NAD83, Datums, and Geoid Models FAQ:

Introduction

I would like to start off this FAQ by thanking everyone who attended our webinar. I would also like to note that there is a difference in being geodetically correct and making things work. In an ideal world, when the NGS introduces a new datum or geoid model, we would all start magically using them and life would be good. In the real world however, when NGS introduces a change, surveyors and GIS professionals still have projects they are working on and historical data going back many years in some cases.

While we would all like to be geodetically correct at all times and we look to the NGS for the latest geodetic information, we rely on tools to do our work (hardware, software, data, land records, etc.) that may or may not be 100% geodetically correct. Additionally, there are tools that may have been geodetically correct at one time and must still be used due to their historical nature or other considerations.

Our webinar and this FAQ attempt to balance geodetic correctness with living in the real world. It is not intended to impugn anyone's tools, methodologies, or geodetic correctness. It is simply to help users understand what is going on with their Trimble equipment so that the USER can make an informed decision about the best practice to use for their applications and have the background to support that decision.

The two points outside my office that were a thousand feet apart last year are still a thousand feet apart and will remain a thousand feet apart (mostly) regardless of how many datums and geoid models are generated. Relative to some other part of the world, these points will have shifted. For most applications I don't care about that, but for some I might. I can also use the most expensive GPS system incorrectly and have it tell me that those two points are something other than one thousand feet apart.

Please keep these points in mind when reviewing our webinar and this FAQ. Finally, the responsibility for your use of and decisions about your tools and methodologies rest with you, not Frontier Precision or Trimble.

The following questions are from our webinar in chronological order with the name of the person asking the question. Some of the questions are similar in nature so we may have responded similarly. We wanted to show that every question was answered (about 50). If you feel that we did not understand or adequately address your question, please let us know. Thank you for your attendance.

1.	Laura L. – Bryan said you should use NAD83(PA11) for CA. I do not believe this is true. PA11 is more for Hawaii.	A. *You are correct Laura. That was a mis-statement. NAD83(PA2011) does not apply to CA although NGS does state that you may need to use their HTDP utility to correct for movement.*
2.	Bill P. – I am not sure so about the statement in regards to using a NAD83 2011 reference position in a NAD CONUS project, that you would have error increase as you move away from that reference position. Please review and advise.	A: *There will still be potential error as you increase away from your reference position in this scenario. However, in testing and review with Trimble, we feel this error would be minimized within the model and never to be seen by the user. With that said, you can use this scenario without sacrificing error based on distance from the base. It is important to note, that it is still recommended to use the proper coordinate system whenever possible.*
3.	Andre D. – Does the 3 feet etc. offset you are showing us with NAD83(2011) and WGS84 also apply to NAD83(CONUS) and WGS84? We are using UTM 19North coordinate system and NAD83(CONUS) which Geoid model do you advise?	*A. No. Not in Trimble Software. For all practical purposes, in Trimble Software, WGS84 and NAD83(CONUS) are the same. If you look at the transformation parameters in the Trimble Software (PP slide 10) you will see that there is no transformation. Only a slight difference in the flattening parameter). If you watched our TBC demonstration, when we selected NAD83 (CONUS) and put in N40 x W105 you saw that the Global LLH and Local LLH were exactly the same. It was only when I selected a newer datum (NA2011) was the +/- 3' datum shift introduced. Illustrated by PP slides 11 & 12 also. A: Geoid 2003 with NAD83 CONUS. See PP slide 23.*
4.	Jared L. – What if the grid value of an OPUS NAD83 (2011) solution is entered into Access while using NAD83 State Plane 3 parameter in your settings? Will this give you accurate grid coordinates but incorrect LLH?	A. *You will have correct Local LLH but not Global LLH. You are essentially "seeding" your coordinate system with the 2011 value which accounts for the +/- 3' datum shift between NAD83 (Conus) and NA2011 but not accounting for the additional transformation parameters.*
5.	Juergen B. - MnCORS offers the 2011 mountpoint. What coordinate system should I use with the TSC2 v 12.46 when NAD83(2011) is not available?	A. *On the Minnesota VRS system (MNCORS), you want to use your county coordinate system and the NAD83_2011 Mount Point. If you are using State Plane Coordinates and also using the MNCORS system, then make sure to choose the US State Plane CONUS projection in the Trimble Software and the NAD83_2011 Mount Point. This is because the transformation is in the Mount Point already.*

