Conversion of NTDB Files using National Transformation Version 2 (NTv2)

In 1990, Natural Resources Canada announced the official adoption of the North American Datum of 1983 (NAD83). The purpose of this decision was to provide Canadians with a reference framework that would respond to today's requirements in terms of positioning. Since then, National Transformation Version 1 (NTv1) has been used to transition from NAD27 to NAD83. Recently, the Geodetic Survey Division launched Version 2 of the National Transformation (NTv2). This more powerful version has enabled Geomatics Canada to enhance the quality of the National Topographic Data Base (NTDB).

What Is the National Transformation (NT)?

The National Transformation provides the means for transitioning from the NAD27 reference system to the NAD83 reference system. Converting data from NAD27 to NAD83 involves the use of tables containing the coordinate differences between NAD27 and NAD83.

National Transformation Version 1 was built on compensation of all the primary and secondary points that existed in Canada in 1988 and 1989, and were based on the GRS80 reference ellipsoid. Interpolating the values between control points sometimes resulted in deviations over 10 m. Since the modeling technique for developing the coordinate difference tables for conversion from NAD27 to NAD83 had shortcomings, errors in deviation between the control networks have been discovered.

National Transformation Version 2, on the other hand, is based on compensating all the primary and secondary points existing in Canada in 1995 and uses the GRS80 reference ellipsoid. In addition, points from municipal secondary networks have been included. Some of the advantages targeted by the development of Version 2 are:

- an improved algorithm for modeling displacement between points in the geodetic network;
- an increase in the number of geodetic networks used in modeling;
- realistic estimates in error weighting that involve accuracy statements for each transformed point; and
- variable density of the grid (file containing grid displacement points) that is better suited to denser geodetic networks.

How Will National Transformation Version 2 (NTv2) Affect NTDB Data?

The use of NTv2 for converting NTDB data instead NTv1 will cause changes in the NTDB product. The main issues in this regard are discussed below.

Coordinates of the Theoretical Neatline

The theoretical neatline is calculated directly on the ellipsoid with predetermined geographic coordinates (National Topographic System [NTS]). Since the same ellipsoid (GRS80) and projection (UTM) are used for both transformations, the coordinates of theoretical neatlines for NTDB data sets are unaffected.

Entity Coordinates

The position of NTDB entities is calculated relative to that of control points in the geodetic network. Since NTv1 and NTv2 are transformations based on two different compensations of the geodetic network, entity positions will differ depending on which compensation is used.

Data Set Divisions

Since NTv2 conversion modifies entity coordinates while the theoretical neatlines of the data sets remain the same, NTv2 conversion impacts on the data set clipping.

The following describes which data sets are modified when NTv2 is used.

Which Data Sets Are Affected by National Transformation Version 2 (NTv2)?

National Transformation Version 2 (NTv2) does not affect all NTDB files, because the impact is directly related to file accuracy.

A study comparing National Transformation Versions 1 and 2 carried out by the Geodetic Survey Division revealed that 90% of the files at the 1:50 000 scale contained maximum differences of less than 5 m and that 82% of files at the 1:250 000 scale contained maximum differences of less than 10 m. The following indicate how one can judge whether or not NTv2 improves the NTDB product.

NTDB Files at the 1:50 000 Scale

The maximum accuracy of NTDB files at the 1:50 000 scale is 10 m. Since structuring tolerances sometimes exceed 5 m, there is no reason to think that correcting data for displacements under 5 m represents an improvement in positioning quality. The same reasoning applies to other NTDB files at the 1:50 000 scale whose accuracy is on the order of 25, 50, and 100 m. Nevertheless, the 5-m displacement criterion can be changed to one equal to 20% of the file accuracy.

NTDB Files at the 1:250 000 Scale

In the case of NTDB files at the 1:250 000 scale, the maximum displacement is equal to 20% of file accuracy. Under 20%, NTv2 does not appear to improve positioning accuracy.

Generally, it must be remembered that only files with displacements that are 20% greater than their accuracy have been corrected with NTv2 to improve positioning quality; this applies to both the 1:50 000 and 1:250 000 scales.

For more information about the impact of converting NTDB files with National Transformation Version 2 (NTv2), contact the **Customer Support Group**:

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Geomatics Canada
Centre for Topographic Information
Customer Support Group
2144 King Street West, Suite 010
Sherbrooke, QC J1J 2E8
CANADA

Telephone: 1-800-661-2638 (Canada and the United States) or (819) 564-4857 (elsewhere)
Fax: (819) 564-5698

Email: ntdb@NRCan.gc.ca
Web: http://www.ctis.nrcan.gc.ca

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Annex – List of files for which we applied the NAD83 NTv2 translation

1:50 000
001N07
011M04
012A02, 012A03, 012A04, 012A05, 012A06, 012A07, 012A08, 012A09, 012A10,
012A11, 012A12, 012A14, 012A15, 012A16
012G09
012J04, 012J06
012P16
021A01
021P01, 021P16
022D13
022E04, 022E05
022E16, 022F12, 022F13, 022F14
022J03, 022J05, 022J06, 022J13, 022J14
022O04, 022O05
024N14
025E03, 025E04
025E13
025K13
031C04
031I10
032A09
032A15, 032A16
032H08
032N01, 032N02, 032N03, 032N06, 032N07, 032N08, 032N09, 032N10, 032N11,
032N14
032O05, 032O12
033E14
033M01
034C07
034L09, 034L10
034N05
040P13
042A06
042D11, 042D12
042G08
042K04
052A05, 052A06, 052A12, 052A13
052B09, 052B10, 052B11, 052B13, 052B14, 052B15, 052B16
052F01
052G03, 052G04
065H10, 065H11
074I12, 074I13, 074I14

1:50 000

074J03, 074J04, 074J05, 074J06, 074J07, 074J08, 074J09, 074J10, 074J11, 074J12, 074J13,074J14, 074J15, 074J16
074K01, 074K06, 074K07, 074K08, 074K09, 074K10, 074K11, 074K12, 074K13, 074K14, 074K15, 074K16
074M14, 074M15
074N01, 074N02, 074N03, 074N04, 074N05, 074N06, 074N07, 074N08, 074N09, 074N10, 074N14, 074N15, 074N16
074O01, 074O02, 074O03, 074O04, 074O05, 074O06, 074O07, 07O08, 074O09, 074O10, 074011, 074O12, 074O13, 074O14, 074O15, 074O16
074P03, 074P04, 074P05, 074P12, 074P13
075D01, 075D02, 075D03, 075D04, 075D05, 075D06, 075D07, 075D08, 075D11, 075D12, 075D13, 075D14
082F15, 082F16
083E04
085A01, 085A02, 085A07, 085A08, 085A09, 085A10, 085A11, 085A15
085H01, 085H02, 085H06, 085H07, 085H08
085I07, 085I08, 085I09, 085I10
092C11, 092C13
092E01
092G06
093H01, 093H07, 093H08, 093H10
095B02
095L14, 095L15
095M02, 095M03, 095M06, 095M07
097G14
103P01
105D04, 105D05
107C03
114P11, 114P12, 114P13, 114P14
115A04, 115A05, 115A12
115B08, 115B09, 115B10, 115B15, 115B16
117A04
117D06, 117D11

1:250 000

074J
074K