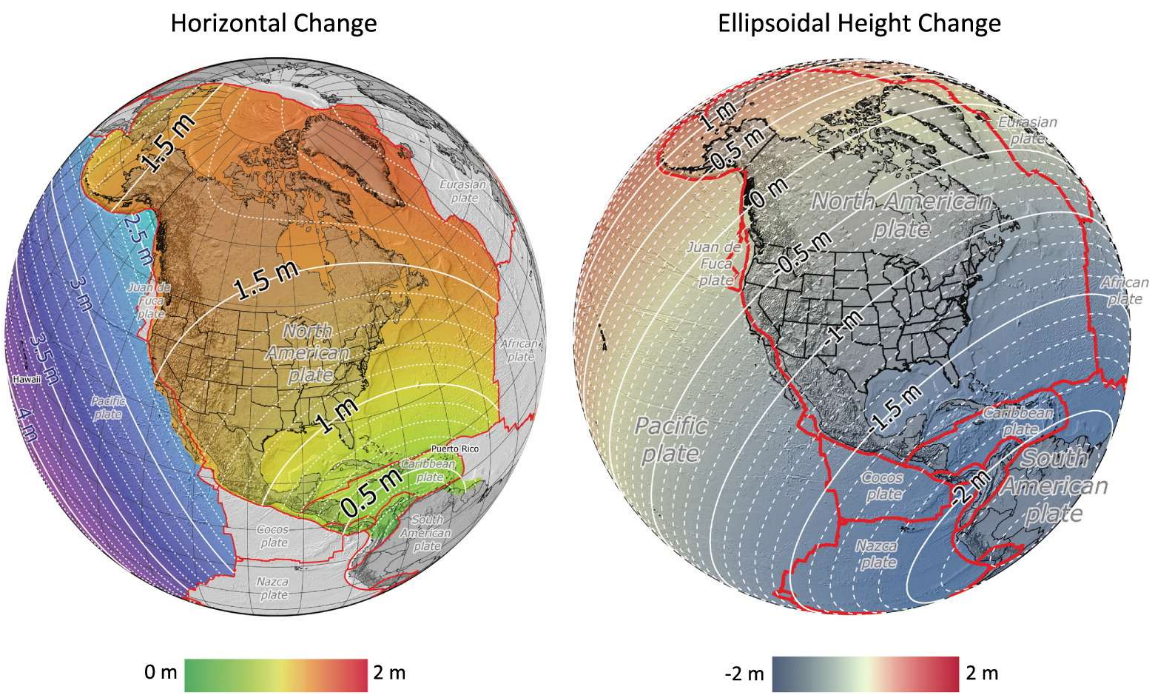
Mobile Coordinate Referencing Viewer



- Released in May of 2023 and now provides users the ability to use Apple and Android platforms
- Now provides users the ability to filter more types of monuments to show active and destroyed monuments
- User can now provide updates for damaged and destroyed monuments through their mobile devices
- https://nsgi.novascotia.ca/nscrs-viewer

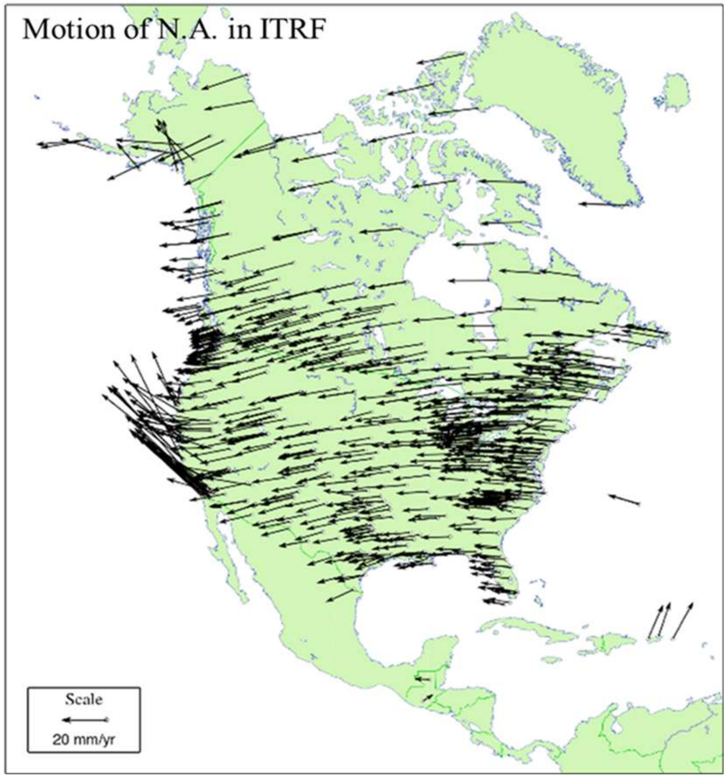
NATRF2022 – What is NATRF2022?

- Current federally adopted system in Canada is NAD83(CSRS)2010.0 v7 and is offset from CoM by ~2.2m
- NATRF2022 will aligned to ITRF2020 at epoch 2020.0 and will be truly geocentric
- Fully compatible with GNSS observations and orbits
- Differences between NAD83(CSRS) and NATRF2022 in NS will be ~1.3m horizontally and 1.1m vertically (ellipsoid)



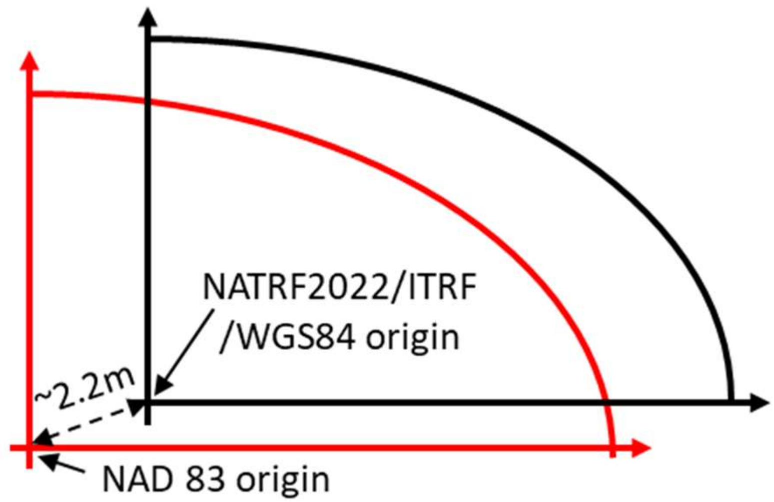
NATRF2022 – What is NATRF2022?

- Like NAD83, NATRF2022 will drift away from ITRF2020 to the motion of the North American Plate
- Dynamic reference system that will be similar to NAD83(CSRS) where coordinates change with time
- Intra-Frame Deformation Model (IFDM) will allow coordinates to be calculated at different epochs to account for changes in time. This in essence replaces velocity models.
- IFDM is expected to account for more complex dynamic motions (e.g. position offsets, seasonal signals, post seismic deformations)



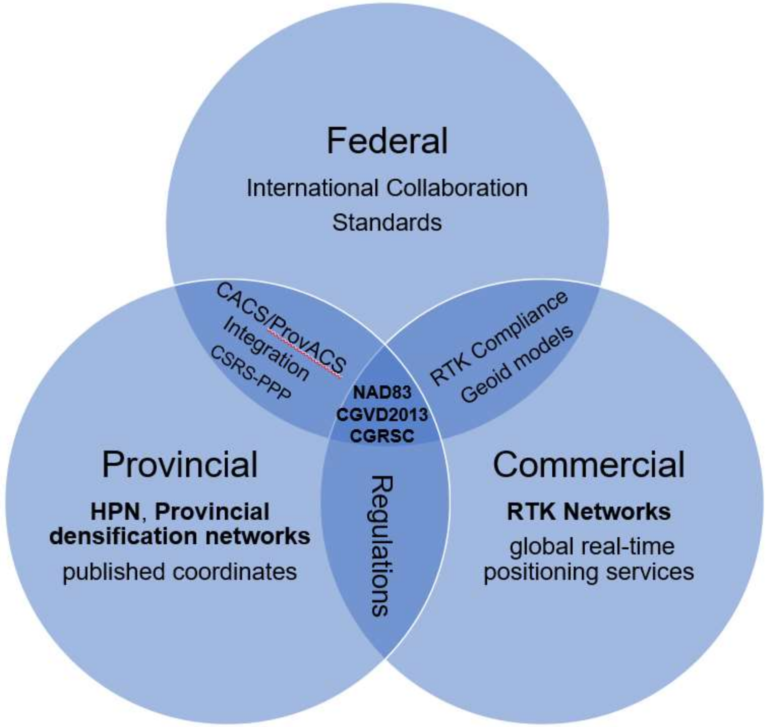
NATRF2022 – Why switch to NATRF2022?

