

Today's discussion

- Differences between current and past Michigan adjustments such as NAD 83(1986), NAD 83(1994), NAD 83(2007) and NAD 83(2011)
- Upcoming 2022 datum (Shifts)
- NGS tool to assist you with Shifts (“NCAT”)
- Other tools as time permits

Example: “ALPENA 2”

Actual published changes for this station:

NAD 27 to **NAD 83(1986)** moved Northeasterly 8.03 feet ($Az\ 57^\circ$)

Example: “ALPENA 2”

Actual published changes for this station:

NAD 27 to **NAD 83(1986)** moved Northeasterly 8.03 feet (Az 57°)

NAD 83(1986) to **NAD 83(1994)** moved Northly 0.39 feet (Az 14°)

Example: “ALPENA 2”

Actual published changes for this station:

NAD 27 to **NAD 83(1986)** moved Northeasterly 8.03 feet (Az 57°)

NAD 83(1986) to **NAD 83(1994)** moved Northly 0.39 feet (Az 14°)

NAD 83(1994) to **NAD 83(2007)** moved Northeasterly 0.02 feet (Az 59°)

Example: “ALPENA 2”

Actual published changes for this station:

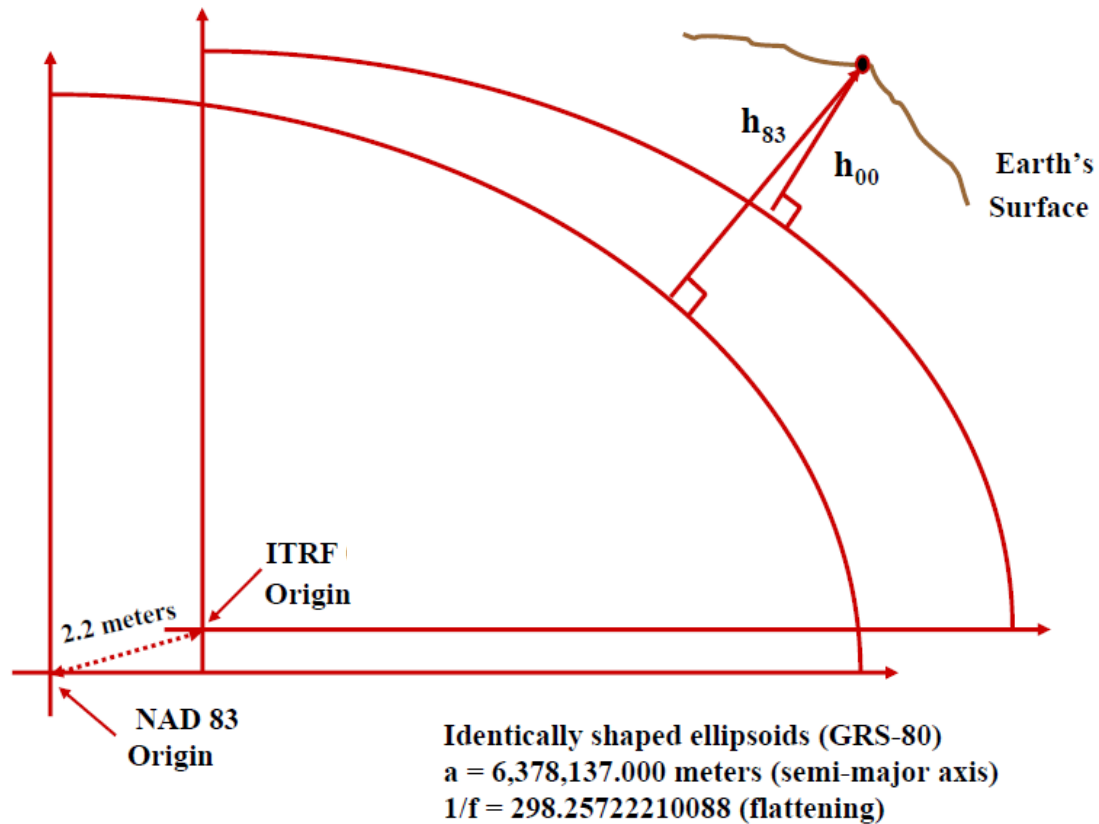
NAD 27 to **NAD 83(1986)** moved Northeasterly 8.03 feet (Az 57°)

NAD 83(1986) to **NAD 83(1994)** moved Northly 0.39 feet (Az 14°)

