INTRODUCTION TO GPS USING GARMIN E-TREX VISTA HCx

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What do you currently use for blast locations?

• Blast Location Technique?

• You own a GPS? Field or car...
Class Goals

• Gather site specific data in a global arena
• Get a unit in everyone’s hands as a means of working field personnel up the GPS technology ladder
• “No blaster left behind!”
• Maps are easy!
Locations in Mining

- Houses
- Wells
- Water monitoring Point
- Blast Locations
- Complaints
- Permit Signs
- Bore holes
- Preblast surveys
- Seismographs
- Seeps/springs
- Flyrock
Spatial Relationships are Important!

Example: Vibration Directional Effects
Linear Features

- Roads
- Diversions
- Property lines
- Highwalls
- Erosion gullies
Areas in Mining

- Permits
- Bonding
- Stockpiles
- Ponds
- Landslides
- Blasting
- Casts
Other Uses

- Navigation to mines
- Navigation to homes
- Cross sections
- Estimating travel times
Past Locations and Areas?

- Survey (costly)
- Compass and range finder (line of sight)
- Compass and tape
- Grid map (eyeball)
- GPS
  - Best technology currently available for blasting!
WHAT IS GPS?

Global Positioning System (GPS) is a satellite-based Navigation system

– U.S. Department of Defense
– NAVSTAR, the official U.S. DoD name for GPS
– The first GPS satellite was launched in 1978
– A full constellation of 24 satellites was achieved in 1994
• GPS satellites:
  – Orbit the earth at about 12,000 miles
  – Constantly moving, two complete orbits in less than 24 hours
  – Travel at roughly 7,000 miles an hour
  – Satellites are powered by solar energy

• 1980’s - System available for civilian use but with Selective Availability (scrambled signal), accuracy 300 feet
HOW GPS WORKS

• Selective Availability off in May 2001, now useable as a hand held unit

• Triangulation to calculate location
  – When locked on to at least three satellites, can calculate a 2D position (latitude and longitude)
  – Four or more satellites, can determine a 3D position (latitude, longitude and altitude)
HOW GPS WORKS

• Standard accuracy with original satellites, 40 feet

• WAAS (Wide Area Augmentation System) capability will improve accuracy to less than 10 feet on average.

• Differential correction provides accuracy to within 3 feet, under ideal conditions less than 1 foot
What is WAAS?

- Federal Aviation Administration Project - augments the GPS constellation to meet the necessary integrity, availability, accuracy, and continuity for use in all phases of flight (airplanes)
- WAAS consists of:
  - 25 reference stations
  - 2 master stations
  - 3 geosynchronous satellites
  - 3 uplink stations
WAAS Status

• WAAS has been available for recreational use and visual flight rules since August 2001
• WAAS was approved for aviation instrument operations on July 10, 2003
• Provides 100% coverage of Continental US & Alaska from 100,000ft. to surface
• Continuing to develop the system to expand vertical navigation to most of North America
• 2-3 meter accuracy
• More information–
  – http://www.gpsinformation.org/dale/dgps.htm
How Does It Work?

Wide Area Augmentation System

GPS L1 & L2

Wide Area Reference Stations Monitor the GPS Satellites

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How Does It Work?

The Information Collected by the Wide Area Reference Stations is Sent to the Wide Area Master Stations Who Will Calculate the Correction Message.
How Does It Work?

The Wide Area Master Station uplinks the correction message to the WAAS GEO satellites via a ground uplink station.
How Does It Work?

The WAAS GEO Satellites Broadcast the WAAS-Corrected Signal to Aircraft and Other Users in the Service Area

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• Provides Dual Coverage Over CONUS and Alaska with AOR/W as hot spare
Accuracy and Precision

• “Accuracy is the degree to which a measured value conforms to true or accepted values. Accuracy is a measure of correctness.”

• “Precision measures exactness. ... It is a measure of the control over random error.”

From: ESRI GIS Dictionary, 2005
USGS Accuracy and Precision Standards

• 90% of “well-defined points” must be plotted to within 1/50th an inch accuracy on a 1:24,000 scale map which is the equivalent of 40 feet on ground surface.

• “Well-defined points are easily visible or recoverable on the ground, such as the following: monuments or markers, property boundary monuments; intersection of roads and railroads; corners of large buildings or structures (or center points of small buildings).”