6.	Nathan N. - When connecting to a permanent municipal type base station, what type of coordinate does access recognize the broadcast coordinate as? Global or Local?	A. *Access recognizes the broadcast base position as a global value. This causes a bit of a problem, if the base position is a transformed position like CORS96 or NSRS2007. If you select the NA2011 datum, then you are performing another transformation on the base position which will introduce a large (+/- 1m) error into your local LLH and grid values. You need to know how the base position was derived. If unable to obtain that information, then you can do some testing and make a best guess (not ideal but better than nothing). You can also start by knowing what you have been doing previously that works for your application. Chances are that if you have a workflow that currently works, changing to NA2011 & Geoid12a will cause problems unless the base station is re-coordinated as well.*
7.	Andre D. – We are using UTM 19 North coordinate system and NAD83(Conus). Which geoid model should we use?	A. *Refer to PP slide 23. Geoid 03 is the recommended geoid model for the NAD83 datum.*
8.	John K. - Do you have a geoid model chart that displays the recommended settings for UTM?	A. *The geoid is a function of the datum so the same chart applies based on the datum you select (Datum column on chart) after you select UTM and the Zone.*
9.	Terry S. - How do you work in the field with a project on state plane cords that has been scaled to ground?	A. *The same way you always have. You don't specify the datum being used for your state plane system in your question. The fact that the coordinates have been scaled to ground does not change the underlying datum that is being used. The difference would be the datum that was used to generate the coordinates that subsequently get scaled up to ground.*
10.	David L. – Given that the software designates only transformations rather than epoch dates, how do you know which epoch published by NGS corresponds to which transformation? Is there any way to know how accurate a Geoid model is for a particular area? Are they more accurate in certain locations?	A. *Epoch dates are not recognized by Trimble, being the transformation parameters of a particular Epoch Date do not change. You have to pay attention to the Adjustment to know what projection to select in the Trimble Software. (answered on-line) The accuracy of the Geoid Model will vary by location. It typically depends on the amount of reference marks used / available, gravitational anomalies, etc. (follow-up) No. The only way to know for sure in a given area would be to test it by checking into a good quality NGS vertical benchmark. The NGS has some good information about geoid models*

		and a FAQ on their website. NGS Geoid Model FAQ.
11.	Ben W. - Are you saying that if we are using NAD 83 Conus and we have selected Geoid 12a that it is being interpolated because the recommended Geoid is 2003? I guess I am interested in the error that may be present with using 12a with the NAD 83 Conus.	A. *Using Geoid 12A with NAD83 (Conus) can have unpredictable results, regardless of which interpolation method you use (Global or Local). NA2011 incorporates some significant ellipsoid height changes through NGS's Height Modernization Project and Geoid 12A was adjusted to NA2011, not independent of it thus incorporating those ellipsoid height changes. The point is, NA2011 and Geoid 12A are designed to work together, other datums and Geoid 12A are not. The errors can range from insignificant to dramatic when Geoid 12A is used with another datum. Also refer to NGS Geoid Model FAQ.*
12.	Mark S. – Why do we get better results using NAD83(1996) with Geoid 09 or Geoid 12A then when we use NAD83(1996) with Geoid 03 (vertically)?	A. *I don't know for sure, but I would hope that the new geoid models (12A & 09) yield better results than the much older 03. Additionally, if you are in MN, the VRS mountpoints are designed to be used with specific Geoid models.*
13.	Steve H. – If we use UTM NAD83(2011) with Geoid 12A, what Geoid model interpolation should we use?	A. *Local. See PP slide 23.*
14.	Ronald M. – Based on what is being said, I assume the if two surveyors use a US State Plane coordinate system and one uses NAD83 (Conus) and geoid 03 and the second surveyor uses NAD83(2011) and Geoid 12A, the will get different positions and elevations?	A. *If they are coming off the same base station, they will get dramatically different answers. However, if they are coming off different base stations that are coordinated to the datum that each surveyor is using, they should see relatively small differences, possibly even within the accuracy of the RTK measurement at relatively close distances.*
15.	Brian K. I recently attended a TBC seminar in which the speaker mentioned that we in MT should not even be using Geoid 12A as it did not change from Geoid 12. However, we're all fed the same format from OPUS in 12A. Does this mean I need to be converting back to geoid 12 or older once my OPUS XML gets imported into TBC?	A. (*answered online as follows) The changes from Geoid 12 to 12A are only down in the South / Southeast. I believe there in no difference in MT. (follow-up) the reported statement from the TBC seminar in MT is a little bit illogical. Technically, in MT, Geoid 12 & 12A are the same thus it really makes no difference which one you use. It follows logically it doesn't make sense "not" to use 12A. You should be able to use 12 & 12A interchangeably but why bother? NGS recognizes 12A as*