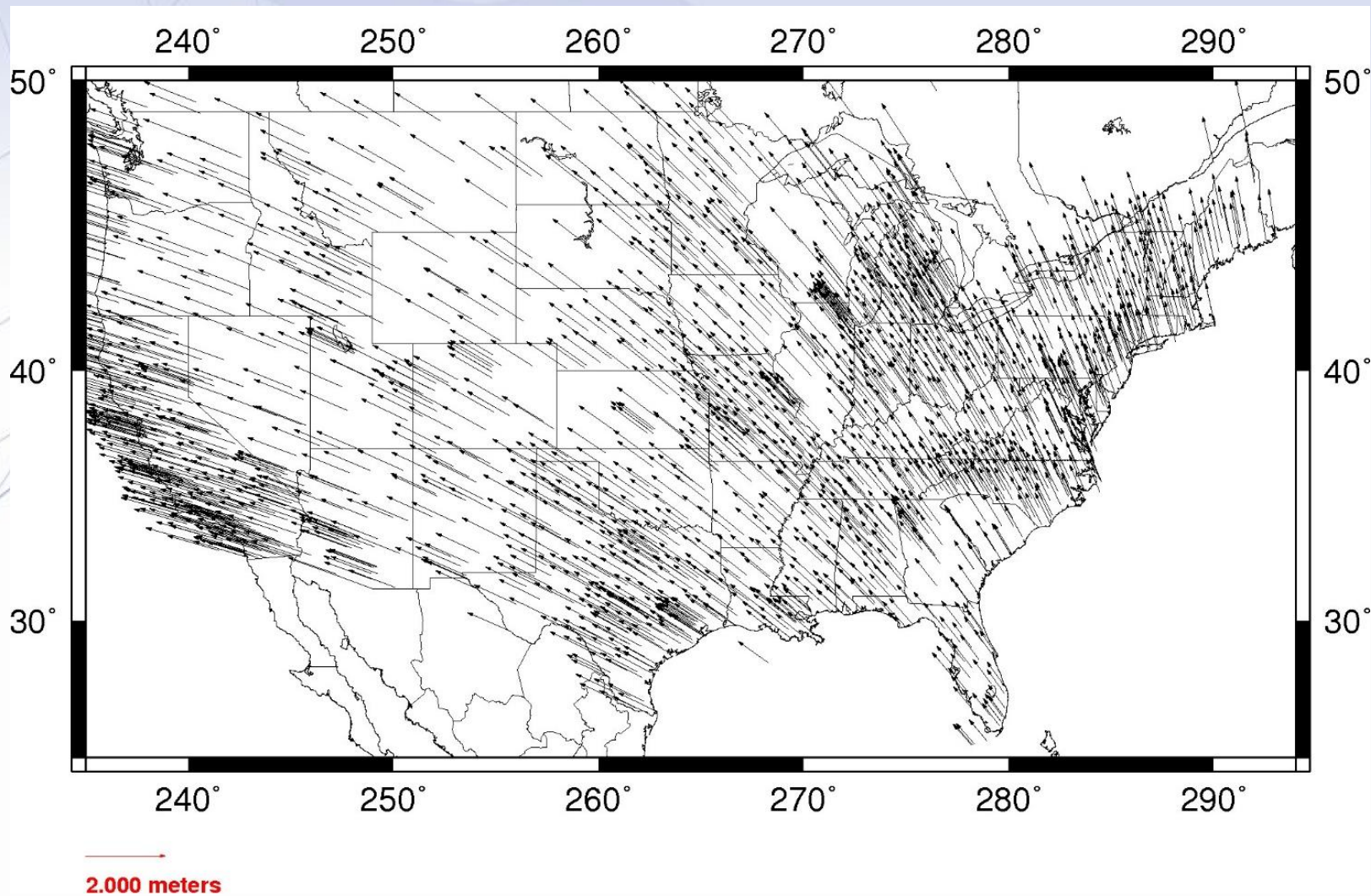
NAD 83(1994) to **NAD 83(2007)** moved Northeasterly 0.02 feet (Az 59°)

NAD 83(2007) to **NAD 83(2011)** moved EastSouthEast 0.08 feet (Az 139°)

