Transformation grids in Alberta

Alberta

Environment and Parks, Government of Alberta

March 2021

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Version 1.0

Land Surveys Section, Lands Policy and Programs Branch, Lands Division

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Preamble

This document describes the transformation grids available in Alberta to transform coordinate data from one geometric reference frame to another and vice-versa as well as data analysis results for each transformation grid. This document supersedes the README.doc file produced by the Geodetic Control Unit (Sustainable Resource Development, now called Alberta Environment and Parks) on August 11, 2007.

There are three transformation grids available for Alberta; the NTV2_0.DAC grid file, the ABCSRSV4.DAC grid file, and the ABCSRSV7.DAC grid file. However, only the NTv2_0.DAC and ABCSRSV7.DAC transformation grid files are available on-line. The ABCSRSV4.DAC transformation grid is available upon request from Geodetic Control as noted below.

For technical assistance and/or additional information on the National Transformation software and/or transformation grids, please contact:

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This documents contains links to data available for download from the Government of Alberta Open Data archive. If the links are no longer active, the documents may be searched for through commonly used search engines.

1. NTV2_0.DAC

The grid shift file NTV2_0.DAC allows users to transform horizontal coordinate data from the North American Datum of 1927 (NAD27) to the original derivation of the North American Datum of 1983 (NAD83(Original)) and vice versa. It is a subset of the NTV2_0.GSB grid file released by the Canadian Geodetic Survey (CGS) in 1995. It was developed by modelling the actual coordinate differences between points referenced to NAD27 and NAD83(Original) at geodetic control markers across Canada. A total of 31,569 Alberta Survey Control Markers (ASCMs) were used in developing the grid. This transformation grid was published in June 1995.

NAD83(Original) coordinate values for ASCMs were derived via a provincial readjustment (NAD83V0.3.-.AB.1), completed in June 1994. Please contact Geodetic Control for further information and assistance if required.

NTV2_0.DAC covers an area from 48^0 00' 00" to 61^0 00' 00" North latitude and 109^0 00' 00" to 122^0 00' 00" West longitude. Depending on the location, the grid density is either 5 arc-minutes or 30 arc-seconds. There are 56 areas in Alberta where the grid has been densified to a spacing of 30 arc-seconds. These areas cover the 73 Municipal Integrated Surveying and Mapping (MISAM) areas as they existed in May 1994. Users can see the extent of the densified grid areas by using the National Transformation (NT) software program *READDA* to read the binary NTV2_O.DAC transformation grid file to view the name and the physical area covered for each of the densified grids.

NOTE - NTV2_0.DAC IS A BINARY FILE; DO NOT ATTEMPT TO EDIT, TYPE OR PRINT IT!

2. ABCSRSV4.DAC

The grid shift file ABCSRSV4.DAC allows users to transform horizontal coordinate data from NAD83(Original) to the 2002 Epoch of the Canadian Spatial Reference System (CSRS) derivation of NAD83 (i.e., NAD83(CSRS) E2002) and vice versa. The Geodetic Control Unit developed this grid following the same approach as used for the NTV2_0.DAC grid by modelling the actual coordinate differences between the NAD83(Original) and NAD83(CSRS) E2002 derived coordinate values for 32,697 ASCMs. This transformation grid was published in June 2005.

NAD83(CSRS) E2002 coordinate values for ASCMs were derived via the second provincial NAD83(CSRS) readjustment (i.e., NAD83V4.0.0.AB.1), completed in October 2004. The NAD83(Original) coordinate values used to develop the grid are based on the coordinate values current to February 2005. Please contact Geodetic Control for further information and assistance if required.

ABCSRSV4.DAC covers an area from 48^0 55' 00" to 60^0 05' 00" North latitude and 109^0 55' 00" to 120^0 05' 00" West longitude. Similar to the NTV2_0.DAC grid, the grid density is either 5 arc-minutes or 30 arc-seconds with the same 56 areas comprising the 73 MISAM areas that have been densified to 30 arc-seconds. Again, the area covered by the densified grids can be viewed by using the NT program *READDA*.

