GIS Mapping Basics

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Agenda

• 1-2:30 Classroom Module
• 2:30-5 Outside Exercise
Experience?

• Level Rod?
• Total Station?
• Robot?
• Base and Rover GPS?
• VRS GPS?
• Post-Processing?
• Loading up your own data?
General Information

1.2 Equipment Basics
<table>
<thead>
<tr>
<th>Supplies</th>
<th>Where do you get them? How?</th>
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</thead>
<tbody>
<tr>
<td>Sets of Plans</td>
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<tr>
<td>FEMA forms</td>
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<tr>
<td>Stakes</td>
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<tr>
<td>Mag Nails</td>
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<tr>
<td>Mag Hubs</td>
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<td>Flagging</td>
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<td>Permanent Marker</td>
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<td>Field Books</td>
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<td>DFIRMs</td>
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<tr>
<td>Information on Control Points/Benchmarks</td>
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</tbody>
</table>
Survey Equipment

- Plans!, Project Field Notebook, Camera
- Tape measure, hubs/mag nails, stakes, flagging*
- Extra person*, radios

- Level setup
- Total Station setup
- GPS setup

- Field Book
  - Electronic
  - Paper
## Equipment Selection

- Advance Notice—more options
- Limited GPS Equipment Availability?

- Level of Accuracy Required?
- Structures or Elevation → Total Station
- Isolated Control Point → GPS
Survey Level Equipment

- Transit Level
- Tripod legs
- Stadia Rod
- Tape Measure
- Paper Field Book
Survey Level Equipment

Level Loop

• Able to properly do math in field book
  • Handout

• Handy Option for elevation checks

• It works in the rain
Total Station Survey Equipment

- Total Station-Trimble S6 Robot
- Legs+Bipod
- Rod+Prism
- Controller
Feature Codes
Total Station Survey Equipment

Total Station Equipment Basics

• In every truck*
• Requires 2 people*
• Use same controller as GPS*
• Must use total station (can’t use GPS):
  • Bridge elevations
  • Structures
  • Offset shot
Total Stations

- Where do you set-up?
- How do you select backsights?
- Tricks/Tips for setting up equipment?
- Reflectorless (No Prism)
- Various Prism Constants
- Check the rod height & plumb
GPS Survey Equipment

- GPS Trimble R6 or R8
- Legs+Bipod
- Controller*
- Base Station or VRS
- Phone*
GPS Equipment Basics

• In every office?
• Requires only 1 person
• Anyone can get GPS buttons to work, we want QUALITY DATA!
GPS Survey Equipment
GPS Survey Equipment

• How GPS works with satellites

\[ h = N + H \]

where:

- \( h \) = ellipsoidal height
- \( N \) = geoid height (geoid heights in U.S. are negative)
- \( H \) = orthometric height (elevation)
GPS Survey Equipment

- Rover plus base station

1. Base station location is known accurately.
2. Base station receives GNSS signals, calculates pseudoranges to satellites, and determines range errors.
3. Base station transmits range corrections to rovers, over a radio link for example.
4. Rover stations receive GNSS signals, calculate pseudoranges, apply range corrections, and determine position.
GPS Survey Equipment

• Satellites send timestamp signals to Earth
• 3 satellites required for horizontal
• 4 satellites required for vertical
• 5\textsuperscript{th} is required for survey grade
GPS Survey Equipment

• Why need phone?
  • Broadcast corrections

• Radio ➔ Phone ➔ Bluetooth ➔ Wifi Hotspots ➔ ”Myfi”

• Required post-processing ➔ mostly done on-the-fly, checks
GPS Survey Equipment

• Horizontal-Total Station accuracy about the same
• Vertical- Total Station generally more accurate

Accuracy if not fixed
• Does not work properly without “sky”
  • PDOP, Satellites
GPS Survey Equipment

**LED conditions**

An LED that is flashing quickly indicates a condition that may require attention, and an unlit LED indicates that no operation is occurring. The following table describes some LED conditions, possible causes, and how to solve them.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The SV Tracking LED is lit solidly and the Logging/memory LED is flashing slowly.</td>
<td>The receiver is in Monitor mode, ready for new firmware to be loaded or new options to be added.</td>
<td>Turn off or turn on the receiver. Load the latest version of the firmware, which you can download from <a href="http://www.trimble.com/support">www.trimble.com/support</a>.</td>
</tr>
<tr>
<td>The SV Tracking LED is flashing rapidly.</td>
<td>The receiver is tracking fewer than four satellites.</td>
<td>Wait until the SV Tracking LED is flashing slowly.</td>
</tr>
</tbody>
</table>
## Receiver issues

The following table describes some possible receiver issues, possible causes, and how to solve them.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The receiver does not turn on.</td>
<td>External power too low.</td>
<td>Check the charge on the external battery, and check the fuse if applicable. Replace the battery if necessary.</td>
</tr>
<tr>
<td></td>
<td>Internal power too low.</td>
<td>Check the charge on the internal batteries and replace if necessary. Ensure battery contacts are clean.</td>
</tr>
<tr>
<td></td>
<td>External power not properly connected.</td>
<td>Check that the Lemo connection is seated properly. Check for broken or bent pins in the connector.</td>
</tr>
<tr>
<td></td>
<td>Faulty power cable.</td>
<td>Try a different cable. Check pinouts with multimeter to ensure internal wiring is intact.</td>
</tr>
<tr>
<td>Receiver does not log data.</td>
<td>Insufficient internal memory.</td>
<td>Delete old files using the GPS Configurator or Trimble Survey Controller software, or by holding down the Power button for 30 seconds.</td>
</tr>
<tr>
<td>The receiver is not responding.</td>
<td>The receiver is tracking fewer than four satellites.</td>
<td>Wait until the 5V Tracking LED is flashing slowly. Power down the receiver and power back up. Hold down the Power button for 30 seconds. If you want to retain data files, remove the CompactFlash card first.</td>
</tr>
</tbody>
</table>
Pop Quiz Questions

• Where do you park your truck on a jobsite? Anything special?
• You’re headed to check a bridge culvert—what do you take? Anything special?
• You’re headed to a new job. What one-time things will you need to do?
Hands On GPS

1.3 Basic Functions
Things to do with GPS

• Finished Floor Elevation
• Culvert
• Hydrant
• Water Meter
• Centerline of Stream
• Ground Shot
• Measure limits of flooding
At the end of this course, you should:

• Know basics of different survey equipment

• Know at least 3 things you can do with GPS