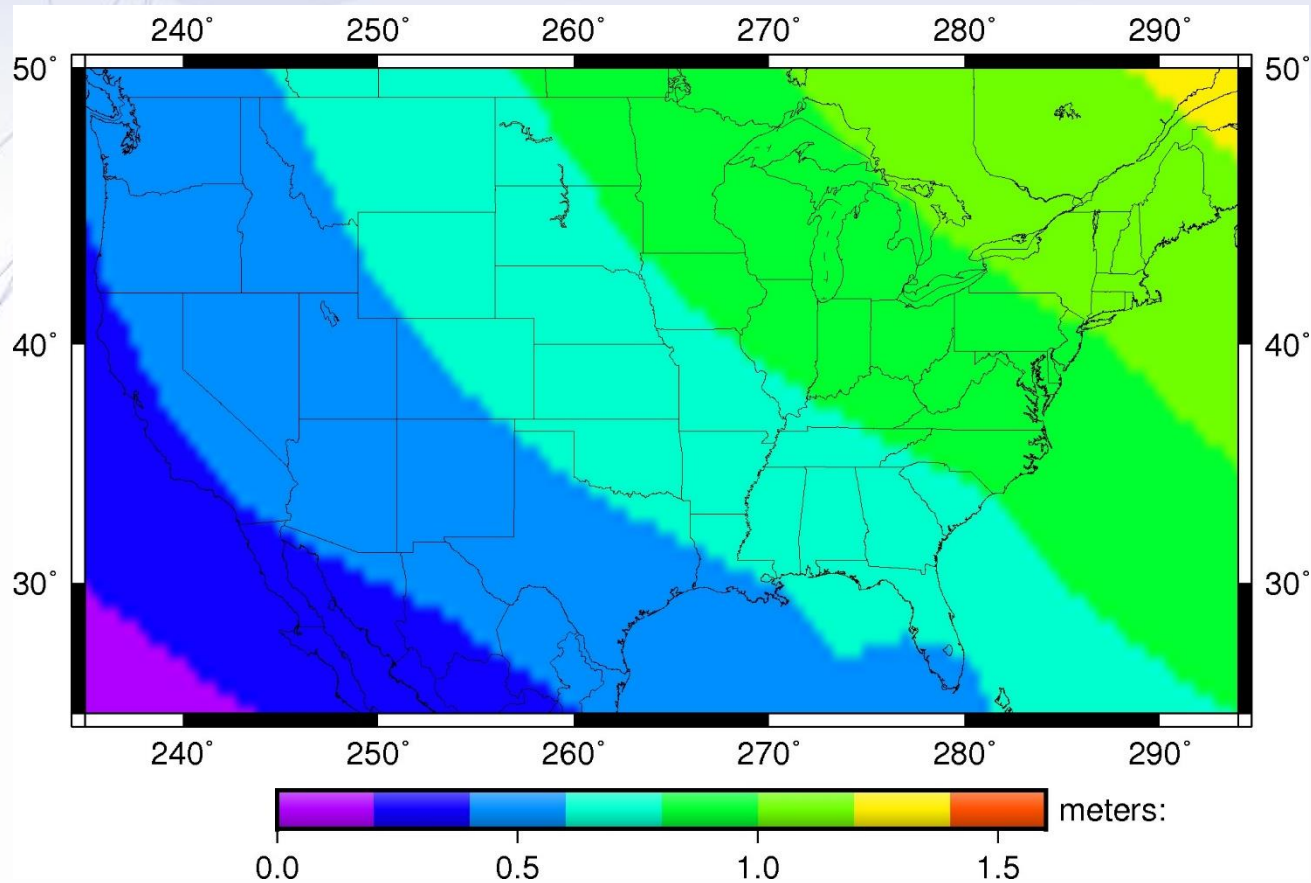
Will you be prepared for **2022**, when new datums will be adopted? You will be seeing much larger changes. More than 2 meters in 3-D positions



