

GPS Nuts & Bolts Best Practices for Mapping and GIS



ELECTRONIC DATA SOLUTIONS

OGUG Workshop

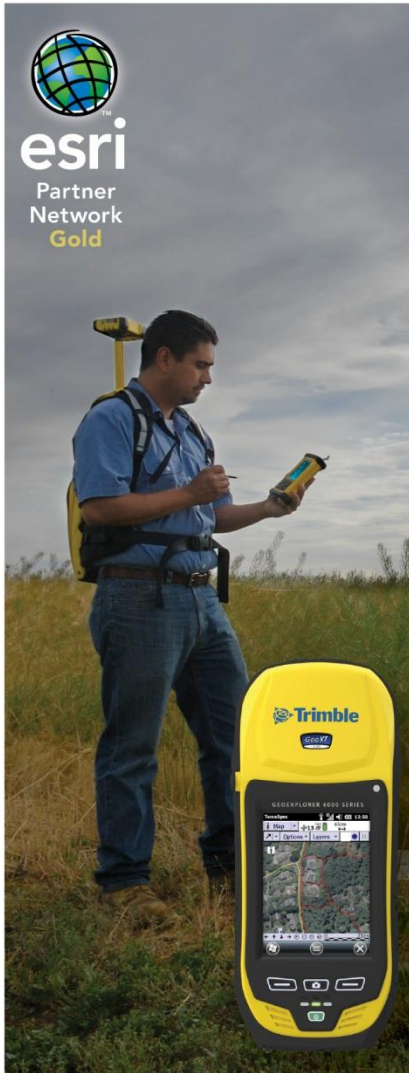
1-11-2012

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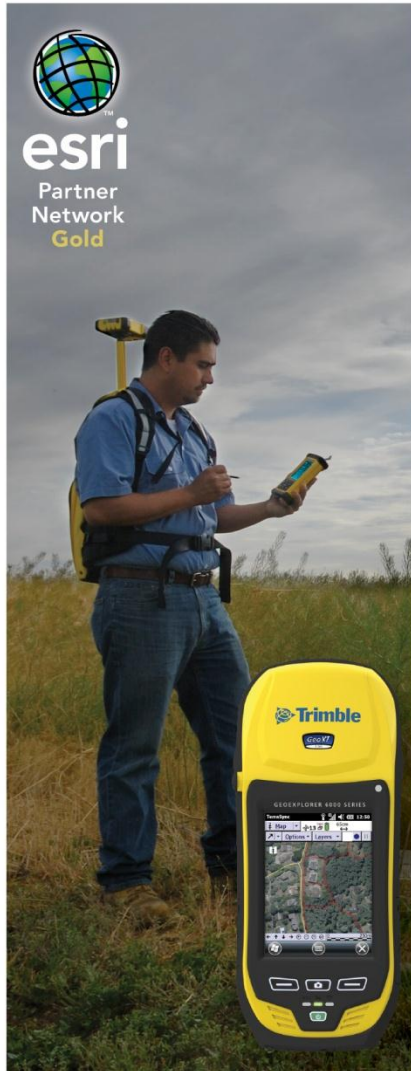
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Presentation



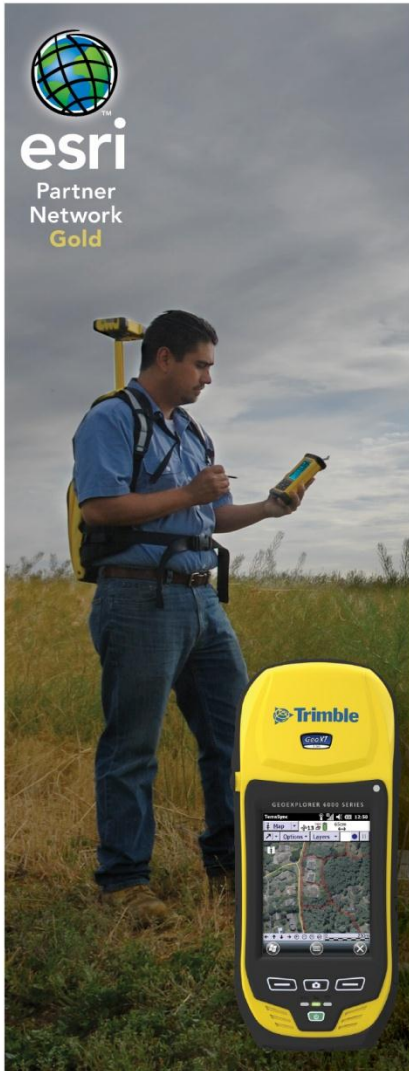
- Centers around Trimble mapping products
- Many suggestions apply to all mapping products
- Recommend sound survey practices
- Use control points every day

Outline



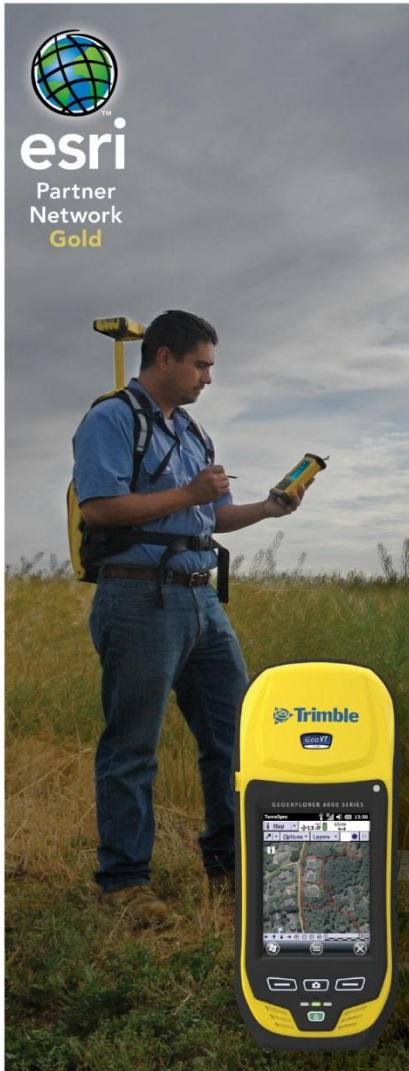
- Latest Trimble technology
- Requirements for collection and processing with latest technology
- Accuracy levels
- Data Collection Best Practices
- Post-Processing Best Practices