		the current model.
16.	Paul V. What is the proper setting for sea level correction and Grid vs ground in the cogo? Q: sorry for state plane is the question.	A: *(answered online as follows) In COGO, you want to set your properties to Grid and uncheck the sea level correction box when working in county coordinates. (follow up) A: For state plane, the sea level box should be checked, and the Grid vs. Ground depends on what calculation you want the software to do when computing points and inverses, etc.*
17.	Leon W. Should we use NAD 83 (2011) in North Dakota? I'm using OPUS to set control.	A: *(answered online as follows) Leon, it will depend on what type of coordinates or adjustment you are tying into. It may vary from job to job. (follow up) A: By default, OPUS will give you the 2011 datum and Geoid 12A.*
18.	Mark V. So in theory, can you simply enter a 1986 coordinate, change the coordinate system to the new 2011 datum, and get a new value for the same point (in 2011 adj)? I think nad83(2007) is a fourteen parameter adjustment, the second set of 7 being vectors in time, I'm not sure whether or not I should use a custom datum transformation for the actual date and time of the project when using VRS, more specifically, does the 2007 mountpoint broadcast a real-time adjustment of 2007 coordinates or only from epoch 2006?	A: *(answered online as follows) In theory, yes, however that is not an advised procedure. (follow up) A: I am not sure about the specifics of the NAD83 (2007) adjustment, as that is not a selection in the Trimble software. The MN DOT 2007 mount point broadcasts based on the NSRS2007 adjustment.*
19.	Elena B. Will NGS provide a "tool" to convert new OPUS coordinates (NAD83 2011 and Geoid 12a) to legacy datums and vice versa for those that don't have TBC?	A: *We cannot speak for NGS or the tools they will or will not provide. We can point you to the below link to stay tuned to what NGS is providing for transformation tools.* *NGS Geodetic Tools*
20.	Dave D. – NGS never published anything called NAD83 CONUS. NGS provides a geoid accuracy map for the lower 48 that is available when using DSWorld.	A: *NAD83 (CONUS) is the Trimble designation for NAD83 with a 0,0,0 transformation.*
21.	Bill K. - Can you define TBC and OPUS please?	A: *TBC is the Trimble office software (Trimble Business Center) OPUS is and NGS program (Online Positioning User Service)*

