

GPS Analyst – Thoughts from the Field:

This document began by Mark D. Roper was updated by Joel Cusick. This is a working document that catalogs the use of GPS Analyst in the first year of its arrival on the GIS Scene. [Mark Roper's meeting with Trimble's Mick Garret is the first Section](#), followed by Tips and Use from [Joel Cusick's work – especially on the Importing of multiple SSF files](#).

Mark D. Roper's meeting with Trimble's Mick Garrett
3/17/2005

These notes pertain to a one-on-one meeting that I had with Trimble's Mick Garrett who graciously came to my office and spent the day with me going over GPS Analyst. His comments on certain paragraphs are in italics. These comments are my thoughts and perceptions about what I got out of the visit.

1. GPS Analyst vs. Pathfinder Office

- The use of GPS Analyst in place of Pathfinder Office for editing can actually have an impact on how data is collected in the field (ex. feature logging rates, GPS filters). What can govern this is how the data is post-processed back in the office. GPS Analyst can more efficiently filter, correct or use mixed qualities of data than PFO.

2. Rebuilding constructions

- Recommended to have Uncorrected Data checked.
 - In general, recommended to have no filters checked.
- The idea is to let the software utilize the power of the construction functions to "filter" the available data and build up to the final feature based off of the required accuracy rather than the user arbitrarily throw out data.

This is definitely true for averaged point positions and vertices and is definitely the way to go. The only caveat here is that when you are working with linear features, you may not necessarily want uncorrected data in them. Currently we don't have the ability to construct based on correction type based on feature class type so you still may need to review the features with uncorrected data checked "Off" to see the results and then look at them with it also checked on later.

3. WAAS

- There are three levels of WAAS correction signal.
 - correlated/historical (can't remember correct term)
 - regional level (can't remember correct term)
 - local level

This is true and it is one of the reasons you are better off when using WAAS that you let the WAAS corrections "settle". By this I mean letting the system track the WAAS satellite for long enough so that all corrections have been received by the receiver. This should be in the 5-10 minute time frame from a cold start. Once you have acquired the WAAS and been using it for a while, intermittently losing the correction for up to 4 minutes and then reacquiring it should not really affect your results. It's mainly the initial start-up after being shut down for more than 5-10 minutes. You just want to make sure you have most current set of all the different correction levels.

4. Logging Intervals

- It is not recommended that you set a logging interval to an oddball value, like 6s, because it will not match-up with the base station intervals very often, unlike 1s or 5s. For example:

<u>Logging Rate</u>	<u>Station Rate</u>	<u>Match with station file</u>
1s	5s	1 in 5s
5s	5s	1 in 5s (it will collect on the multiples of 5)
6s	5s	1 in 30s
10s	5s	1 in 10s
1s	30s	1 in 30s
5s	30s	1 in 30s
10s	30s	1 in 30s

This was true for early receivers but in recent times this has been resolved to a large extent. Nowadays however, you should set all logging rates to 1 second, even with TerraSync. That way you will have the data that you can use to construct your features from. If you choose to log at more than 1 second, you will miss the opportunity to potentially use this data later. If you really don't want to log at 1 second, then you should at least set to an even interval like to 5, 10, 15.... seconds. Most definitely not 7 or 11, or any other prime number!

5. Constructions

- **For use with GPS Analyst**, it is perfectly okay to set the logging rate for Lines/Areas at 1s and let the Construction of Features process filter data out and up to the final GPS feature. It is probably not a good idea to do this if using Pathfinder Office as you would still be relying mostly on manual editing.
- Construction intervals Path settings involve the use of Time, Distance and Angle of Deflection to edit the feature.
- Currently, there are three construction types
 - Path
 - Ring
 - Smart Average
- Use the Construct Features and Validate tools to filter and achieve desired data quality more than other included filtering tools.

6. Base Stations

- For all base stations, use the published Reference Position in the CBS list rather than the coordinates found in the header file. However, it is good to periodically verify the CBS list position against the base station's published position.

7. Integrity Index

- The Integrity Index uses the coordinates in the CBS list to compare against.
- Use the Integrity Index more than the distance from base file to base differential correction on.

This is true as a general rule, especially if there are large discrepancies in the integrity indexes. If I have a base station that was 300km away with an integrity index of 87 and a base 50 km away with an II of 85, I

would choose the 50km base station because of the possibility of ionospheric anomalies. The II is based on the data we downloaded when we computed the II and it may vary when _you_ actually go into the field.