Things to Consider



- Field Data Collection Protocol
 - Dependent on type of receiver
 - Dependent on desired accuracy
 - Dependent on environment
 - Dependent on data management practices

Latest Trimble Technology



- Floodlight Satellite Shadow Reduction Technology (GLONASS)
 - Provides more positions and higher accuracy in difficult environments
- DeltaPhase Post-processing Technology
 - Improved GPS accuracy
 - Introduced at Pathfinder Office v4.20 and GPS Analyst v2.20

Trimble Floodlight

Satellite Shadow Reduction Technology

Increased satellite availability

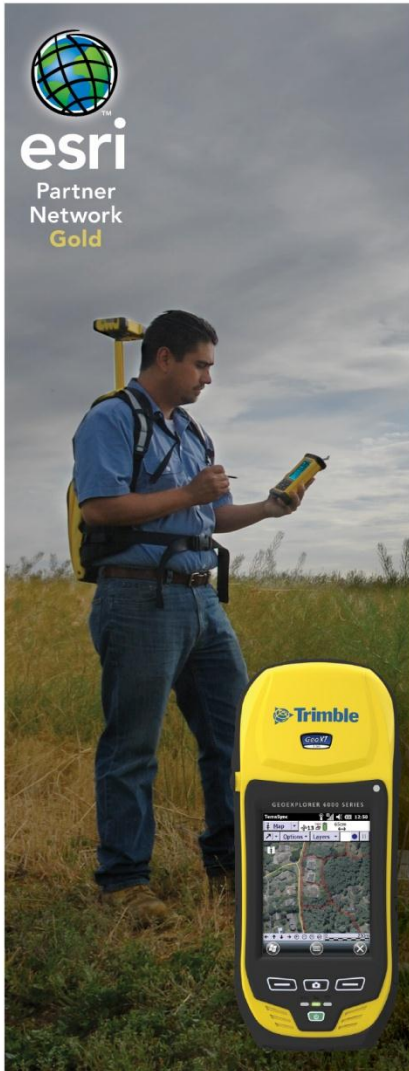
- Multi-constellation positioning

Stabilized acquisition and tracking

- Advanced tracking algorithms and filters

Improves accuracy and limits position outages

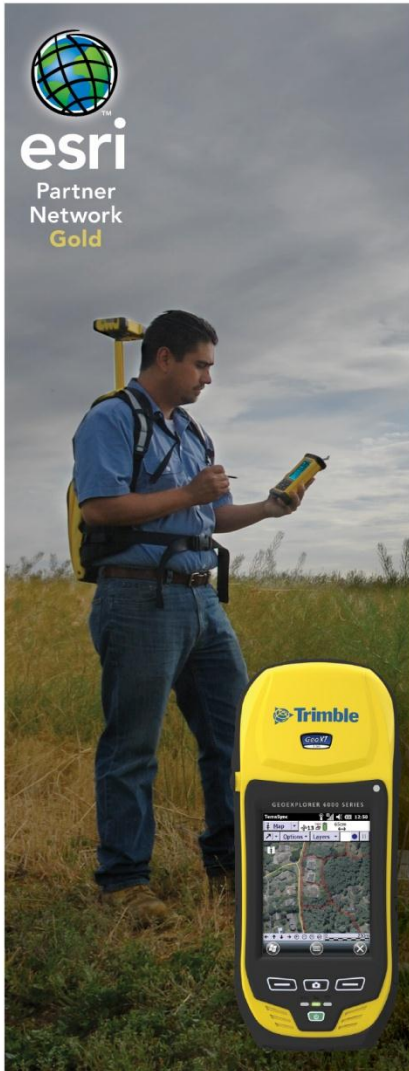
- Altitude-constrained positioning



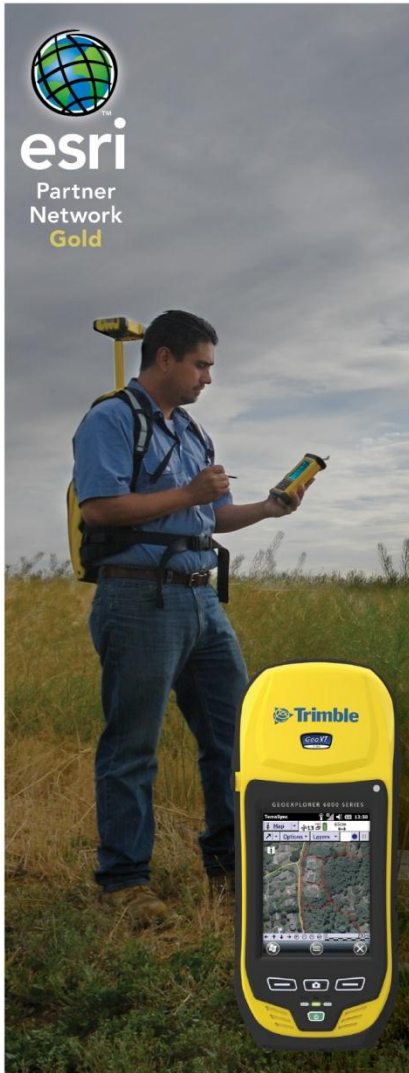
Floodlight Supported Receivers

Only available on the new 6000 Series GeoExplorer

- Standard on 6000 GeoXH (subfoot)
- Optional on 6000 GeoXT (submeter)

