BLASTING APPLICATIONS FOR GPS

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PreBlast Survey and Blast Locations

- Required by rules
- Establish spatial relationships
- Establish distances
- Establish allowable charge weights
- Liability protection
35S5-WM1
13th April 2002
Magazines and Seismograph Locations

- Seismograph locations are important for liability protection and site characterization
- ATF requires schematics and aerial photograph documentation for:
  - Security
  - Emergency response
How Locations

- Survey (costly)
- Aerial Photography (costly)
- Compass and range finder (line of sight)
- Topographic Grid map (eyeball)
- GPS
Accuracy of Blasting Data

- Two components
  - Northing and Easting
  - Latitude and Longitude
  - Distance and Azimuth
  - Grid map?

- Industry standard - Measurements to two significant digits
  - < 100’ ...............to the nearest foot
  - 100’ – 1,000’ ......to the nearest 10 feet
  - 1000’ – 10,000’ …to the nearest 100 feet
GPS Accuracy

- GPS receivers use triangulation to calculate location.
- Receiver must be locked on to at least three satellites to calculate a 2D position (latitude and longitude).
- Four or more satellites, can determine a 3D position (latitude, longitude and altitude), 40 feet accuracy on average.
GPS Accuracy

- WAAS (Wide Area Augmentation System) capability can improve accuracy to less than ten feet on average.

- Differential correction provides accuracy to within 3 feet, under ideal conditions less than 1-foot.
# GPS Selection

<table>
<thead>
<tr>
<th></th>
<th>Low end</th>
<th>Mid range</th>
<th>High end</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>40 feet</td>
<td>10 feet</td>
<td>3 feet</td>
</tr>
<tr>
<td>Price</td>
<td>$100</td>
<td>$450</td>
<td>$4,000</td>
</tr>
</tbody>
</table>
Track and Point Comparison
Garmin vs Trimble
THE GPS UNIT’S BUTTONS

ZOOM IN/OUT Button

PAGE Button: Used to cycle through pages.

CLICK STICK: Can be pressed in, moved up/down, or left/right.

POWER Button
Satellite Page

- Once enough satellites have been located, you can begin using the GPS unit.
- The unit will display your current location coordinates at the bottom of the screen (dd mm.mmm or dd mm ss.s)
- Can be changed to UTM
WAAS Enabled

- Acquired satellites darken
- Satellites # 33+
- “D” indicates differential correction
- Best with a clear view of sky (like most mines)
Map Page

- The black arrowhead represents you.
- And the direction you are facing.
- The top of the GPS unit represents North.
Waypoints

- Symbols
- Names (Shot121103)
- Coordinates
- Elevation
- 500 waypoint limit

Location: N 40°25.499' W080°02.287'
Elevation: 1059'
Distance: 1.90'
Bearing: W
Tracks

- Track is a cookie crumb trail
- Distance or time based
- 10,000 points
OTHER FEATURES

COMPASS

ALTIMETER

TRIP INFO

OTHER FUNCTIONS
Software

- Download GPS to desktop
  - Map Source
  - ArcView
  - Ozi Explorer
  - TopoFusion
- Save data monthly
- Save data by site
- Query for locations and distances
GPS in Blasting

- Location and distance documentation
- Spatial relationships established
- WAAS enabled system - $400
- PreBlast survey locations
- Permanent documentation of blast sites and seismograph locations for liability protection
- ATF documentation of magazines
- ** Area calculations for bonding**
QUESTIONS?

Global Positioning System

Your location is:
37° 23.323’ N
122° 02.162’ W