With the implementation of NAD83(CSRS)v7 E2010 in Alberta, the ABCSRSV4.DAC transformation grid is only available upon request from Geodetic Control. Please contact the Geodetic Control for assistance.

NOTE – ABCSRSV4.DAC IS A BINARY FILE; DO NOT ATTEMPT TO EDIT, TYPE OR PRINT IT!

3. ABCSRSV7.DAC

The grid shift file ABCSRSV7.DAC allows users to transform horizontal coordinate data from NAD83(Original) to the 2010 Epoch of the CSRS derivation of NAD83 (i.e., NAD83(CSRS)v7 E2010) and vice versa. Geodetic Control developed this grid following the same approach as the NTV2_0.DAC and ABCSRSV4.DAC grids by modelling the actual coordinate differences between the NAD83(Original) and NAD83(CSRS)v7 E2010 derived coordinate values for 32,863 ASCMs. This transformation grid was completed in November 2020.

NAD83(CSRS)v7 E2010 coordinate values for ASCMs were derived via the third provincial NAD83(CSRS) readjustment (i.e., NAD83V7.0.0.AB.1), completed in August 2020. The NAD83(Original) coordinate values used to develop the grid are based on the coordinate values current to August 2020. Please contact Geodetic Control for further information and assistance if required.

ABCSRSV7.DAC covers an area from 48^0 55' 00" to 60^0 05' 00" North latitude and 109^0 55' 00" to 120^0 05' 00" West longitude. Similar to the NTV2_0.DAC/ABCSRSV4.DAC grids, the grid density is either 5 arc-minutes or 30 arc-seconds with the same 56 areas comprising 73 MISAM areas that have been densified to 30 arc-seconds. Again, the area covered by the densified grids can be viewed by using the NT program *READDA.*

NOTE – ABCSRSV7.DAC IS A BINARY FILE; DO NOT ATTEMPT TO EDIT, TYPE OR PRINT IT!

4. Transformation Grid Analysis

Transformation grid analysis tables have been created for the NTV2_0.DAC, ABCSRSC4.DAC, and ABCSRSV7.DAC transformation grids. These tables give the user insight into the accuracy of the transformation grids in order to make informed decisions on how best to proceed when transforming from one geometric reference frame (i.e., datum) to another.

The tables are used to present data analysis based on: The 50th and 90th percentile maximum coordinate differences for ASCMs where the integrated coordinates referenced to one datum have been transformed to a second datum and then compared to the integrated coordinates for the same ASCMs referenced to the second datum; and the coordinate differences at specific ASCMs where the difference is 0.05 m or greater for ASCMs in urban areas (i.e., the 30 arc-second densified grid areas) and 0.75 m or greater for ASCMs in rural areas (i.e., the 5 arc-minute grid areas).

4.1 NTV2_0.DAC Transformation Grid Analysis

Table 1 - NAD83(Original) vs NAD27 Transformed to NAD83(Original) Coordinate Differences Summary listed by Municipality

Table1-NAD83(Original)_vs_NAD27_Mun

Table 2 - NAD83(Original) vs NAD27 Transformed to NAD83(Original) Coordinate Differences Summary listed by 1:250,000 ASCM Index Map Number

Table2-NAD83(Original)_vs_NAD27_Rura

Table 1 gives the 50th and 90th percentile maximum coordinate differences between integrated NAD83(Original) and transformed NAD27 to NAD83(Original) coordinate values for Alberta Survey Control Markers (ASCMs) in 75 municipalities throughout Alberta. Only markers with integrated NAD83 coordinates were included in this analysis. No Benchmarks or temporary (traverse) points were included in the investigation. The NAD27 to NAD83(Original) transformation grid NTV2_0.DAC provides the basis for this evaluation. Users who require coordinate differences at a particular ASCM can contact Geodetic Control for further information. Table 2 gives the same information for ASCMs in rural areas grouped by 1:250,000 ASCM Index Map number.