Effect upon latitude/longitude

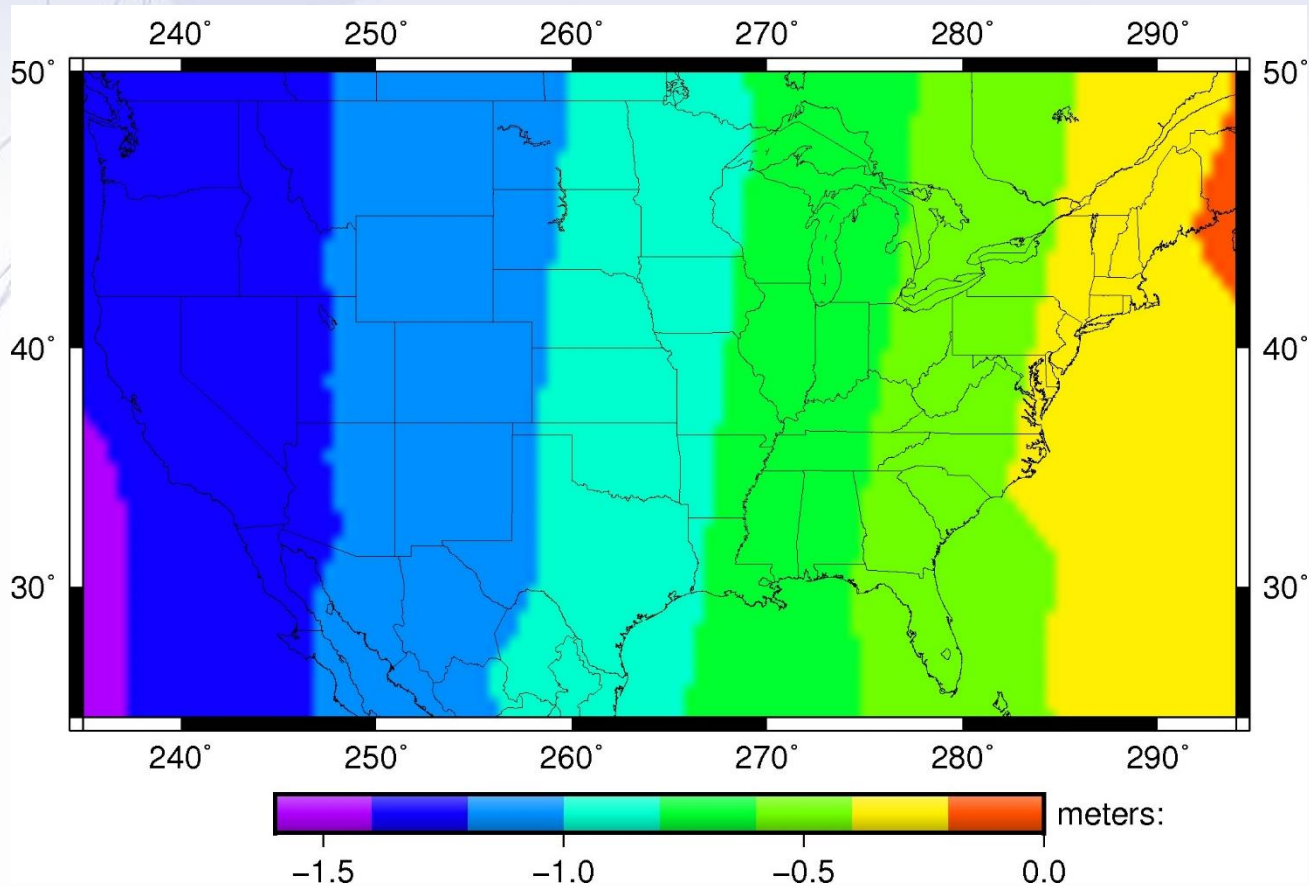


Non-Geocentricity: Latitude

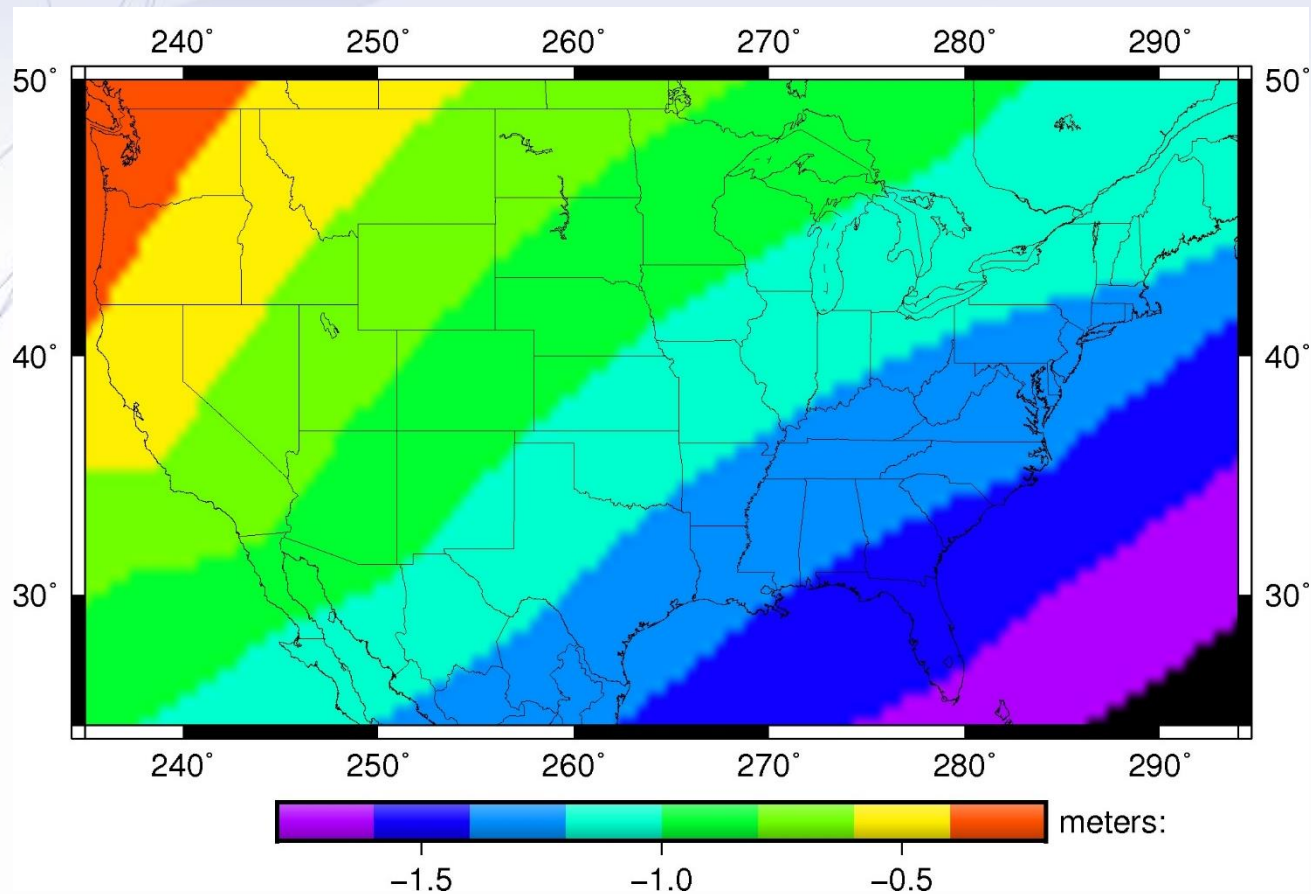


Non-Geocentricity: Longitude

Note these are EAST Lon.



Non-Geocentricity: Ellipsoid Height



The NGS tool to deal with the different adjustments to NAD 83

The screenshot shows the NOAA National Geodetic Survey website. At the top left is the NOAA logo. The main header reads "National Geodetic Survey" with the tagline "Positioning America for the Future". Below the header is a navigation bar with tabs for "NGS Home", "About NGS", "Data & Imagery", "Tools", "Surveys", and "Science & Education". A search bar is on the right. A red arrow points to the "Tools" tab, which has a dropdown menu open. The menu items are: "Adjust Leveling (LOCUS)", "Geodetic Tool Kit", "Web Services", "Process GPS data (OPUS)", "Coordinate Conversion and Transformation Tool (NCAT)", "Vertical Conversions (VDATUM)", "Download PC Software", "GEOID12B Toolkit", "GPS Toolbox", "HTDP", and "VERTCON". The "Coordinate Conversion and Transformation Tool (NCAT)" option is highlighted with a red rectangular box. On the left side of the page, there is a "Quick Links" section with a list of