- NATRF2022 is geocentric and will remove ~2.2m offset in comparison to WGS84/ITRF with NAD83
- Will be fully compatible with GNSS technology in a market that relies heavily on GNSS from both expert and mainstream users
- NATRF2022 better supports modern space based positioning solutions (e.g. commercial RTK, RTN, and RTPPP)
- Serves as an economic driver for industry in the geospatial digital economy by having a shared reference system
- No more support from federal level (CGS)

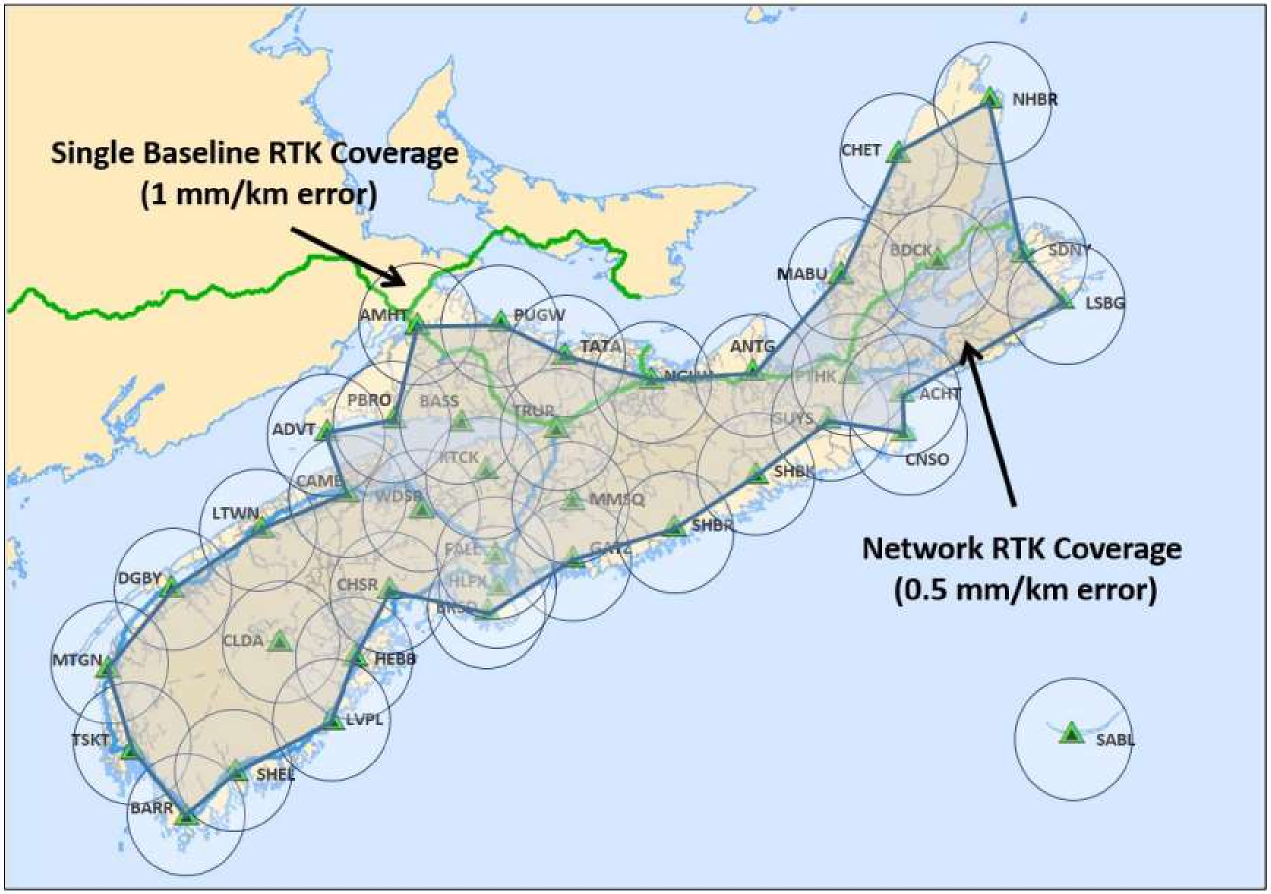


NATRF2022 – When is it being implemented?

- Canadian Geodetic Survey (CGS) has committed to adopting and implementing NATRF2022 in 2025 from a federal level
- Canadian Geodetic Reference System Committee (CGRSC) has supported the move to adopt NATRF2022 and is currently consulting with partners in all provinces
- Canadian Council on Geomatics (CCOG) has signed off on supporting the move to NATRF2022
- Provinces will have tools from CGS to begin implementing NATRF2022 in 2025



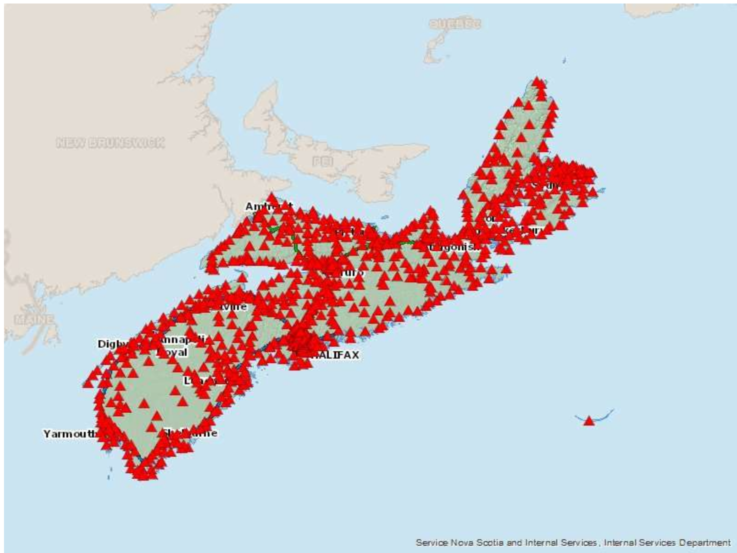
1. Nova Scotia Active Control Stations



- Quick adoption of NATRF2022 following NRCan adjustment
- Service Providers to follow NRCan recommendations
- Instant access to NATRF2022
- Ability to broadcast on legacy and NATRF2022

2. Re-observation and expansion of HPN

- Established process of re-observing HPN
- 1300 HPN
- Summer program
- ANSLS, GNS, COGS



Pros	Cons
Greater certainty in quality of HPN coordinates	Cost
Coordinates directly calculated in NATRF2022, no further adjustment needed	
HPN maintained and more accessible for QA/QC	