8. Datum shifting

- Datum shifts between features and GPS positions may be a result of a slightly corrupted MXD file. The solution is to start with a new and empty MXD.

I tried to reproduce this and have not been able to do so under 9.0. I would be keen to see if you can.

9. Symbolology by GPS

- You can display the GPS positions by level of accuracy by using a Graduated symbolology.

10. Feature Accuracy

- Final feature accuracy is a weighted average. So, including uncorrected data is not really a bad thing.

Again, be aware of linear features where uncorrected data may not look very nice. Some filtering for specific features may be necessary, but thankfully, you can edit the construction of a specific feature using the rebuild feature button. This will enable you to rebuild a specific feature and do so using position filters. Quite nice.

11. Data Dictionaries

- You can import Data Dictionary Files (DDF) into the geodatabase export Geodatabases to create DDF's.

12. Feature Editing

- Don't necessarily delete outlying positions without examining the cause of why they are outliers. You might end up deleting higher quality positions.

13. GPS Enabled Geodatabases

- **For GPS Analyst, you set the Spatial Reference for the GPS Session.** This is dependent on either an existing feature's SR when the Geodb is enabled or by importing from a geodatabase containing a template SR. You cannot have features GPS enabled in two different SR's within the same geodatabase.
- Once a geodatabase has been disabled from GPS, the underlying GPS data for the features is removed from the database and cannot be re-linked to the existing features.

14. Software Issues

- It would be nice if the Validation Window was not docked as a default when it is initially displayed.
- Maybe have a context menu when right-clicking on a position that had *Delete* and *Properties*.

- Offsetting a feature in the Path Construction does not affect the average and worst accuracy values. Obviously, this would only be a problem to features that you did not intend to offset.
- GPS Analyst caused unexpected display problems within a customized MXD project. *Panning and Zooming* and *Go Back to Previous Extent* had problems with correctly rendering the map.
- There appeared to be a 1 meter datum shift (WGS84 vs NAD83) when comparing the same data differentially corrected within Pathfinder Office versus GPS Analyst. I am not sure where the problem lies.
- Default Construction parameters that were changed at the Feature level in ArcCatalog did not appear to have been applied/changed when viewing the construction parameters in ArcMap. I still had to individually change the construction path parameters for each linear feature to my revised parameters, at least for the session I was working in. (Maybe it is not supposed or still don't fully understand it all that is going on.)
- It might be nice to have a labeling function for the GPS positions, but there may not be an actual need for it.
- Is an UNDO tool possible?

These were previously identified software issues

- *You can only edit points one at a time, rather than groups/blocks.* This may no longer be an issue do to the more advanced method of editing utilizing the constructions feature in Analyst, especially since you are building based on estimated accuracies as well as other filters.
- *You cannot have a floating (undocked) Edit Constructions window.* Maybe this was a result of the Beta version, but this works now.
- *Report feature in validation creates a textfile that is hard to read.* It still is a problem.
- *There appears to be a .12 meter difference between Pathfinder Office Differential Correction and GPS Analyst Differential Correction solutions. I only ran this test 1-2 times, but it may need to be looked into.* I mentioned a similar issue with a variation in the corrections between the two programs. Point is, I would naturally assume the corrections to be the same if I use the same base files, but so far, I have not had this occur. It still may be a problem on my end, but I haven't found it.
- *How would the GPS Analyst install be affected if ArcGIS is centralized on the Citrix servers?* Still a concern.

Joel Cusick – NPS
Using GPS Analyst – From a Data Loading Perspective
Using GPS Analyst Version 1.20, ArcGIS 9.1
1/25/06

These notes pertain to a process that Joel initiated in Fall / Winter 2005 in loading multiple Trimble SSF files using GPS Analyst as part of a migration effort with the Exotic Plant Management team moving into Geodatabases. My comments on certain paragraphs are in italics. These comments are my thoughts and preliminary use issues. These may change subject to more experience.

Short Summary: GPS Analyst is a great improvement over the traditional workflow with Pathfinder Office and TerraSync. Still, Version 1.2 has some major hurdles to overcome to think about eliminating the need for Pathfinder Office.