Each table includes the total number of markers sampled, the maximum and minimum coordinate difference for the markers sampled, the 50th and 90th percentile coordinate difference, and the number of markers within each percentile. Note that the 50th and 90th percentile coordinate differences are rounded up to the nearest 0.005 m for the municipalities and 0.050 m in rural areas.

Table 3 - NAD83(Original) vs NAD27 Transformed to NAD83(Original) Coordinate Differences in Municipalities Exceeding 0.050 m

Table3-NAD83(Original)_vs_NAD27_Mun

Table 4 - NAD83(Original) vs NAD27 Transformed to NAD83(Original) Coordinate Differences in 1:250,000 ASCM Index Map Areas Exceeding 0.750 m

Table4-NAD83(Original)_vs_NAD27_Rura

Table 3 lists the analysis results for specific ASCMs in the densified municipalities where the coordinate difference between NAD83(Original) and NAD27 transformed to NAD83(Original) is greater than 0.050 m. Only those municipalities with at least one marker that meets the criteria are listed. Table 4 lists similar results for ASCMs within areas defined by the 1:250,000 ASCM

index map areas. However, these rural ASCMs are only displayed in the table if the coordinate difference between integrated and transformed coordinate values exceeds 0.750 m.

See Section 4.4 *Analysis Table Contents* of this document for specific information on the content of tables 3 and 4.

4.2 ABCSRSV4.DAC Transformation Grid Analysis

Table 5 - NAD83(CSRS)E2002 vs NAD83(Original) Transformed to NAD83(CSRS)E2002 Coordinate Differences Summary listed by Municipality

Table5-NAD83(CSRS)E2002_vs_NAD83(O

Table 6 - NAD83(CSRS)E2002 vs NAD83(Original) Transformed to NAD83(CSRS)E2002 Coordinate Differences Summary listed by 1:250,000 ASCM Index Map Number

Table6-NAD83(CSRS)E2002_vs_NAD83(O

Table 5 gives the 50th and 90th percentile maximum coordinate differences between integrated NAD83(CSRS) E2002 and transformed NAD83(Original) to NAD83(CSRS) E2002 coordinate values for Alberta Survey Control Markers (ASCMs) in 75 municipalities throughout Alberta. Only markers with integrated NAD83(Original) coordinates were included in this analysis. No Benchmarks or temporary (traverse) points were included in the investigation. The NAD83(CSRS) E2002 to NAD83(Original) transformation grid **ABCSRSV4.DAC** provides the basis for this evaluation. Users who require coordinate differences at a particular ASCM can contact Geodetic Control for further information. Table 6 gives the same information for ASCMs in rural areas grouped by 1:250,000 ASCM Index Map number.

Each table includes the total number of markers sampled, the maximum and minimum coordinate difference for the markers sampled, the 50th and 90th percentile coordinate difference, and the number of markers within each percentile. Note that the 50th and 90th percentile coordinate differences are rounded up to the nearest 0.005 m for the municipalities and 0.050 m in rural areas.

Table 7 - NAD83(CSRS)E2002 vs NAD83(Original) Transformed to NAD83(CSRS)E2002 Coordinate Differences in Municipalities Exceeding 0.050 m

Table7-NAD83(CSRS
)E2002_vs_NAD83(Or

Table 8 - NAD83(CSRS)E2002 vs NAD83(Original) Transformed to NAD83(CSRS)E2002 Coordinate Differences in 1:250,000 ASCM Index Map Areas Exceeding 0.750 m

Table8-NAD83(CSRS
)E2002_vs_NAD83(Or

Table 7 lists the analysis results for specific ASCMs in the densified municipalities where the coordinate difference between NAD83(CSRS)E2002 and NAD83(Original) transformed to NAD83(CSRS)E2002 is greater than 0.050 m. Only those municipalities with at least one marker that meets the criteria are listed. Table 8 lists similar results for ASCMs within areas defined by the 1:250,000 ASCM index map areas. However, these rural ASCMs are only displayed in the table if the coordinate difference between integrated and transformed exceeds 0.750 m.