Estimated Cost : ~$220,000

2. Re-observation and expansion of HPN

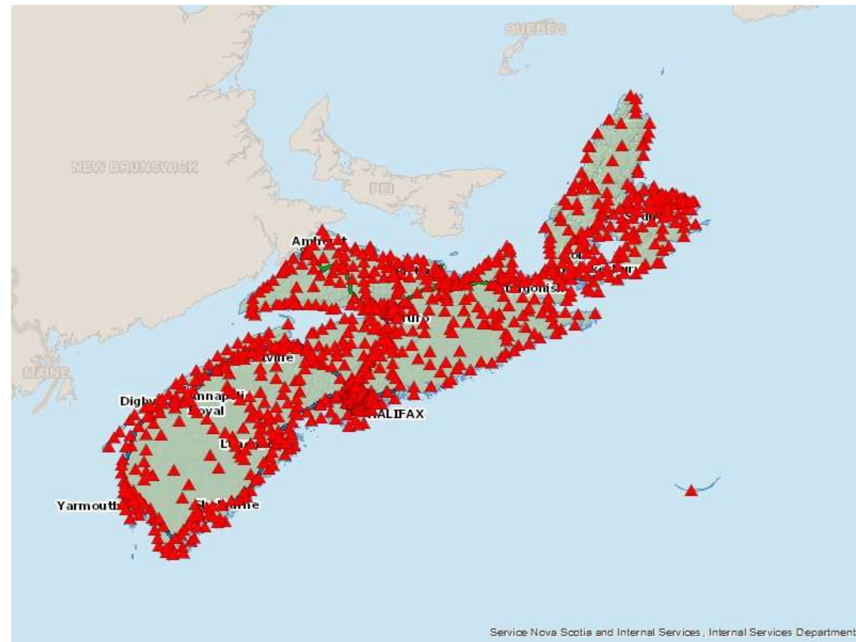
- 500 new HPN

Pros	Cons
More accessible HPN for QA/QC, differential GNSS and conventional instruments	Cost
Opportunity for better grid shift file for historic data sets	

Estimated Cost : ~$110,000

3. Coordinate Transformation

Pros	Cons
Straightforward task with minimal cost	Coordinates will only be accurate if the control monuments have not moved over time (true whether or not a transformation takes place, but a re-observation campaign would provide updated values)



- New NRCan Tools (TRX)to support coordinate transformation

Estimated Cost : ~$50,000

4. Grid Shift Files

Accuracy	Accessibility	Cost	Comments
Dependent upon distortion in original network	File is applicable to all modelled regions	Medium	Enables historic data sets to be migrated to NATRF2022

- NRCan/CGRSC is investigating Tools to support development of Grid Shift Files
- Best suited for GIS layers
- HPN observations also required

Estimated Cost : ~$70,000

5. Readjustment of Passive Network

Accuracy	Accessibility	Cost	Comments
Dependent upon stability of passive network and quality of observations	Dependent upon density of existing monuments	Dependent upon familiarity with observations to be adjusted	Publishing distorted NATRF2022 coordinates should be avoided as it will cause distrust in the new system

- **Not recommended**
- Accuracy based on past observations
- Better to use access to NSACS and NRTK network

NATRF 2022 – Nova Scotia Implementation

- Upgrades of NSACS receivers and antennas– 2024 – 2029
- NRTK Correction software – GEO++ (~end of 2024/25 fiscal year)
- NATRF2022 NSACS coordinates – as provided by NRCAN ~2025
- NATRF2022 access – as soon as NSACS coordinates are updated
  - Staged roll out to full implementation
- HPN NATRF2022 – as soon as NSACS coordinates are updated
- Tools for Coordinate Transformation – NRCan

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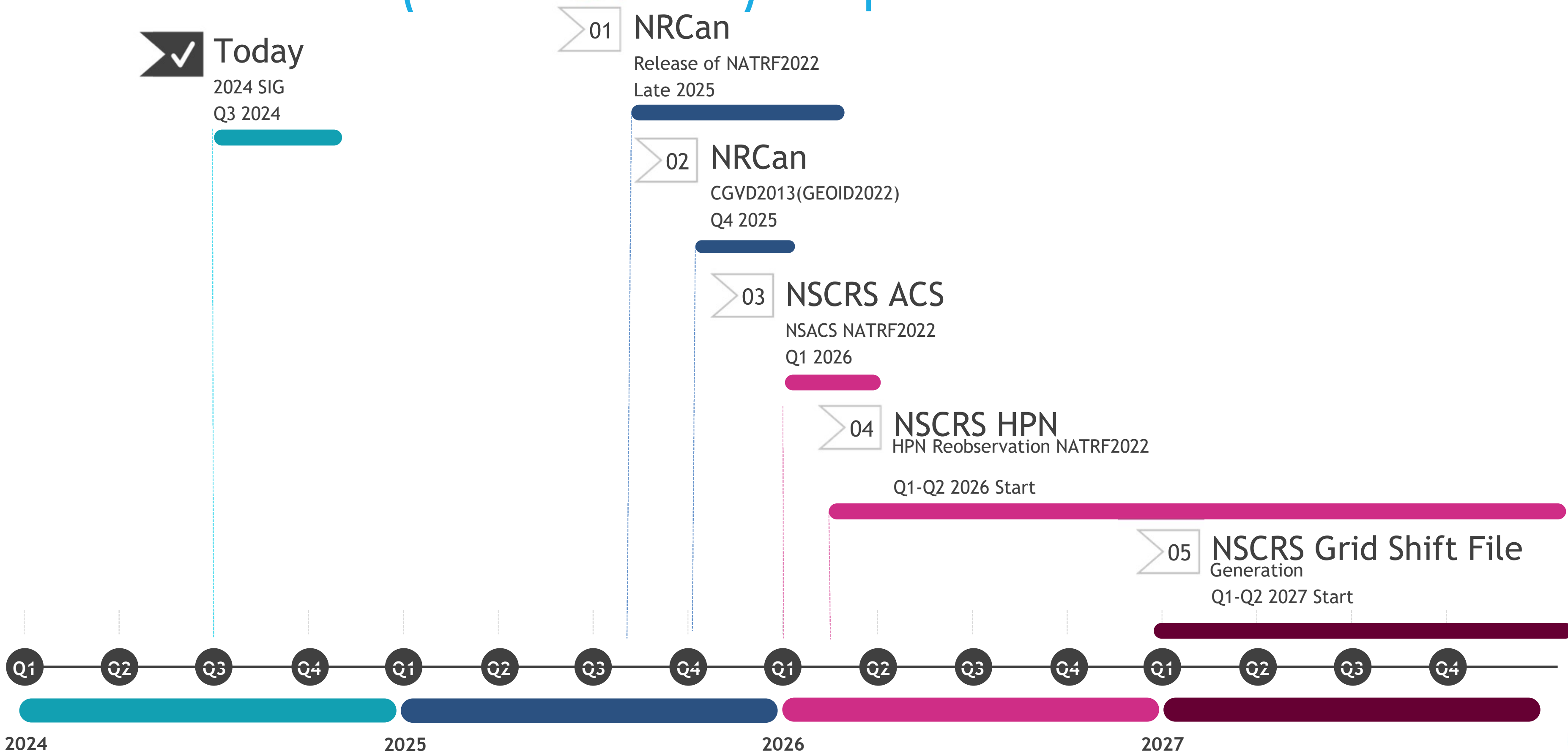
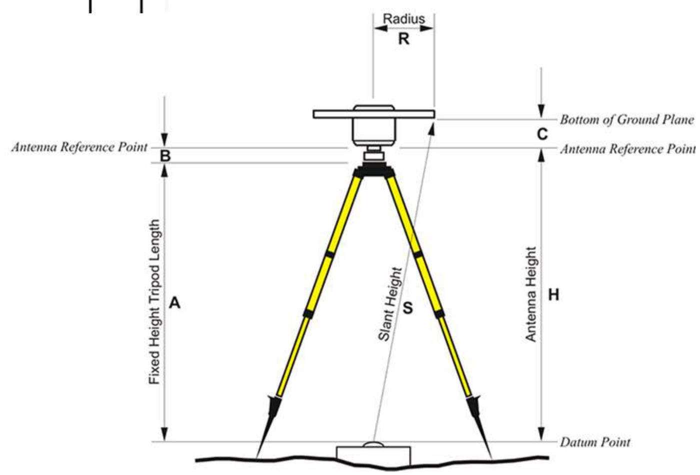
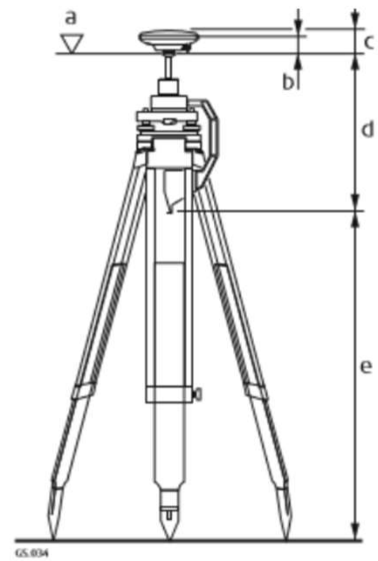
Nova Scotia NATRF2022 and CGVD2013(NAPGD22) Implementation Plan