resources including "OPUS", "CORS", "Survey Mark Datasheets", "NGS Data Explorer", "OPUS Projects", "Geodetic Tool Kit", "State Plane Coordinates", "Antenna Calibration", "UFCORS", "GEOID", "GPS on Bench Marks", "Geodetic Advisors", "Storm Imagery", "Publications", "2019 Geospatial Summit", "FAQs", and "Contact Us". On the right side, there are promotional banners for "Looking for Bench Marks?", "Emergency Response" (with links for Hurricane Michael, Hurricane Florence, and Tropical Storm Gordon), and "Notices".

Coordinate Conversions

NCAT incorporates the capabilities of what were originally several stand-alone NGS computer products:

XYZ Coordinate Conversion (XYZWIN 2.0)

Universal Transverse Mercator Coordinates (UTMS 2.1)

State Plane Coordinates, NAD 83 (SPC83 2.1)

State Plane Coordinates, NAD 27 (GPPCGP 2.0)

U.S. National Grid (USNG 2.3)

Convert from:



LLh



SPC



UTM



XYZ



USNG



NGS Coordinate Conversion and Transformation Tool (NCAT)

National Geodetic Survey

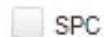
- NGS Home
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- Single Point Conversion
- Multipoint Conversion
- Web services
- Downloads
- About Conversion Tool

Convert from:



LLh



SPC



UTM



XYZ



USNG

Lat

Enter lat-lon in decimal degrees

44.7796058972

Lon

-85.4870058972

Lat

or degrees-minutes-seconds

N

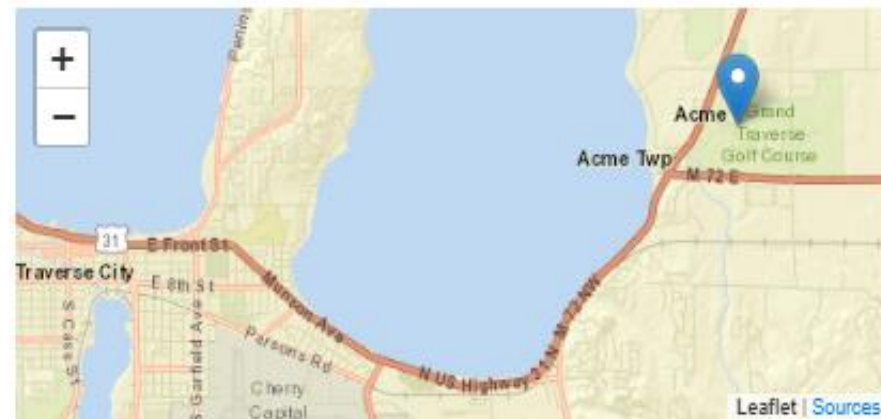
44-46-46.58123

Lon

W

085-29-13.22123

or drag map marker to a location of interest



Ellipsoid Height (m)

200.000

Input datum

NAD83(2011)

Output datum

NAD83(FBN)

Don't see a datum in the list? Click [here](#) to learn more.

Converted coordinates will be in output datum.

Convert

“Single Point” input section

Convert from:

LLh

SPC

Enter lat-lon in decimal degrees

Lat

39.2240867222

Lon

-98.5421515000

or degrees-minutes-seconds

Lat

N



39-13-26.71220

Lon

W



098-32-31.74540

or drag map marker to a location of interest

DD



or

DMS



“Datum(s) Selection” Section

Ellipsoid Height (m)

Input datum → → **Output datum** →

*Don't see a datum in the list?
Click here to learn more.*

★
Remember to assess the accuracy of older datums... (e.g. NAD 27) before you use

Output datum

INPUT AND OUTPUT REALIZATIONS... AVAILABLE CHOICES

- NAD83(2011)
- NAD83(NSRS2007)
- NAD83(FBN) (1994 in MI)
- NAD83(HARN) ...(N/A in MI)
- NAD83(1986)
- NAD27
- USSD

Single Point Transformation Output for station "SP 0109"

Converted coordinates will be in output datum.

Convert

Export Results to



LLh		SPC		UTM (m)		XYZ (m)		USNG
SrcLat	39.8282942750 N394941.85939	Zone	<input type="text" value="IL W-1202"/>	Zone	<input type="text" value="16"/>	X	29,900.248	16SBK7315312062
DestLat	39.8282943191 N394941.85955	Northing (m)	351,051.287	Northing	4,412,062.077	Y	-4,904,962.345	
Siglat (arcsec)	±0.000034	Northing (usft)	1,151,740.763	Easting	273,153.735	Z	4,063,456.874	
SrcLon	-89.6507338222 W0893902.64176	Northing (ift)	1,151,743.066	Convergence (dms)	-01 41 54.56			
DestLon	-89.6507339595 W0893902.64225	Easting (m)	744,165.148	Scale factor	1.00023357			
Siglon (arcsec)	±0.000021	Easting (usft)	2,441,481.822	Combined factor	1.00021047			
SrcEht (m)	147.185	Easting (ift)	2,441,486.705					
DestEht (m)	147.192	Convergence (dms)	00 19 49.64					
sigeht (m)	±0.005	Scale factor	0.99996518					
		Combined factor	0.99994209					

You may change the default UTM and SPC zones, where applicable. The change is processed interactively once a lat-long is converted; DO NOT click the Convert button.

NCAT can do batch file transformations too

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

Single Point Conversion | **Multipoint Conversion** | Web services | Downloads | About Conversion Tool

Upload data to be converted (see samples and instructions [here](#)).
Results are ready for download after a "Done" message appears

+ Choose

Website Owner: Na

NOS Home ▪ NGS Employees ▪ Privacy Policy ▪ Disclaimer ▪ USA.gov ▪ Ready.gov ▪ Site Map ▪ Contact Webmaster

Enlarged view

Single Point Conversion | **Multipoint Conversion** | Web services | Downloads | About Conversion Tool

Upload data to be converted (see samples and instructions [here](#)).
Results are ready for download after a "Done" message appears

+ Choose

INPUT: Each batch file needs a header line as shown here:

ID,lat,lon,eht,inDatum,outDatum,spczone,utmzone

ID,lat,lon,eht,inDatum,outDatum,spczone,utmzone

282A0,N442047.96891,W0905502.57567,N/A,NAD83(2011),NAD83(FBN),auto,auto

83A0,N442039.38060,W0905426.65350,N/A,NAD83(2011),NAD83(FBN),auto,auto

83A1,N442037.31035,W0905423.59681,N/A,NAD83(2011),NAD83(FBN),auto,auto

89A0,N442059.15317,W0905444.27514,N/A,NAD83(2011),NAD83(FBN),auto,auto

89A1,N442037.31014,W0905423.59656,N/A,NAD83(2011),NAD83(FBN),auto,auto

254A0,N442032.86025,W0905409.49936,N/A,NAD83(2011),NAD83(FBN),auto,auto

This message is shown on the batch file page:

Upload data to be converted (see samples and instructions [here](#)).

Results are ready for download after a "Done" message appears

OUTPUT FILE (reformatted by me):

Datums in-out

Lat: in-out

Lon: in-out

ID	srcDatum	destDatum	srcLatDms	destLatDms	siglat	srcLonDms	destLonDms	siglon
282A0	NAD83(2011)	NAD83(HARN)	N442047.96891	N442047.96839	0.000026	W0905502.57567	W0905502.57562	0.000031
83A0	NAD83(2011)	NAD83(HARN)	N442039.38060	N442039.38007	0.000024	W0905426.65350	W0905426.65346	0.000031
83A1	NAD83(2011)	NAD83(HARN)	N442037.31035	N442037.30982	0.000024	W0905423.59681	W0905423.59677	0.000032
89A0	NAD83(2011)	NAD83(HARN)	N442059.15317	N442059.15265	0.000025	W0905444.27514	W0905444.27510	0.00003
89A1	NAD83(2011)	NAD83(HARN)	N442037.31014	N442037.30961	0.000024	W0905423.59656	W0905423.59652	0.000032
254A0	NAD83(2011)	NAD83(HARN)	N442032.86025	N442032.85972	0.000024	W0905409.49936	W0905409.49932	0.000032



NGS Coordinate Conversion and Transformation Tool (NCAT)

National Geodetic Survey

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- Single Point Conversion
- Multipoint Conversion
- Web services
- Downloads
- About Conversion Tool

Convert from:

- LLh
- SPC
- UTM
- XYZ
- USNG

Enter lat-lon in decimal degrees

Lat

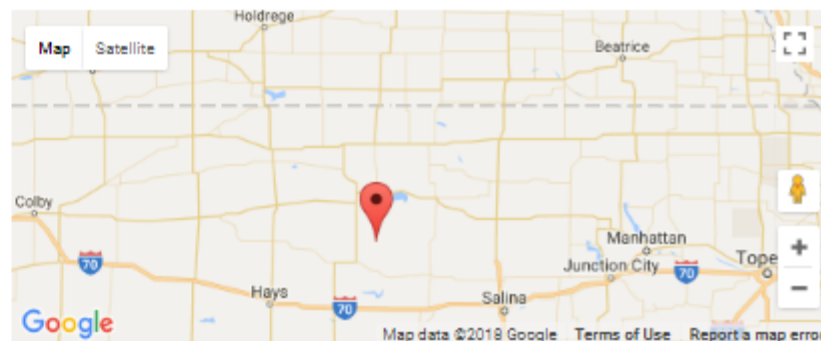
Lon

or degrees-minutes-seconds

Lat

Lon

or drag map marker to a location of interest



Ellipsoid Height (m)

Input datum

Output datum

Converted coordinates will be in output datum.

Convert

Export Results to



OUTPUT CHOICES ←

- LLh
- SPC
- UTM (m)
- XYZ (m)
- USNG

You may change the default UTM and SPC zones, where applicable. The change is processed interactively once a lat-long is converted; DO NOT click the Convert button.



NGS Coordinate Conversion and Transformation Tool (NCAT)

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Convert from:

- LLh
- SPC
- UTM
- XYZ
- USNG

Northing

Easting

Ellipsoid Height

Units

SPC zone

Input datum

Output datum

Don't see a datum in the list? Click [here](#) to learn more.

Converted coordinates will be in output datum.

Convert

Export Results to



**STATE PLANE COORDINATE
CONVERSION OPTION**

Other useful NGS Tools:

1. “OPUS”
2. “OPUS SHARE”
3. “OPUS PROJECTS”

Online Positioning User Service - OPUS

A National Geodetic Survey web tool to enable users to establish precise geodetic control that is tied to the National Spatial Reference System (NSRS).