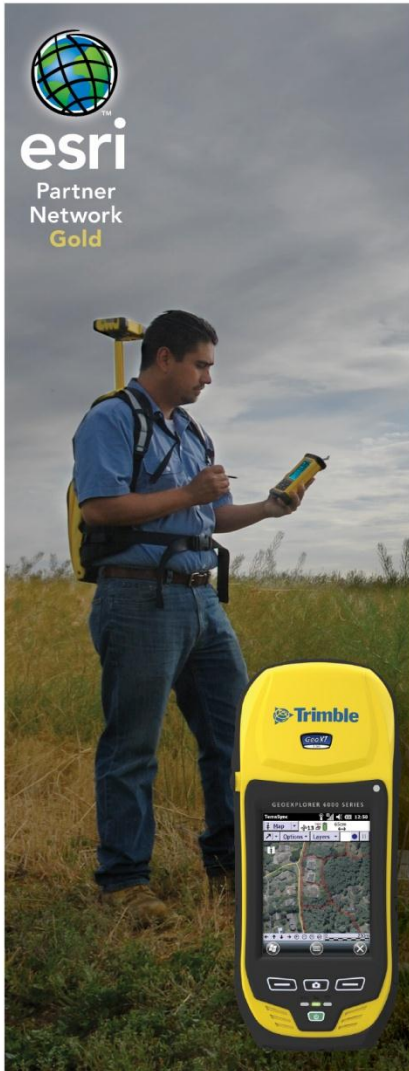


Accuracies with DeltaPhase

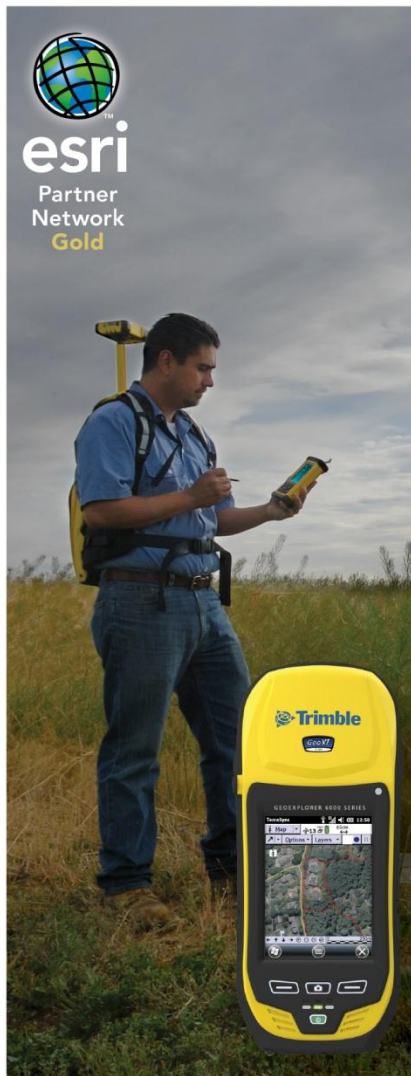


- SiRF post-processed
 - 2 – 5 meters with Nomad® 800G and Yuma®
 - 1 – 3 meter accuracy for Juno™ SB/SC/SD and Nomad® 900G handhelds
- GeoXT™ handheld and GPS Pathfinder® ProXT™ receiver
 - 50 cm – 1 m
- GeoXH
 - H-Star™ Post Processing
 - 10 cm **faster**, at longer ranges, in tougher environments

Data Collection Best Practices

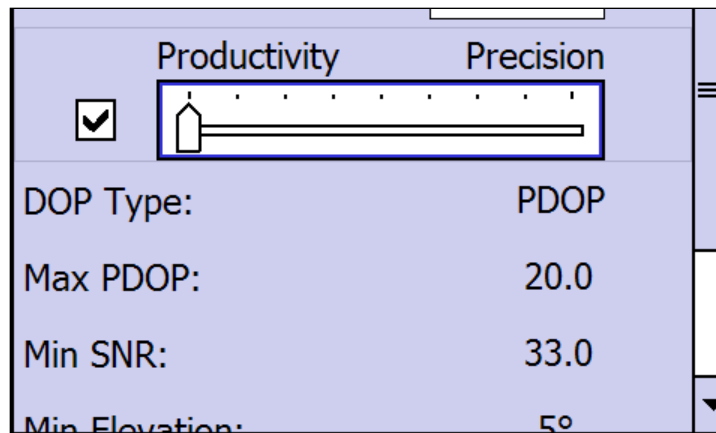


Data Collection Software Settings



If you intend to postprocess:

- Always use left-slider 'Productivity' field software settings



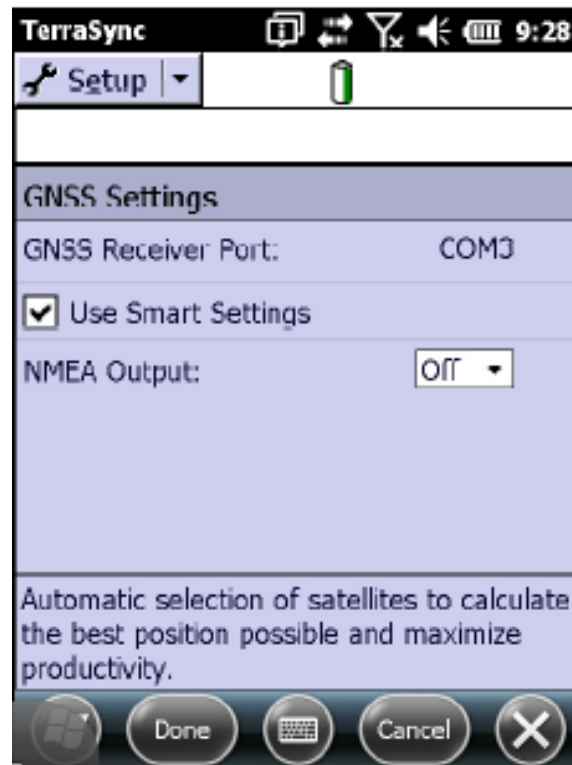
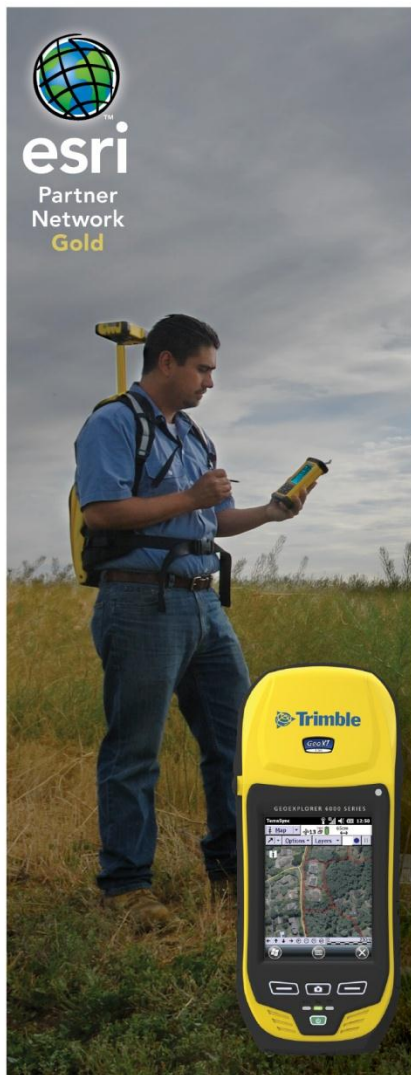
For real-time-only work (no postprocessing):

Use the GPS settings slider as usual, e.g.:

- Mid-slider for more accurate positions in easy conditions
- Left-slider to improve yield in difficult conditions

Floodlight Data Collection Software Settings

In TerraSync 5.21 for the 6000 Series Geo, use the built in Smart Settings and TerraSync will do the work.



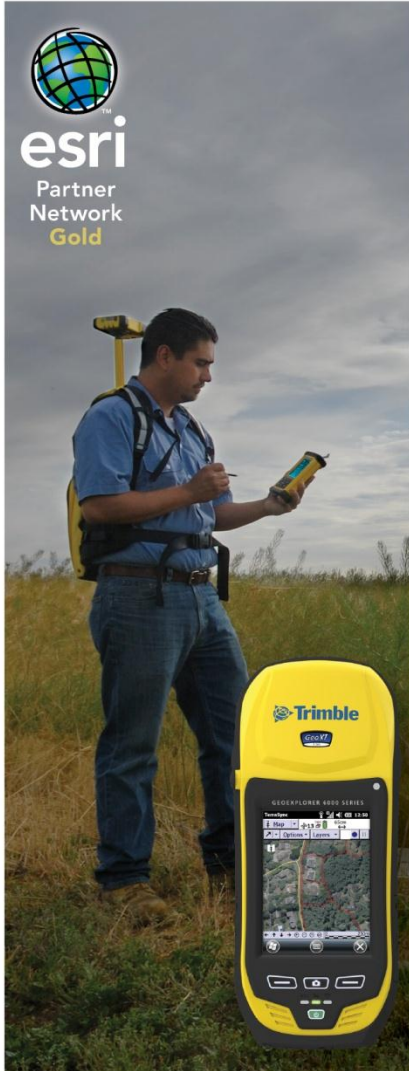
Data Collection Best Practices

Collect good quality GPS measurements
between features (30–60s minimum)

For example:

- Collect good measurements in the open, while walking towards the 'tough' feature
- Then collect the feature
- Then collect more good measurements while walking away towards the open.

Why? Good data before/after the feature helps the postprocessing engine smooth out jumps and spikes at the feature