NRTK Best Practices - Heights



NRTK Best Practices - Heights



a) Mechanical reference plane
b) Vertical phase centre offset for L1
c) Vertical phase centre offset for L2
d) Vertical offset
e) Vertical height reading

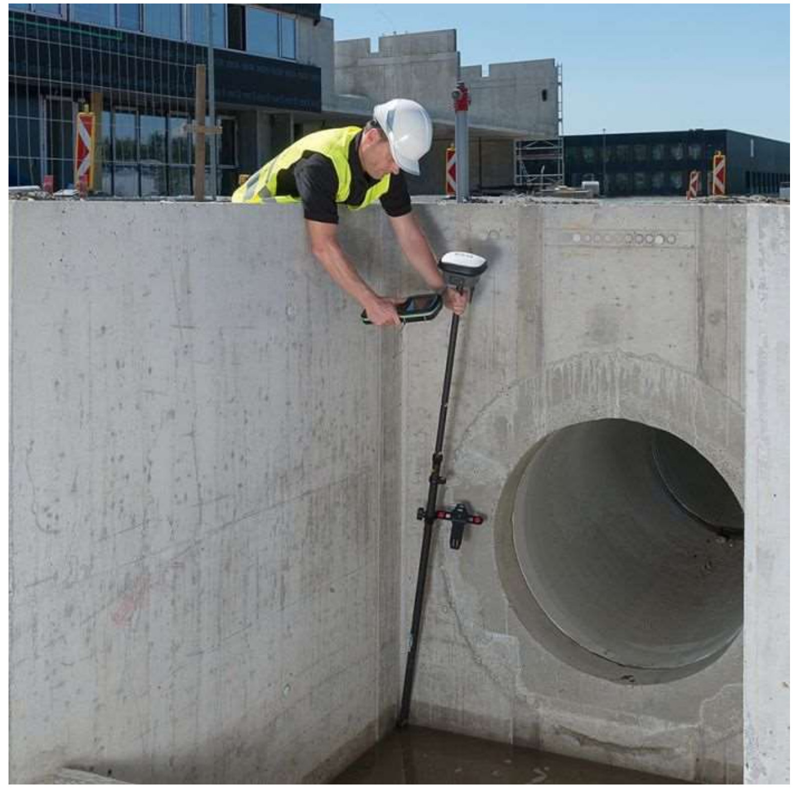
NRTK Best Practices – Tilt RTK Sensors

MEASUREMENT PERFORMANCE & ACCURACY[1]		
Time for RTK initialisation		Typically 4 s
Real-time kinematic (Compliant to ISO17123-8 standard)	Single baseline Network RTK	Hz 8 mm + 1 ppm | V 15 mm + 1 ppm Hz 8 mm + 0.5 ppm | V 15 mm + 0.5 ppm
Real-time kinematic tilt compensated	Not for static control points	Additional Hz uncertainty typically less than 5 mm + 0.4 mm/° tilt down to 30° tilt
RTK bridging	Up to 10 min bridging of RTK outages	Hz 2.5 cm | V 5 cm
PPP	Initial convergence to full accuracy typically 10 min, Re-convergence < 1 min	Hz 2.5 cm | V 5 cm
Post processing	Static (phase) with long observations Static and rapid static (phase)	Hz 3 mm + 0.1 ppm | V 3.5 mm + 0.4 ppm Hz 3 mm + 0.5 ppm | V 5 mm + 0.5 ppm
Code differential	DGNSS	Hz 25 cm | V 50 cm

REAL TIME KINEMATIC SURVEYING		
Single Baseline <30 km		
	Horizontal	8 mm + 1 ppm RMS
	Vertical	15 mm + 1 ppm RMS
Network RTK[4]		
	Horizontal	8 mm + 0.5 ppm RMS
	Vertical	15 mm + 0.5 ppm RMS
RTK start-up time for specified precisions[5]		2 to 8 seconds
TRIMBLE INERTIAL PLATFORM (TIP) TECHNOLOGY		
TIP Compensated Surveying[6]		
	Horizontal	RTK + 5 mm + 0.4 mm/° tilt (up to 30°) RMS
	Horizontal	RTX + 5 mm + 0.4 mm/° tilt (up to 30°) RMS
IMU Integrity Monitor	Bias monitoring	Temperature, age and shock

- **10 ° of tilt can introduce ~9mm of error into your observation. In addition to the already 8mm/15mm + 0.5ppm.**

NRTK Best Practices – Tilt RTK Sensors



NRTK Best Practices - Obstructions

NRTK Best Practices – Orbits

Table 2.5.: Errors in baseline components due to orbit errors.

Orbit Error	Baseline Length	Baseline Error	Baseline Error
2.5 m	1 km	0.1 ppm	– mm
2.5 m	10 km	0.1 ppm	1 mm
2.5 m	100 km	0.1 ppm	10 mm
2.5 m	1000 km	0.1 ppm	100 mm
0.05 m	1 km	0.002 ppm	– mm
0.05 m	10 km	0.002 ppm	– mm
0.05 m	100 km	0.002 ppm	0.2 mm
0.05 m	1000 km	0.002 ppm	2 mm

Table 2.6.: Estimated quality of orbits in 2015 (see `http://www.igs.org/products`).

Orbit Type	Quality	Delay of Availability	Available at
Broadcast Orbits	~ 1 m	Real–time	Broadcast message
CODE Ultra Rapid Orbits	< 5 cm	Real–time	CODE through FTP
CODE Rapid Orbits	< 2.5 cm	After 12 hours	CODE through FTP
CODE Final Orbits	< 2.5 cm	After 5–11 days	CODE, IGS Data Centers
IGS Ultra Rapid Orbit (pred)	~ 5 cm	Real–time	IGS Data Centers
IGS Ultra Rapid Orbit (obs)	< 3 cm	After 3 hours	IGS Data Centers
IGS Rapid Orbit	< 2.5 cm	After 17 hours	IGS Data Centers
IGS Final Orbit	< 2.5 cm	After ~13 days	IGS Data Centers

Dach, R., S. Lutz, P. Walser, P. Fridez (Eds); 2015: **Bernese GNSS Software Version 5.2.** User manual, Astronomical Institute, University of Bern, Bern Open Publishing. DOI: 10.7892/boris.72297; ISBN: 978-3-906813-05-9.

