Ecology Information Technology Standard
Vertical Datum

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Introduction: Determining and referencing location and elevation is a fundamental value of geographic information. Adoption of a standard Vertical Datum provides a foundation for data integration and error reduction.

The objective of this standard is to provide a foundational element for the integration and reuse of the agency's investment in significant geo-datasets. Geo-data holdings that are built on common technical standards of registration, elevation (vertical datum) and horizontal reference (coordinate system) enable or facilitate:

- Data exchange for key datasets,

- Reduction of staff time spent converting between one vertical datum and another,

- On the fly integration of distributed and separately maintained geo-datasets and,

- Minimize content distortions and error introduction brought on by referencing multiple vertical datums.

Standards:

In support of the above objectives, Ecology adopts the following technical standard related to Vertical Datum for significant geo-datasets. This standard is intended to apply to existing and new 'significant' agency geo-datasets.

North American Vertical Datum 1988 (NAVD88) as defined by the National Geodetic Survey (NGS) is the official civilian datum for surveying and mapping in the United States.[1] The Washington Department of Ecology is adopting NAVD88 as the agency standard vertical datum.

All elevation data created by or submitted to Ecology should be collected in or converted to NAVD88. The collection method used to determine elevation should be specified.

Elevations may be recorded in either feet or meters as long as the unit of measure is explicitly stated in the metadata.

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[1] Federal Register, Vol. 58, No. 120 page 34245) on June 24, 1993. -
http://www.ngs.noaa.gov/PUBS_LIB/FedRegister/FRdoc93-14922.pdf

Scope: The vertical datum standard applies to all significant geospatial data acquired or created by Ecology.

Exemptions:

Users stating that collecting elevations in NAVD88 is not feasible should submit metadata describing the vertical datum collected so that elevations may be converted to NAVD88 if necessary.

If tidal datums are collected, they should be converted to NAVD88 to be useful. At a minimum, if tidal elevations are not reported as NAVD88, the tidal datum utilized (MHW, MSL, MLLW, etc.) and the name of the tide station and benchmark monument used should be reported.

Local datums do not provide useful elevation data to Ecology and should not be used.

Implementation:

This standard does not require the modification of existing elevation data in Ecology databases.

This standard does not mandate any changes to current methodologies used to collect elevation data other than to require vertical datum metadata and state a preference for the use of NAVD88 as the vertical datum.

The standard places no additional licensing requirements on the collectors of horizontal and vertical data. However, it should be noted that in WA State, surveying work is broadly defined and state law requires surveying work to be conducted by a licensed land surveyor (RCW 18.43.020 (9) and Title 196, WAC).

Authority/References:

Ecology Standards	GIS Standards	http://www.ecy.wa.gov/services/gis/data/standards.htm
WSDOT	Monument Standard	http://www.wsdot.wa.gov/publications/manuals/fulltext/M22-01/410.pdf - , Page 3
WADNR	GPS Standards and Guidelines	http://www.dnr.wa.gov/Publications/eng_plso_gps_guidebook.pdf, Page 22
Ecology	GPS Accuracy Guideline	http://www.ecy.wa.gov/pubs/0006015.pdf, Page 22
ECY Policies and Procedures	Data Architecture	http://aww.ecology/pol%5Fproc/pol11-53.pdf
ECY Policies and Procedures	Info. Technology Architecture	http://aww.ecology/pol%5Fproc/pol11-54.pdf

APPENDIX

Best methods for converting between NGVD29 and NAVD88.

1. **VDatum** is a robust datum conversion tool designed to vertically transform geospatial data among a variety of tidal, orthometric and ellipsoidal vertical datums - allowing users to convert their data from different horizontal/vertical references into a common reference system. Because of its ability to transform elevations from tidal datums, VDatum is being used by the Toxics Cleanup Program for vertical datum conversions. The PC executable and all required data files can be downloaded from:

   http://vdatum.noaa.gov/subdownload/download_national.html

   Required files are:

   VDatum_main.zip – the VDatum software

   VDatum_core.zip – all models required for datum conversions including NAD27, NAD83, NAD83 (HARN), NVGD29, and NAVD88 along with several GEOID models.

   Additionally, for conversions involving tidal datums, follow the West Coast dataset link and download datasets for Washington – Juan de Fuca Strait and Puget Sound.

   Unzip all of these files in a folder reserved for the VDatum software and data.

2. **VERTCON** is an easy tool to use and is available on-line or as a downloadable PC executable.   The program computes the modeled difference in orthometric height between the North American Vertical Datum of 1988 (NAVD 88) and the National Geodetic Vertical Datum of 1929 (NGVD 29) for a given location specified by latitude and longitude.   The output of VERTCON will be the value of the difference between NGVD29 and NAVD88 elevations. If a NAVD 88 height is desired when a NGVD 29 height is given, ADD the model value ALGEBRAICALLY to the NGVD 29 height. If a NGVD 29 height is desired when a NAVD 88 height is given, SUBTRACT the model value ALGEBRAICALLY from the NAVD 88 height.

   To obtain the PC executable of VERTCON, go to http://www.ngs.noaa.gov/PC_PROD/VERTCON/ and click on the "**ZIP'ed**" link to download all files needed to run the application.

   To use the online version of VERTCON, click on the following link http://www.ngs.noaa.gov/cgi-bin/VERTCON/vert_con.prl

3. **CORPSCON -** Version 6.0, is a MS-Windows-based program which allows the user to convert coordinates between Geographic, State Plane, Universal Transverse Mercator (UTM) and US National Grid systems on the North American Datum of 1927 (NAD 27), the North American Datum of 1983 (NAD 83) and High Accuracy Reference Networks (HARN). Corpscon uses the National Geodetic Survey (NGS) program NADCON to convert between NAD 27, NAD 83 and HARN. Corpscon, Version 6.0, performs vertical conversions to and from the National Geodetic Vertical Datum of 1929 (NGVD 29) and the North American Vertical Datum of 1988 (NAVD 88).

   Corpscon can be downloaded from:

   http://crunch.tec.army.mil/software/corpscon/corpscon.html. Selecting CORPSCON_CONUS_GEOXX.EXE is the simplest way to download the software and all the data needed to utilize Corpscon.

4. **WA Tidal Datum Conversions** – The Seattle District of the U.S. Army Corps of Engineers maintains an on-line set of conversion tables for converting between local tidal datums and NGVD29 and NAVD88 datums. Not all conversions are available at all locations.

   Conversion tables can be accessed at the following URL. http://www.nws.usace.army.mil/PublicMenu/Documents/Reg/applications/tides/tides.cfm

NOTE: Current versions of ArcGis <u>do not support</u> vertical datum transformations.