<https://www.ngs.noaa.gov/OPUS/>



OPUS: Online Positioning User Service

National Geodetic Survey

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Search

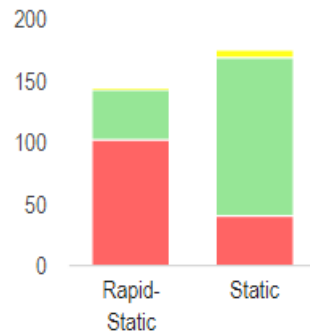


OPUS menu

[home](#) / [upload](#)
[about OPUS](#)

[projects](#)
[shared solutions](#)

[support](#) / [feedback](#)



OPUS Today
as of 2019-06-09T20:30 EDT

ITRF2014 frame and GEOID18 now available in BETA

Try **BETA OPUS** to preview **BETA GEOID18** and the new **ITRF2014** frame for **CORS**.

Upload your data file.

Solve your GPS position & tie it to the National Spatial Reference System.

What is OPUS? [FAQs](#)

Choose File No file chosen

* **data file** of dual-frequency GPS observations. [sample](#)

NONE

antenna - choosing wrong may degrade your accuracy.

2.05 meters above your mark.

antenna height of your antenna's reference point.

john.ellingson@Noaa.gov

* **email address** - your solution will be sent here. [Privacy Act Statement](#)

Options to **customize** your solution.

Upload to Rapid-Static
for data 15 min. - 2 hrs.

Upload to Static
for data 2 hrs. - 48 hrs.

* required fields
We may use your data for internal evaluations of OPUS use, accuracy, or related research.

Station Name	Antenna	Antenna Height	Reference Point	Reference Point Height	Reference Point Description
1	TRIMBLE	2.05	MARK	0.00	MARK
2	TRIMBLE	2.05	MARK	0.00	MARK
3	TRIMBLE	2.05	MARK	0.00	MARK
4	TRIMBLE	2.05	MARK	0.00	MARK
5	TRIMBLE	2.05	MARK	0.00	MARK
6	TRIMBLE	2.05	MARK	0.00	MARK
7	TRIMBLE	2.05	MARK	0.00	MARK
8	TRIMBLE	2.05	MARK	0.00	MARK
9	TRIMBLE	2.05	MARK	0.00	MARK
10	TRIMBLE	2.05	MARK	0.00	MARK

sample solutions

THIS IS OPUS

OPUS also allows you to “SHARE” your solution

Options to customize your solution.

formats **formats explained**

base stations **Use:** **Exclude:** **identify any CORS you wish to explicitly include or exclude from your solution by typing in 4-char site IDs separated with line break**
-- sample
-- find site IDs

state plane **your SPCS zone**

project identifier **enter the id provided by your project manager**

my profile **customize OPUS defaults for future solutions**

share my solution **sharing explained**

Shared Solution

PID: BBBB01
Designation: LARRIMORE 2006
Stamping: Larrimore 2006
Stability: May hold, commonly subject to ground movement
Setting: Object surrounded by mass of concrete
Description: This station is established to posthumously commemorate National Geodetic Survey Lead Computer Specialist CRAIG B. LARRIMORE for his success in promoting access and maintenance for the National Spatial Reference System. This mark demonstrates the initial use of the internet to automatically upload, process, adjust, archive, and display field survey data, made possible through Craig's efforts.
 Note: The station resides within a memorial garden on private property. Recovery is not recommended.
Observed: 2006-01-12T15:59:00Z [See Also Original](#)
Source: OPUS - page5 1209.04



Close-up View

REF_FRAME: NAD_83(2011)	EPOCH: 2010.0000	SOURCE: NAVD88 (Computed using GEOID12B)	UNITS: m	SET PROFILE	DETAILS
LAT: 39° 21' 51.77107" ± 0.019 m LON: -77° 46' 21.55804" ± 0.009 m ELL HT: 98.923 ± 0.021 m X: 1045792.598 ± 0.009 m Y: -4825830.607 ± 0.024 m Z: 4023736.628 ± 0.017 m ORTHO HT: 132.591 ± 0.039 m		UTM 18 SPC 4701(WV N) NORTHING: 4360880.958m 97391.754m EASTING: 261128.820m 748846.721m CONVERGENCE: -1.75938721° 1.10165396° POINT SCALE: 1.00030260 0.99995111 COMBINED FACTOR: 1.00028708 0.99993559			

CONTRIBUTED BY

[krishna.tadepalli](#)
 National Geodetic Survey

Horizon View

Map Satellite

LARRIMORE 2006
 Get directions: [To here](#) (nearest road)

Uvilla Bakerton

Polomac Riv

Map data ©2019 Terms of Use Report a map error

OPUS PROJECTS:

Requires attendance of training class

Questions.....

John Ellingson

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