NRTK Best Practices – Orbits

CSRS-PPP 3.54.2 (2022-11-10)

KM032560.23o
KM03

Data Start	Data End	Duration of Observations
2023-09-13 10:10:30.00	2023-09-13 21:03:30.00	10:53:00
Processing Time		**Product Type**
16:30:36 UTC 2024/04/30		NRCan/IGS Final
Observations	**Frequency**	**Mode**
Phase and Code	Double	Static

Elevation Cut-Off	Rejected Epochs	Fixed Ambiguities	Estimation Steps
7.5 degrees	0.00 %	69.46 %	30.00 sec

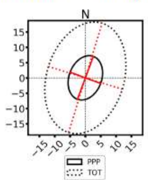
Antenna Model	APC to ARP	ARP to Marker
EML_REACH_RS2 NONE	L1 = 0.135 m L2 = 0.137 m	H:1.821m / E:0.000m / N:0.000m

(APC = antenna phase center; ARP = antenna reference point)

Estimated Position for KM032560.23o

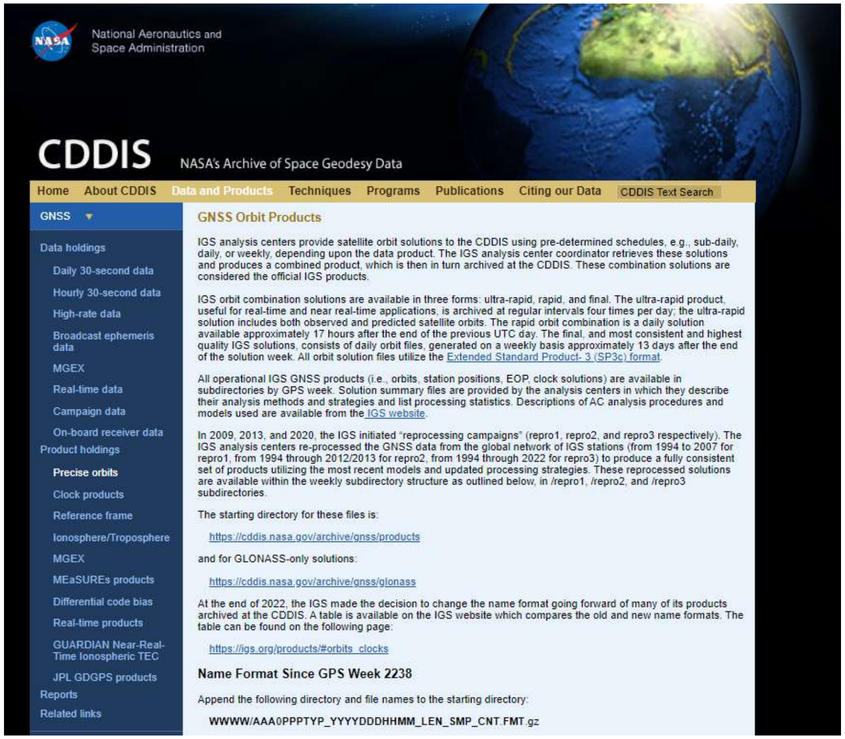
	Latitude (+n)	Longitude (+e)	Ell. Height
NAD83(CSRS) (2010.0)†	45° 43' 34.06393"	-63° 52' 47.98550"	-10.341 m
SIG_PPP(95%)‡	0.006 m	0.004 m	0.021 m
SIG_TOT(95%)‡	0.015 m	0.011 m	0.023 m
A priori*	45° 43' 34.11191"	-63° 52' 48.09253"	-5.735 m
Estimated – A priori	-1.481 m	2.314 m	-4.606 m

Orthometric Height CGVD2013 (CGG2013a) (2010.0)	95% PPP Error Ellipse (mm)	95% TOT Error Ellipse (mm)	UTM (North) Zone 20
7.768 m (click for height reference information)	semi-major: 7 mm semi-minor: 5 mm semi-major azimuth: 20° 20' 28.49"	semi-major: 19 mm semi-minor: 13 mm semi-major azimuth: 17° 3' 1.7"	5063995.794 m (N) 431524.539 m (E) Scale Factors 0.99965764 (point) 0.99965927 (combined)



*(Coordinates from RINEX header used as a priori position)

†(Epoch transformation using velocity grid NAD83v70VG (click for documentation))



GNSS Orbit Products

IGS analysis centers provide satellite orbit solutions to the CDDIS using pre-determined schedules, e.g., sub-daily, daily, or weekly, depending upon the data product. The IGS analysis center coordinator retrieves these solutions and produces a combined product, which is then in turn archived at the CDDIS. These combination solutions are considered the official IGS products.

IGS orbit combination solutions are available in three forms: ultra-rapid, rapid, and final. The ultra-rapid product, useful for real-time and near real-time applications, is archived at regular intervals four times per day; the ultra-rapid solution includes both observed and predicted satellite orbits. The rapid orbit combination is a daily solution available approximately 17 hours after the end of the previous UTC day. The final, and most consistent and highest quality IGS solutions, consists of daily orbit files, generated on a weekly basis approximately 13 days after the end of the solution week. All orbit solution files utilize the Extended Standard Product- 3 (SP3c) format.

All operational IGS GNSS products (i.e., orbits, station positions, EOP, clock solutions) are available in subdirectories by GPS week. Solution summary files are provided by the analysis centers in which they describe their analysis methods and strategies and list processing statistics. Descriptions of AC analysis procedures and models used are available from the IGS website.

In 2009, 2013, and 2020, the IGS initiated "reprocessing campaigns" (repro1, repro2, and repro3 respectively). The IGS analysis centers re-processed the GNSS data from the global network of IGS stations (from 1994 to 2007 for repro1, from 1994 through 2012/2013 for repro2, from 1994 through 2022 for repro3) to produce a fully consistent set of products utilizing the most recent models and updated processing strategies. These reprocessed solutions are available within the weekly subdirectory structure as outlined below, in /repro1, /repro2, and /repro3 subdirectories.

The starting directory for these files is:

https://cddis.nasa.gov/archive/gnss/products

and for GLONASS-only solutions:

https://cddis.nasa.gov/archive/gnss/glonass

At the end of 2022, the IGS made the decision to change the name format going forward of many of its products archived at the CDDIS. A table is available on the IGS website which compares the old and new name formats. The table can be found on the following page:

https://igs.org/products/#orbits_clocks

Name Format Since GPS Week 2238

Append the following directory and file names to the starting directory:

WWWW/AAA0PPPTYP_YYYYDDDHHMM_LEN_SMP_CNT.FMT.gz

http://ftp.aiub.unibe.ch/CODE_MGEX/CODE/2024/

NRTK Best Practices – Antenna Calibration

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KM032560.23o
KM03

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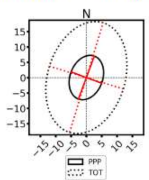

*(Coordinates from RINEX header used as a priori position)

†(Epoch transformation using velocity grid NAD83v70VG (click for documentation))

Antenna Calibrations

National Geodetic Survey

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

Browse Antenna Information by Company Brand and Model ▾ Access Calibrations

This web site provides Global Navigation Satellite System (GNSS) antenna calibrations for specific antenna types (antenna code + radome code). These calit

NGS offers complete, downloadable files of absolute antenna calibrations in both ANTEX and ANTINFO formats. These can be found under the "Access Calit

A new reference system, IGS20, was released on 2 October 2022, replacing the previous IGS14 reference system. As a service to users, NGS will offer comp

When processing data, please check that you are using the antenna calibration product for the reference frame (IGS14 or IGS20) consistent with the orbits an

Click on menu item "Browse Antenna Information by Company Brand and Model" to view antenna metadata such as photographs, diagrams, height measurer frame for one antenna at a time.