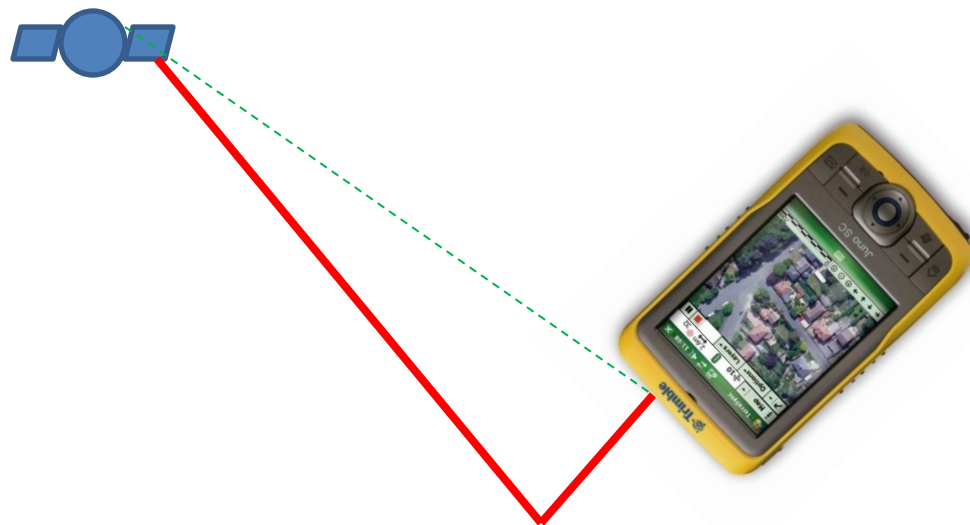
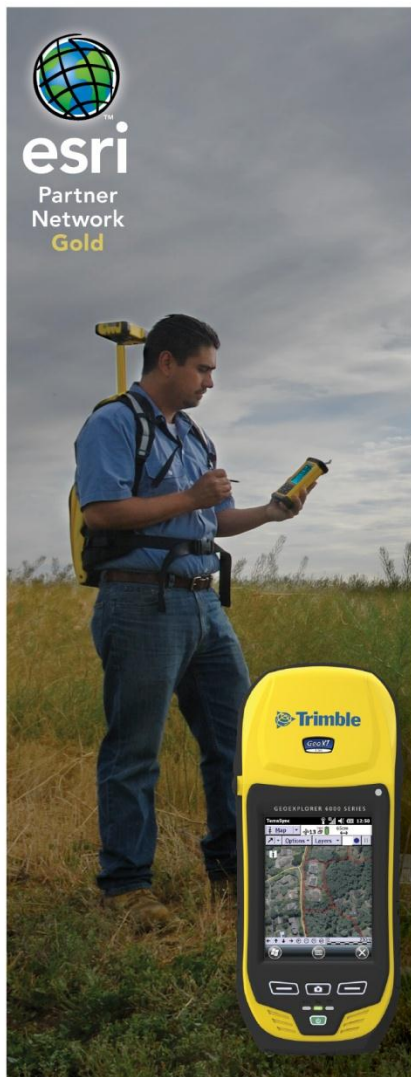
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Data Collection Best Practices

Keep GPS antenna correctly oriented

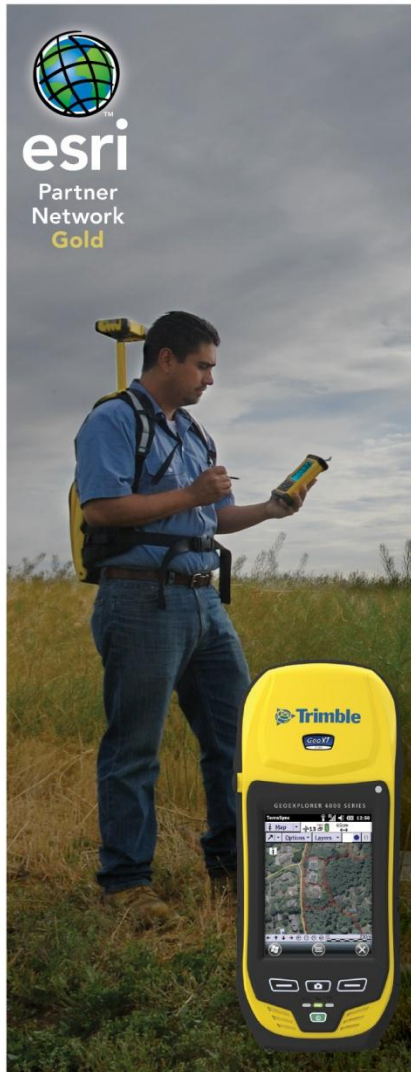
- If you aim at the ground it will pick up reflected signals (multipath) and degrade accuracy
- This includes between features
- Consider disconnecting GPS rather than walking along with device pointing at the ground



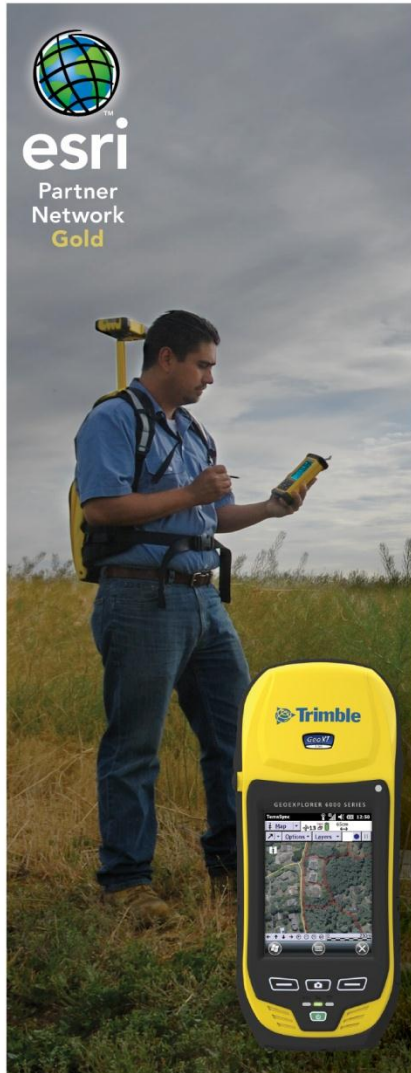
Data Collection Best Practices

How long should a point feature be logged?

- 5s is OK in good conditions, if the accuracy (ERTA or EPPA) is well under what you need.
This assumes you have good data before/after the feature!
- If accuracy is less than desirable, log for 15s or 30s.