22.	Scott M. - My job is in a state plane (KS, South zone) coordinate system, yet I've been provided a horizontal datum (HARN) and vertical datum (NAVD88). Does NAD83 Conus (since Trimble Access automatically selects NAD83 Conus as your datum when using a state plane coordinate system) capture these two individual datums?	A: *Yes. However, the horizontal datum is what we are referring to when we say NAD83 CONUS and not the vertical datum. You would need to choose the appropriate geoid model to capture the NAVD88 elevations.*
23.	Gary B. - Can you again give the definition difference between local and global using the NAD83 (2011) in TBC?	A: *The Global position in the Trimble software products refers to the WGS84 position for that particular coordinate. The Local position in the Trimble Software products refers Local LLH position after the datum transformation has been applied. See slide 8.*
24.	Vince C. - Let us know where to get the Geoid 12 download?	A: *(answered online as follows) The Geoid 12A download can be accessed by going to www.fpisurvey.com, then picking Trimble/Geoid Model Downloads.*
25.	Kris M. - Which geoid is best for nad27 state plane?	A: *When working with NAD27, that is a horizontal datum and not a vertical datum. You would be recommended to use Geoid 03 and check and/or calibrate vertically where required when using NAD27.*
26.	David N. - Geoid 12A should be used ONLY with NAD83(2011). NEVER with any other horizontal datum.	*Comment only.*
27.	Brent W. - Is it wrong to say: if using any state plane coordinates, plan on always adjusting the local or grid coordinates and that would cover all situations?	A: *This would be a safe bet. No matter what Datum is being used, the safe bet would be to modify the Grid or Local positions when available.*
28.	Callie H. - We survey in US State Plane 1983, Geoid 09, we use Opus solutions to adjust our base point in our projects in TBC, should we be changing our project properties to 2011 after our first day of surveying, then apply the 2011 OPUS Solution, and then leaving our Project in 2011 or can you then change your properties back to 1983 conus? Or should we totally ditch the older versions and only use 2011 and Geoid12A now?	A: *We cannot advise as to exactly how you want to run your surveys, just how the Trimble software will react to different scenarios. From what you ask, it is advised when using OPUS solutions that you bring those solutions in using the NAD83 2011 projection. It is not recommended to be changing your projects back and forth between these projections as your coordinates will change and this could create some confusion when going back and forth. With that said, it is possible to do as you suggest, however we would recommend to keep everything in the new 2011 projection and Geoid 12A when working with OPUS if possible.*

29.	Trisha W. - Does the geoid 12a apply to southern Ontario as well?	A: NGS states the following: There were also some changes in Canada. However, GEOID12A, as with all previous hybrid geoid models (GEOID09, GEOID03), should not be used in Canada or Mexico or in ocean areas more than 30 km offshore.
30.	Ryan W. - Just to recap, for County Coord Systems: Distance = Grid and Sea Level should not be checked?	A: *(answered online as follows) That is correct Ryan.*
31.	Steve H. - If we use UTM NAD83 (2011) with Geiod 12a what Geiod Model Interpolation should we use? What geiod model interpolation should we use with UTM NAD83(2011) and Geiod model 12a?	A: *In both cases, the Local Interpolation.*
32.	David F. - Using UTM 15N and VRS what is latest and most accurate setup on TSC3 and Access? 12a and	A: *Assuming you are asking for the Geoid model with that projection, I would say Geoid 12A (Local Interpolation) with UTM 15N.*
33.	Andrew J. - This is great. How does this relate to Trimble Pathfinder Office/Terrasync products?	A: *Pathfinder Office and TerraSync software use the same Coordinate System database, so the same rules apply for that software.*
34.	Robert Z. FYI ...TBC V3.01 is the latest as of this morning	A: *(answered online as follows) It actually came out a number of weeks ago. It should have the same warranty date as 3.0. Thanks.*
35.	Peter B. - So, when using OPUS data, we can change our TBC coordinate system to 2011 to input OPUS data and then change back to our project datum?	A: *If you have to work in that particular Datum to do your fieldwork, then yes you should be able to use that workflow. However, we would encourage users when using OPUS and keying in the 2011 adjustment coordinates to stay in that Coordinate system.*
36.	Michael L. - When did NGS start issuing NAD83 2011 ONLY data. Why don't they allow the option to choose the coordinate system anymore?	A: *Not sure on this answer. I assume you are referring to your OPUS solution. This would be a question better answered by someone representing NGS.*
37.	Dean S. - How long has TBC ver 3 been out?	A: *(answered online as follows) I believe it came out in May. Keep in mind that version 3.xx is for 64-bit machines only. If you have a 32-bit machine, you need to use 2.9x.*
38.	Notes regarding NGS and what they have available for users on www.ngs.noaa.gov NGS released 2011 Datum/Geoid 12A Feb 2012. NGS stop offering datum choice Sep 2012 for OPUS	Two programs in BETA currently. Geocon converts NAD83 (HARN) to NAD83 (NSRS2007). http://beta.ngs.noaa.gov/GEOCON/ Geocon11 converts NAD83 (NSRS2007) to NA2011. http://beta.ngs.noaa.gov/GEOCON11/