If you need older products such as IGS08 calibrations, please contact ngs.antcal @ noaa.gov.

NGS also calibrates survey-grade antennas from qualified providers. See **Policy** and **Procedures** documents for details.

```
     1.4            M                                       ANTEX VERSION / SYST
A                                                           PCV TYPE / REFANT
############################################################ COMMENT
General hint for satellite antenna corrections:             COMMENT
   All values in this file refer to an IGS-specific axis    COMMENT
   convention which differs from manufacturer               COMMENT
   specifications for certain satellite types. The IGS      COMMENT
   convention allows for a uniform description of the       COMMENT
   spacecraft attitude for all satellites applying a yaw-   COMMENT
   steering attitude control. Detailed definitions are      COMMENT
   provided in Montenbruck et al. (2015).                   COMMENT
                                                            COMMENT
GPS satellite antenna corrections:                          COMMENT
  - z-offsets:                                              COMMENT
    + satellite-specific                                    COMMENT
    + based on reprocessed (1994-2020) AC SINEX files       COMMENT
    + weighted mean of eight ACs (COD, ESA, GFZ, GRG, JPL,  COMMENT
      MIT, NGS, ULR)                                        COMMENT
    + solutions aligned to ITRF2020                         COMMENT
    + trend-corrected to epoch 2015.0                       COMMENT
    + analyzed and combined by IGN                          COMMENT
    + L1 and L2 set to the results for the ionosphere-free  COMMENT
      linear combination                                    COMMENT
    + block-specific mean values for historical satellites  COMMENT
      (active prior to 1994)                                COMMENT
    + BLOCK IIIA satellites: disclosed PCO values           COMMENT
      adjusted by one common offset in z direction (+89.35) COMMENT
      (GPS, 2021)                                           COMMENT
  - phase center variations:                                COMMENT
    + block-specific                                        COMMENT
    + purely nadir-dependent (no azimuth-dependence)        COMMENT
    + maximum nadir angle: 14 degrees (Block I), 17 degrees COMMENT