Best Practices For High Accuracy Receivers



Preserve carrier lock

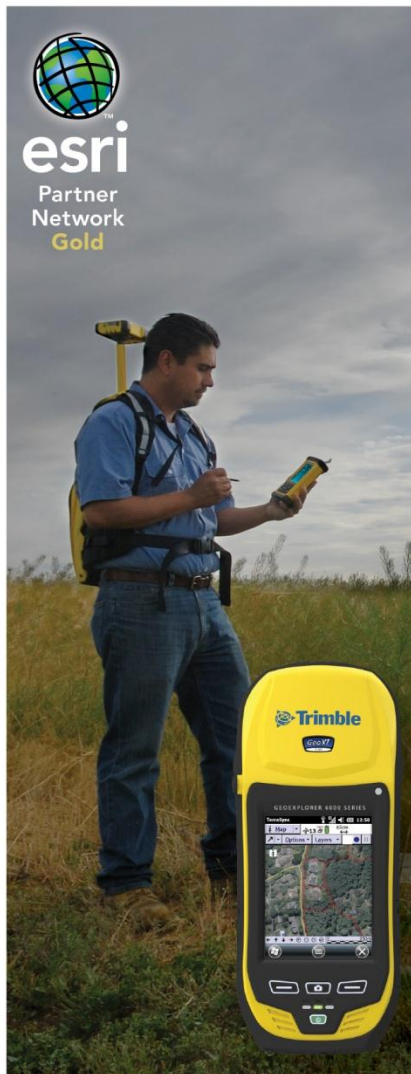
- The longer you can hold the carrier lock the better the position
- Tip: Sudden movements can break carrier lock in difficult conditions

Use an external antenna in tough environments

- Easier to get above your body
- Stronger signal reception
- Larger groundplane - less multipath

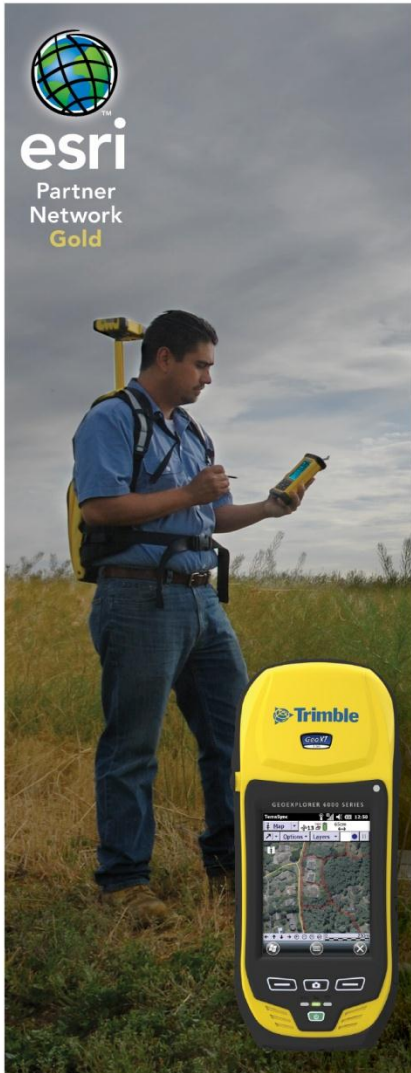
Antenna Type Is Important

- Select the correct Antenna in the field software
- Helps the postprocessor get high accuracy results from data in difficult environments
- Only relevant for H-Star and Standard Carrier processing



Confirm Antenna Height		X
Height:	2.000 m	
Type:	Tempest	▼
Measure To:	GeoXT Internal	▲
	Hurricane	▬
	Tempest	▬
	Tornado	▬
	Unknown External	▼
OK		