See Section 4.4 *Analysis Table Contents* of this document for specific information on the content of tables 7 and 8.

4.3 ABCSRSV7.DAC Transformation Grid Analysis

Table 9 - NAD83(CSRS)v7E2010 vs NAD83(Original) Transformed to NAD83(CSRS)v7E2010 Coordinate Differences Summary listed by Municipality

Table9-NAD83(CSRS
)v7E2010_vs_NAD83(

Table 10 - NAD83(CSRS)v7E2010 vs NAD83(Original) Transformed to NAD83(CSRS)v7E2010 Coordinate Differences Summary listed by 1:250,000 ASCM Index Map Number

Table10-NAD83(CSR
S)v7E2010_vs_NAD83

Table 9 gives the 50th and 90th percentile maximum coordinate differences between integrated NAD83(CSRS)v7 E2010 and transformed NAD83(Original) to NAD83(CSRS)v7 E2010 coordinate values for Alberta Survey Control Markers(ASCMs) in 75 municipalities throughout

Alberta. Only markers with integrated NAD83(Original) coordinates were included in this analysis. No Benchmarks or temporary (traverse) points were included in the investigation. The NAD83(CSRS)v7 E2010 to NAD83(Original) transformation grid ABCSRSV7.DAC provides the basis for this evaluation. Users who require coordinate differences at a particular ASCM can contact Geodetic Control for further information. Table 10 gives the same information for ASCMs in rural areas grouped by 1:250,000 ASCM Index Map number.

Each table includes the total number of markers sampled, the maximum and minimum coordinate difference for the markers sampled, the 50th and 90th percentile coordinate difference, and the number of markers within each percentile. Note that the 50th and 90th percentile coordinate differences are rounded up to the nearest 0.005 m for the municipalities and 0.050 m in rural areas.

Table 11 - NAD83(CSRS)v7E2010 vs NAD83(Original) Transformed to NAD83(CSRS)v7E2010 Coordinate Differences in Municipalities Exceeding 0.050 m

Table11-NAD83(CSRS)v7E2010_vs_NAD83

Table 12 - NAD83(CSRS)v7E2010 vs NAD83(Original) Transformed to NAD83(CSRS)v7E2010 Coordinate Differences in 1:250,000 ASCM Index Map Areas Exceeding 0.750 m

Table12-NAD83(CSRS)V7E2010_vs_NAD83

Table 11 lists the analysis results for specific ASCMs in the densified municipalities where the coordinate difference between NAD83(CSRS)v7E2010 and NAD83(Original) transformed to NAD83(CSRS)v7 E2010 is greater than 0.050 m. Only those municipalities with at least one marker that meets the criteria are listed. Table 12 lists similar results for ASCMs within areas defined by the 1:250,000 ASCM index map areas. However, these rural ASCMs are only displayed in the table if the coordinate difference between integrated and transformed exceeds 0.750 m.

See Section 4.4 *Analysis Table Contents* of this document for specific information on the content of tables 11 and 12.

4.4 Analysis Table Contents

All tables list the accuracy values determined by program INTGRID (see the *National Transformation User's Guide* for more information), the ASCM index map name and number, the NAD83(Original) horizontal integration status code, order, condition of the marker, and a qualifier indicating whether the ASCM was included or excluded in the development of the transformation

grid. Described below are the various codes used for the integration status, order, and marker condition. For further information please see the Alberta Survey Control Products Manual (https://open.alberta.ca/publications/0773212981) or contact Geodetic Control.

Integration Codes as noted in the tables are as follows:

- I = Integrated
- U = Unclassified
- T = Provisional
- Y = Consult Agency

Order Codes as noted in the tables are as follows:

- 1 = First order
- 2 = Second order
- 3 = Third order
- 4 = Fourth order
- U = Unclassified

Marker Condition Codes in the tables are as follows:

- GOOD
- DESTROYED
- ANOMALOUS

IMPORTANT: Users are advised to use caution when transforming points in the areas as identified in Tables 3 and 4, 7 and 8, and 11 and 12 due to the reduced accuracy of the transformation grid(s).