      (Block II/IIA/IIR-A/IIR-B/IIR-M/IIF/IIIA)             COMMENT
    + adopted from igs05.atx                                COMMENT
    + solutions aligned to IGb00                            COMMENT
    + unweighted mean of two ACs (GFZ, TUM)                 COMMENT
    + L1 and L2 set to the results for the ionosphere-free  COMMENT
      linear combination                                    COMMENT
    + Block IIF: adopted from igs08.atx, solutions aligned  COMMENT
      to IGS08, unweighted mean of CODE and ESOC            COMMENT
    + BLOCK IIIA: based on estimations by ESA and CODE      COMMENT
    + extension for nadir angles beyond 14 degrees based on COMMENT
      LEO data from 2009 analyzed by CODE                   COMMENT
  - x- and y-offsets:                                       COMMENT
    + block-specific (except for Block IIR)                 COMMENT
    + satellite-specific corrections from pre-flight        COMMENT
      calibrations for Block IIR (Dilssner et al., 2016:    COMMENT
      Evaluating the pre-flight GPS Block IIR/IIR-M antenna COMMENT
      phase pattern measurements, IGS Workshop 2016)        COMMENT
                                                            COMMENT
GLONASS satellite antenna corrections:                      COMMENT
  - z-offsets:                                              COMMENT
    + satellite-specific                                    COMMENT
    + weighted mean of five ACs (COD, ESA, GFZ, GRG, TUG)   COMMENT
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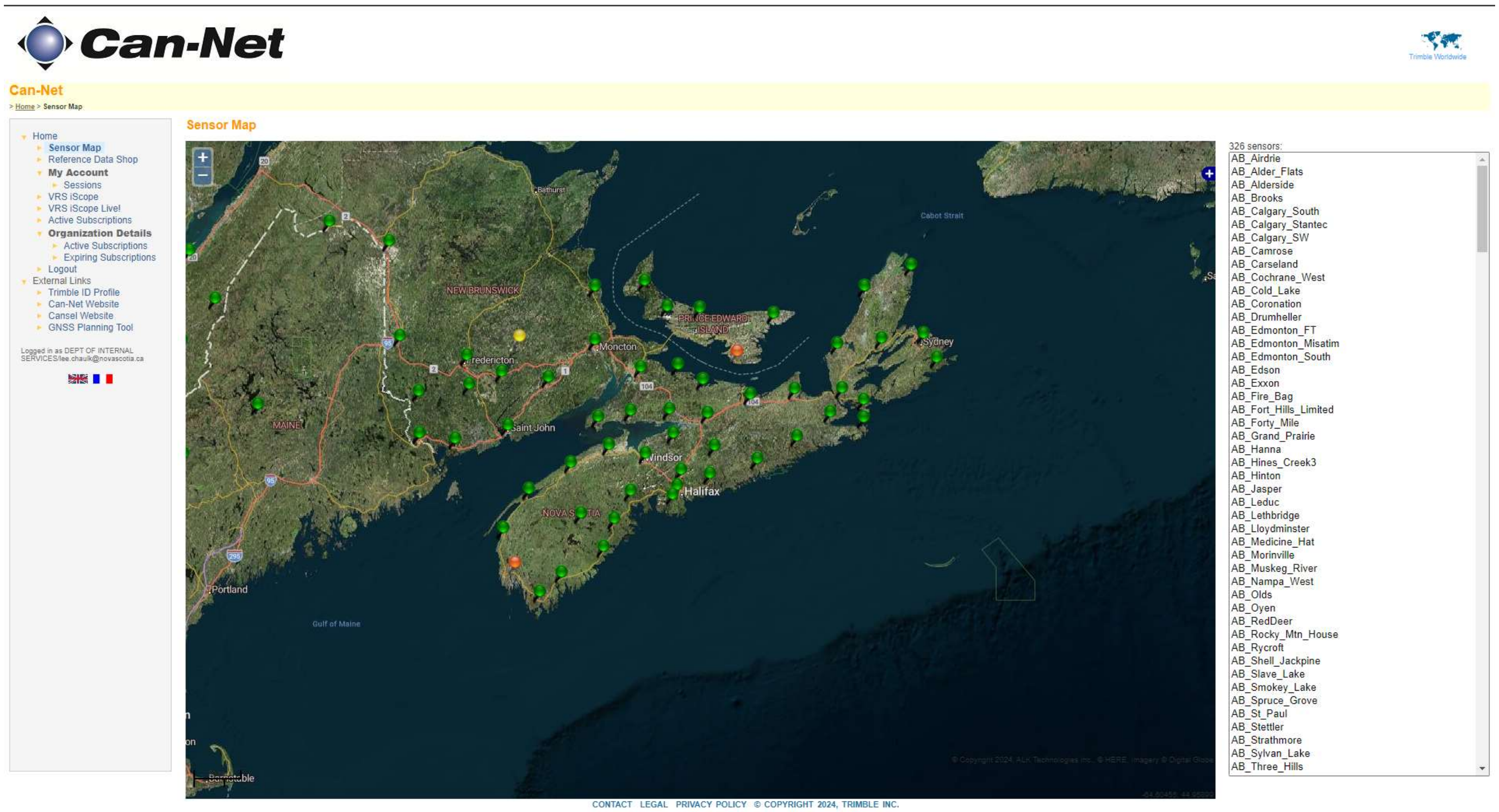
Trimble/Cansel/Can-Net

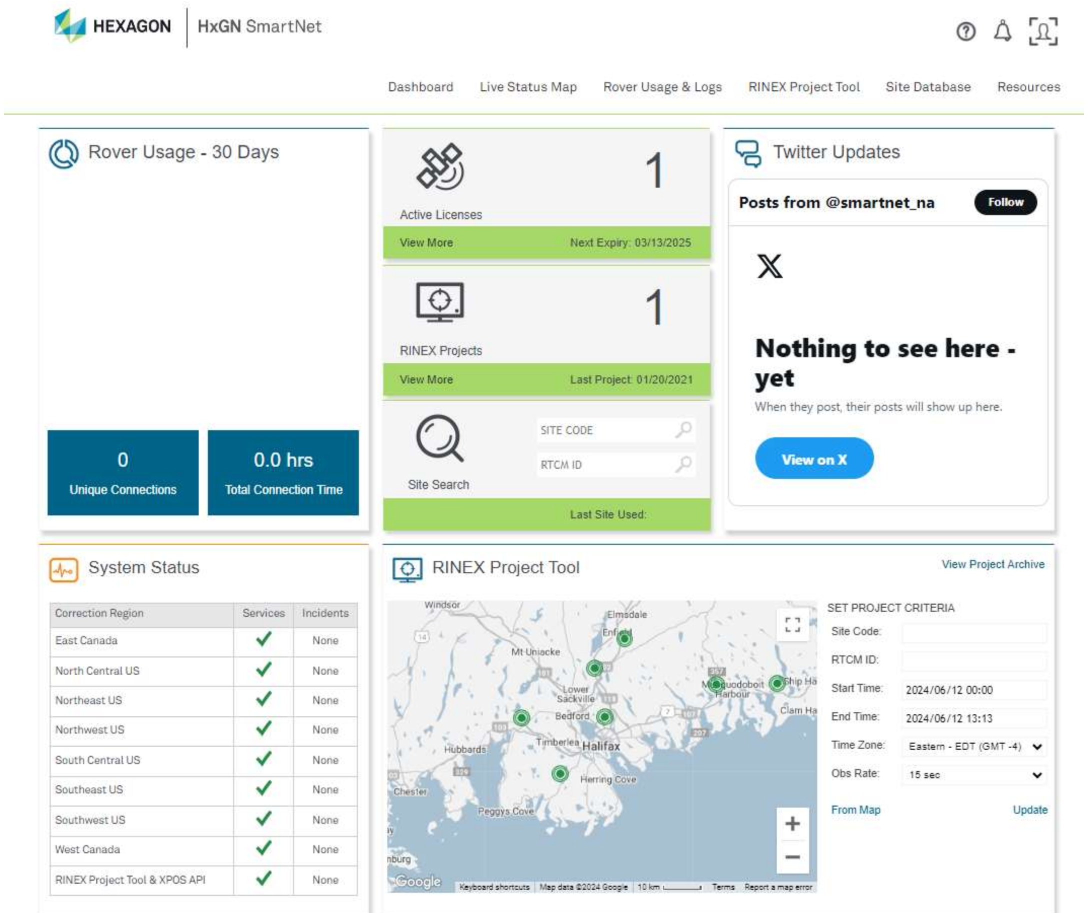


Trimble/Cansel/Can-Net

Mountpoint	Solution Type/Format	Supported GNSS Types	Receiver Type
CANEASTVRSRTCM	VRS, RTCM 3.1	GPS and GLONASS	All
CANEASTVRSRTCM32	VRS, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
CANEASTVRSCMRP	VRS, CMR+	GPS and GLONASS	Trimble, various non
CANEASTVRSCMRX	VRS, CMRx	GPS, GLONASS, Galileo, BeiDou*	Trimble, various non
CANEASTSSRRTCM	Single Base, RTCM 3.1	GPS and GLONASS	All
CANEASTSSRRTCM32	Single Base, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
CANEASTSSRCMRP	Single Base, CMR+	GPS and GLONASS	Trimble, various non
CANEASTSSRCMRX	Single Base, CMRx	GPS, GLONASS, Galileo, BeiDou*	Trimble, various non

NOVA SCOTIA

Leica SmartNet



Leica SmartNet

Mountpoint	Solution Type	Supported GNSS Types	Receiver Type
MSM_iMAX	iMAX, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	Leica, various