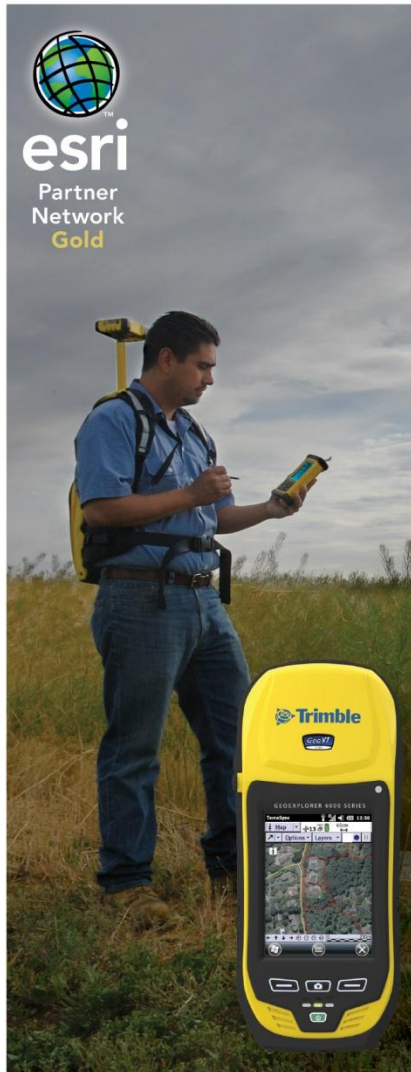
Post-Processing Best Practices



Post-Processing Best Practices

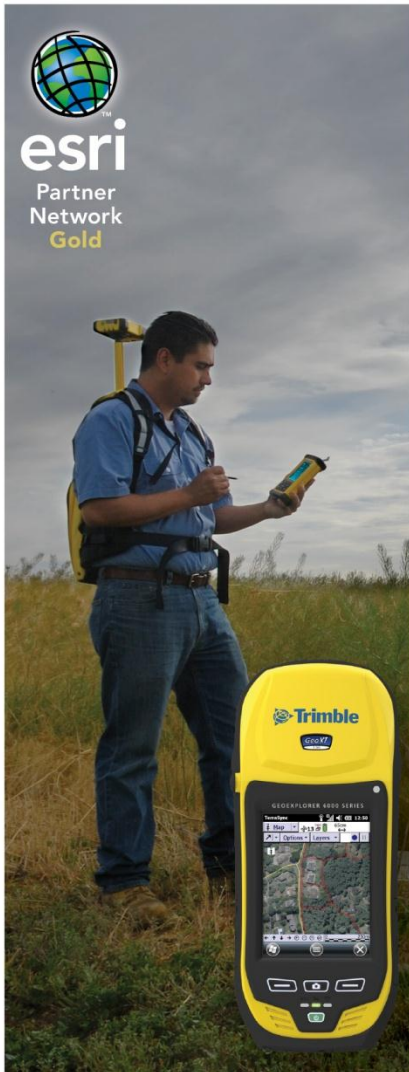
Should I always post-process my data?

- SiRF receivers (Juno, Nomad, Yuma) do not have multipath rejection technology.
- Post-processing can magnify errors in data collected in a high-multipath environment with a SiRF receiver.



Post-Processing Best Practices

- Correct using the 'Smart automatic filtering' setting



Correction Settings

Settings

Output Positions

- Corrected only
- Corrected and Uncorrected

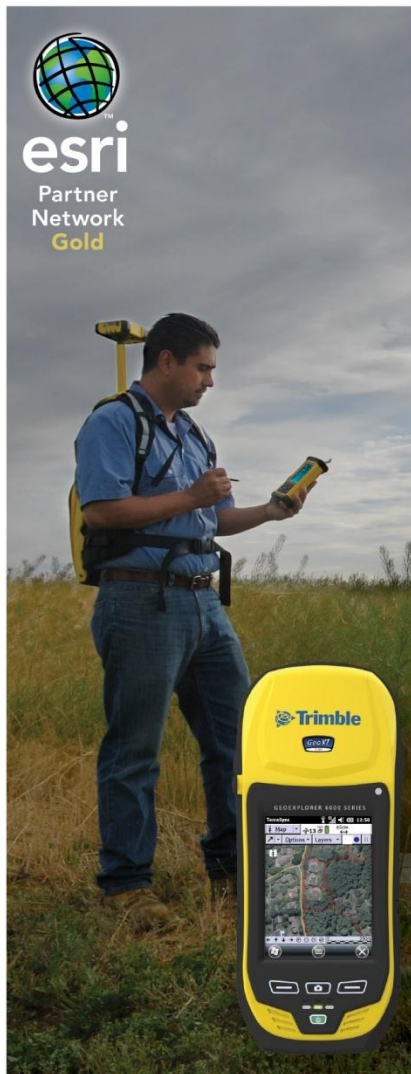
GPS Filtering

- Use smart automatic filtering (recommended)
- Use new filter settings:

Post-Processing Best Practices

What type of base station is needed?

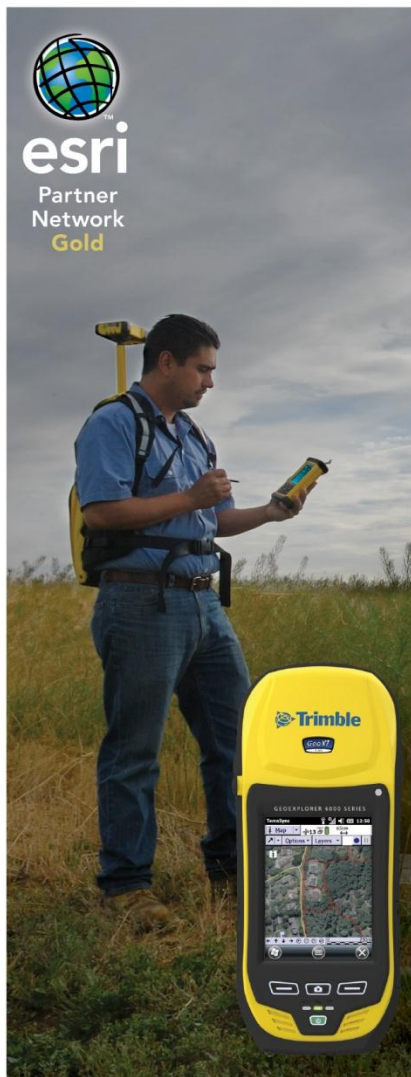
For ProXRT receivers with the GLONASS option and 6000 Series Geo's with the Floodlight Technology, GNSS base station is recommended but not required.



Post-Processing Best Practices

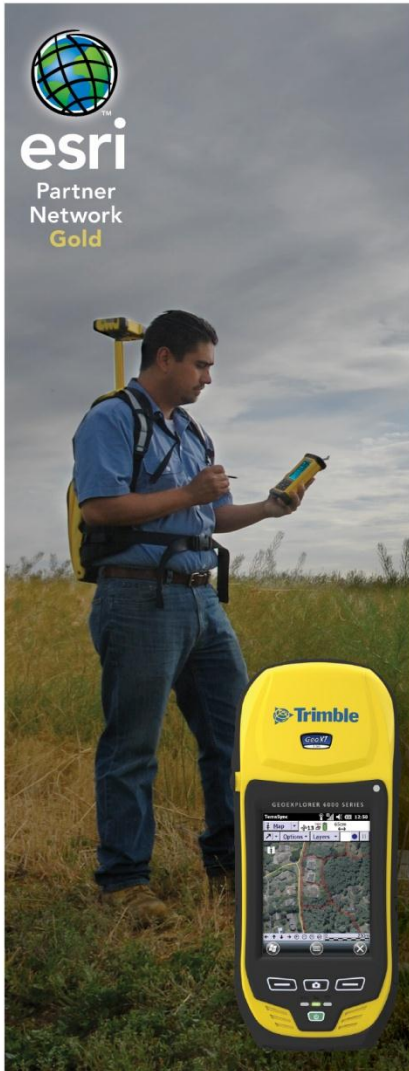
How far away can a base station be?