1. GPS Analyst vs. Pathfinder Office

- You can only get HELP for Analyst by launching from the GPS Analyst Toolbar inside ArcMap. Pretty clunky since you will be using HELP a lot

2. GPS Analyst vs. Pathfinder Office

- The use of GPS Analyst in place of Pathfinder Office for editing can actually have an impact on how data is collected in the field (ex. feature logging rates, GPS filters). What can govern this is how the data is post-processed back in the office. GPS Analyst can more efficiently filter, correct or use mixed qualities of data than PFO.
- GPS Analyst is not yet mature enough to drop the use of PFO for major GPS editing work. There are yet too many tools available in PFO that are not ported over into GPS Analyst as of version 1.20 (editing blocks), all the utilities inside PFO. Don't drop PFO yet.
- My workflow, unless major changes occur in Analyst this summer will be:
 - After Field Work, launch PFO
 - Transfer SSF's into PFO
 - Diff Correct in PFO
 - Edit in PFO
 - Save COR file as "Edited_RoverName.cor"
 - Import the edited Rover into GDB using GPS Analyst.

3. Datum shifting

- You must be in a NAD83 based Geodatabase or all bets are off. Use this crutch to migrate. Dire shifting consequences can result if not in NAD83 based GDB's. Number one reason is there is no high quality shifter between WGS84 and NAD27.
- Folks using Realtime NDGPS realtime beacon are already in NAD83 (CORS96). For those data, use the first transform _1.
- Folks post-processing or using WAAS or Autonomous are in ITRF00 (or WGS84(G1150)). For those data, use the second transform _2 When post-processing against CORS, then use the 5th NAD83_WGS84 transform to edit all your data from

4. Importing From Multiple SSF files

- Here is where I have gained a lot of experience. We loaded over 250 COR files from the summer of 2005 with one GPS Analyst load. Keep these thoughts in mind:

- First SSF file in the loader sets the domains, and controls overall look of GDB. Pay attention to the loading of multiple COR files. Use the best, most rounded out File for the first in the list.
- It appears, small edits to underlying DDF's do not cause duplicate feature names. These include, adding values to menu choices, floating choices to top, or naming the DDF uniquely.
- There has been some cases where I cannot determine a difference between two DDFs using the DDF editor in PFO, but GPS Analyst considered the SSF file that used the DDF's as unique and caused duplicate features.
- Use Append tool to merge back unique duplicate features. This is found in the Data Management ToolBox, General ToolSet.
- Spatial domains of some data imported using a "featureless" SSF file are not recognized by ArcGIS and will cause these data to fall outside most any Spatial Domain of a GDB. You should remove or cull out the 0 position features from the SSF file prior to loading. This is commonly caused by someone opening, closing a feature without storing any positions for that feature. This could be a result of a SSF file with no ephemeris or Almanac data. Enforce good field technique, like always begin a SSF file with a well-warmed up GPS and never attempt to store a feature without any positions.
- Domain creation is automatic and fast, but clearing out unused domains from duplicate features is time consuming.
- Descriptions of domains are not carried over from the DDF editor. This makes for some typing.

5. When it comes to check data back out to Trimble or building a GDB for GPS Analyst.

- Some things just don't work as slick as using GPS Analyst with ArcPad. Here are some
 - Exporting feature and Feature Names:
 - Feature and Attribute Names: though you can go beyond 10 and 8 characters (the limit with Shapes), you are still stuck with a 20 character limit for both feature and attributes.
 - Never begin a feature or Attribute with a number or "underscore" "_". Use underscores between names. No unusual characters.
 - You can begin using spaces and longer names for Features since a GDB does not have the concerns like a shapefile does.
- There is no control in bringing back only updated or new features. You get all the non-edited or altered data as well as all the new data.
 - For now, check out old data and load that data in the background.
 - For now, during check out, export the DDF, then with the old data in background, create a new file using the DDF.

6. Building a GDB by importing an SSF

- Yep, you can do it, but I think its best to build from scratch the GDB and emulate the domains from the DDF. This does two things:
 - Every DDF needs changing. Use the domain creation step in a GDB to think about naming conventions or altering the look and feel. Remember, your not constrained by 8 character feature names and 10 character field names. You have 20 now. Best to Fix this now.

- Slows you down and lets you think about the GDB process. Your GIS will thank you for it.
- Tip: Open the Data Dictionary Editor in PFO. Open the DDF you want to emulate in a GDB. Export the DDF as a TEXT file. Open Text file in Excel, clean up and remove the “” quotes using find replace. Save the file as a table, and you could suck the values into a domain using ArcToolbox Domain ToolSet / Table to Domain Tool.