MSM_NEAR	Single Base, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	Leica, various
MSM_ViRS	VRS, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
RTCM3_iMAX	iMAX, RTCM 3.1	GPS and GLONASS	Leica, various
RTCM3_MAX	MAX/MAC, RTCM 3.1	GPS and GLONASS	Leica, various
RTCM3_NEAR	Single Base, RTCM 3.1	GPS and GLONASS	All
RTCM_ViRS	VRS, RTCM 3.1	GPS and GLONASS	All

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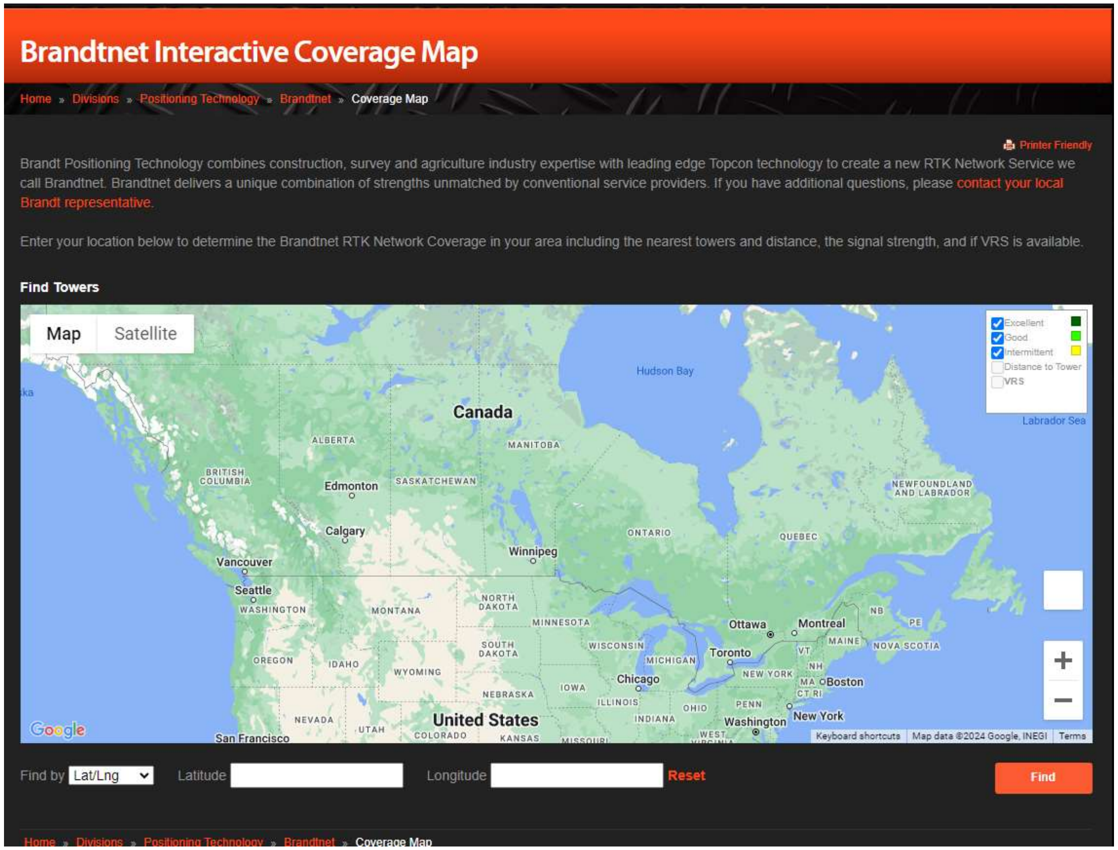
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Good
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VRS
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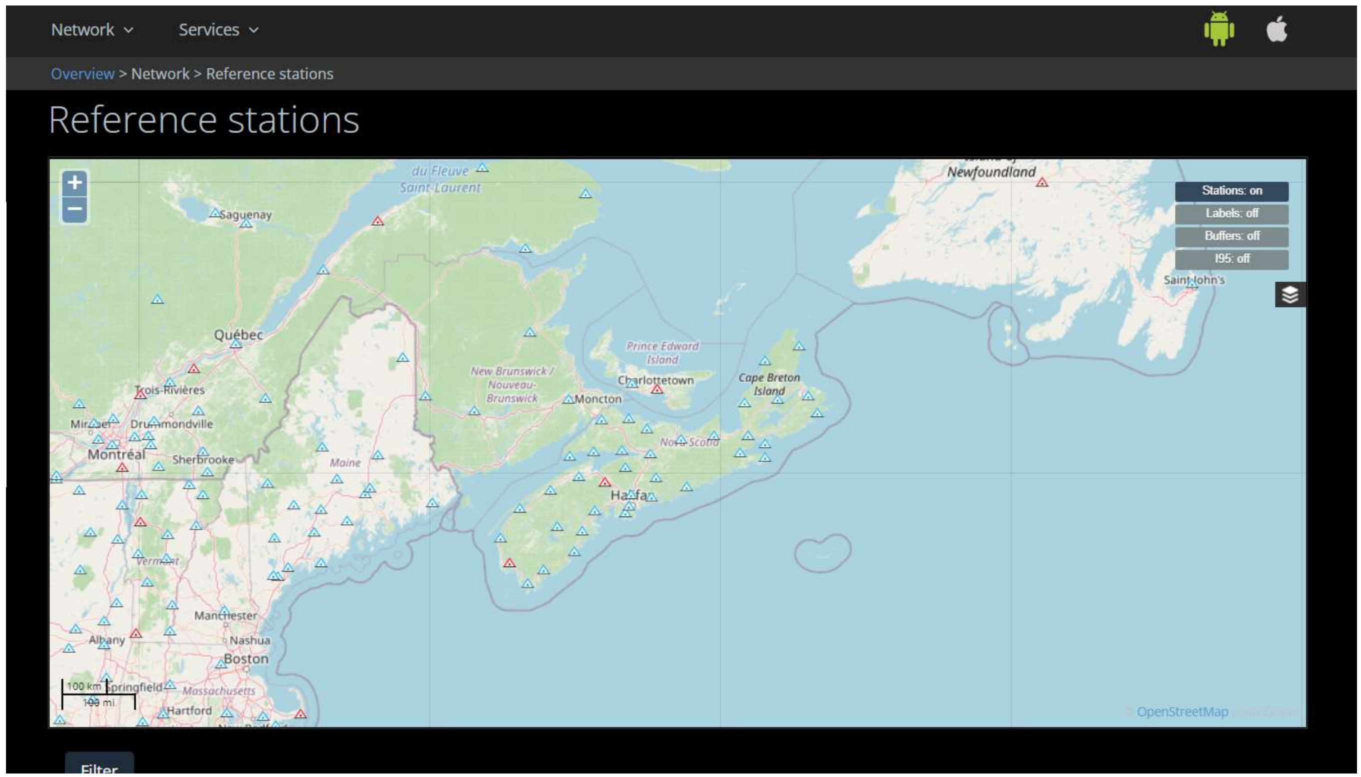
Mountpoint	Solution Type	Supported GNSS Types	Receiver Type
Topcon_RTCM3	VRS, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
VRS_Hemi_RTCM3	VRS, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
VRS_Leica_RTCM3	VRS, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
VRS_NovAtel_RTCM3	VRS, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
VRS_Trimble_CMRP	VRS, CMR+	GPS, GLONASS, Galileo, BeiDou*	Trimble, various
VRS_Trimble_RTCM3	VRS, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
SBL_Hemi_RTCM3	Single Base, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
SBL_Leica_RTCM3	Single Base, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
SBL_NovAtel_RTCM3	Single Base, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
SBL_Trimble_RTCM3	Single Base, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
SBL_Topcon_RTCM3	Single Base, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All

SDF

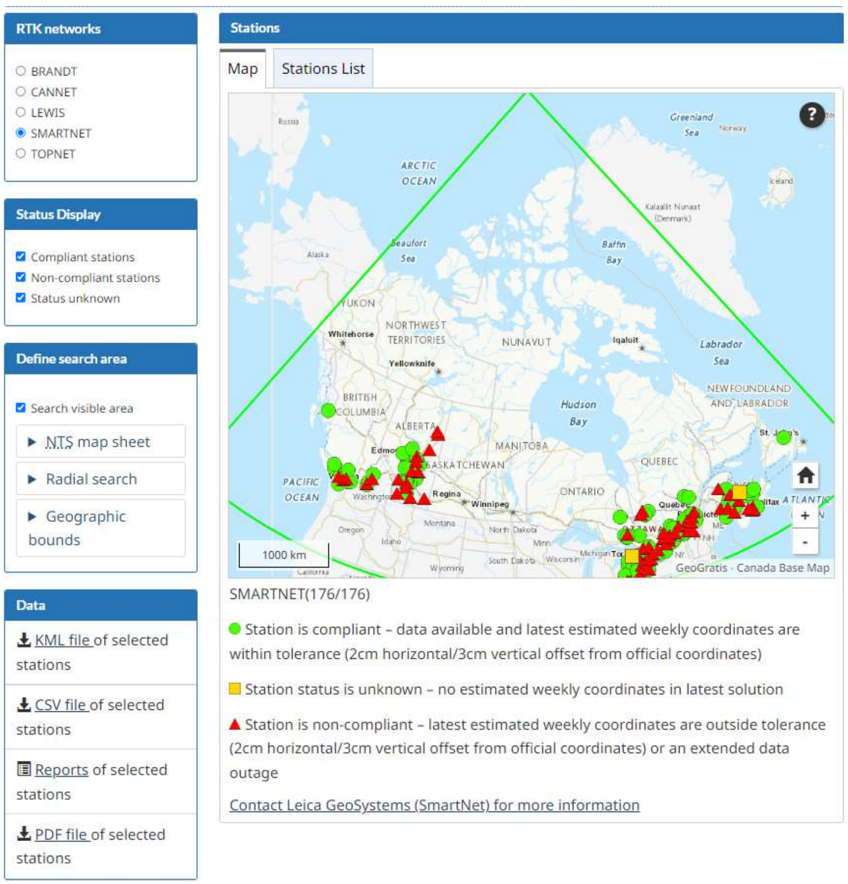


SOLUTIONS

SDF

Mountpoint	Solution Type	Supported GNSS Types	Receiver Type
NET_MSM	VRS, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
NETRTK_CMR+	VRS, CMR+	GPS, GLONASS, Galileo, BeiDou*	Trimble, various
NETRTK_RTCM3	VRS, RTCM 3.1	GPS and GLONASS	All
RTK_MSM	Single Base, RTCM 3.2	GPS, GLONASS, Galileo, BeiDou*	All
RTK_CMR+	Single Base, CMR+	GPS, GLONASS, Galileo, BeiDou*	Trimble, various
RTK_RTCM3	Single Base, RTCM 3.1	GPS and GLONASS	All

Other NRTK Service Providers



- NRCan RTK Compliance program provides users a way to confirm a set of standards is met.
- Current website shows what stations are compliant for each vendor and where.
- Further information can be found in 2019 Geomatica article
- BEWARE of cheap service providers who don't comply. You get what you pay for.

Thank you