- Longer baselines supported with DeltaPhase and Floodlight technologies (150 miles)



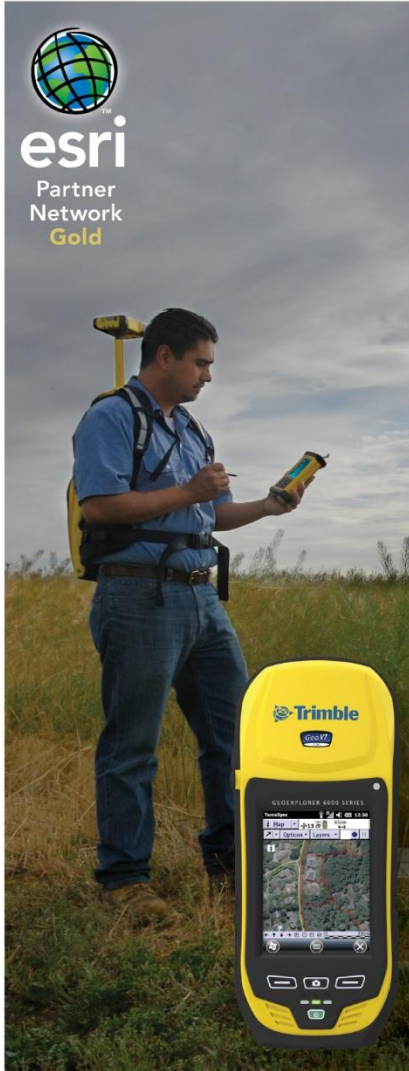
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Check into Control



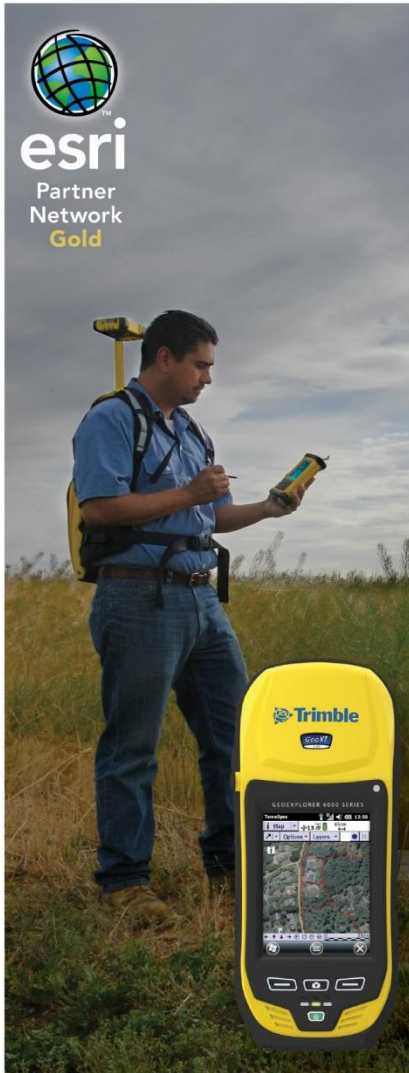
- Recommend users check into NGS control points
- How often?
 - At least twice per day
- How to locate?
 - http://www.ngs.noaa.gov/cgi-bin/ds_pid.prl
 - Radial search from center of project site

Check into Control

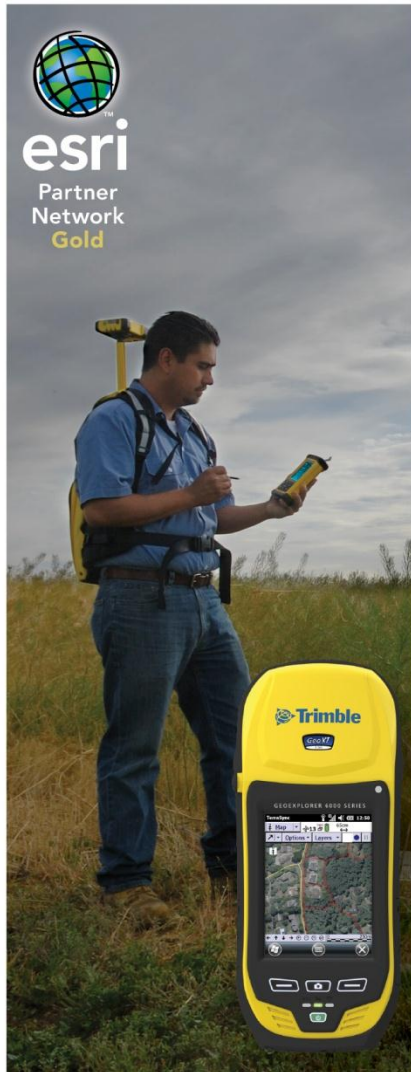


- No guarantee that all position are of equal accuracy unless.....
- New feature in TerraSync Professional field software
- “Accuracy-based logging”
- Surveyors have had feature for years
- MGIS users can enjoy same advantage

Summary



- Know the capabilities and limitations of your system
- Use the system as professional mapping tool
- Follow repeatable field data collection protocol
- Pay attention to details
- Check into control



Questions?