From: USGS Map Accuracy Standards Fact Sheet FS-171-99 (November 1999)
The ‘uncertainty’ or ‘error’ of any point depicted on an USGS topographic map (1:24,000). In this example, shown as a 40 foot error radius encircling a benchmark location.
GPS Equipment Summary
Leica SR530

- Significant ‘learning curve’.
- Physically cumbersome.
- Highly precise and accurate measurement.
- Not useful in ‘finding things’.
- Requires downloading data in office.
- Expensive to own and operate.
GPS Equipment Summary
Trimble with Laptop and Arcpad

• Slight ‘learning curve’.
• Physically cumbersome.
• Accurate for measuring mining locations.
• ‘Real-time location’ on convenient base map(s) is very useful.
• Fairly expensive to own and operate.
GPS Equipment Summary
Garmin eTrex Vista

- Easy to use and download.
- Sufficiently accurate in getting locations for mining.
- Projects in ArcView.
- Waypoint navigation can be used to locate field features.
- Inexpensive to own and operate.
Track and Point Comparison
Garmin vs Trimble
GPS Selection for Data Collection

Low end  | Mid range  | High end
---|---|---
40 feet  | 10 feet  | 3 feet
$100     | $200     | $4,000+
Today’s Mid range choices

E-trex
Vista
$250

Oregon
$550
Touch Screen

E-trex 30
$300
Data - Waypoints

- Symbols
- Names (Shot121103)
- Coordinates
- Elevation
- 500 waypoint limit
- Averaging
Data - Tracks

- Track is a cookie crumb trail
- Distance or time based
- 10,000 points
- 20 saved tracks
- Linear Features
- AREAS!!!
Key Functions

- **IN/OUT Zoom keys**
  - From the Map page, press to zoom the map in or out.
  - From any other page, press to scroll up or down a list or move a highlighted slider.

- **MENU/FIND key**
  - Press and release to view the Options Menu for a page.
  - Press and hold to display the Find Menu.

- **ENTER/ROCKER key**
  - Rock up or down or right or left to move through lists, highlight fields, on-screen buttons, or icons; enter data; or move the map panning arrow.
  - Press in and release to enter highlighted options and data or confirm on-screen messages.
  - Press in and hold at any time to MARK your current location as a waypoint.

- **QUIT/PAGE key**
  - Press to cycle through the main pages.
  - Press and hold to turn the compass on or off (Vista HCx and Summit HC only).

- **POWER key**
  - Press and hold to turn on or off.
  - Press and release for backlighting or to view time, date, and battery capacity.

Each button has a double purpose: Depress and hold for second function.
Getting Started

Installing Batteries and Lanyard

The eTrex operates on two AA batteries (not included). Use Alkaline, NiMH, or Lithium batteries. See page 37 for setting the battery type.

To install the batteries:
1. Remove the battery cover by turning the locking ring 1/4 turn counter-clockwise and pulling the cover loose.
2. Insert the batteries, observing the proper polarity.

Remove the batteries when you do not plan to use the unit for several months. Stored data is not lost when batteries are removed.

To install the lanyard:
1. Place the loop of the lanyard through the slot at the base of the unit.
2. Route the strap through the loop, and pull tight.

Optional belt clip (attaches to belt or waistband)

USB connector port (under weather cap)

Belt clip knob

Lanyard installation

Auxiliary mount adapter (Do not discard. This adapter attaches to the unit for connection to mounting kits.)
Power Up the Unit

1. Press and Hold the Power Key **ON THE RIGHT** to Turn the Unit On

2. The First Screen to Appear is

3. Press the Menu Key **ON THE LEFT** to view the Menu screen

4. Depress the Thumb stick to turn GPS off
Satellite Page

- Location Accuracy
- Displays current location coordinates (dd mm.mmm or dd mm ss.s)
- Acquired satellites darken
- Outer ring – Horizon
- Inner ring – 45° of sky
WAAS

- Satellites 35, 48 and 51
- "D" indicates differential correction
- Begin data acquisition when accuracy is acceptable (almanac acquired)
- Best with a clear view of sky (like most mines)
SET PAGES

Map Page  Compass Page  Altimeter Page  Main Menu

MAP  COMPASS  ALTIMETER  MAIN MENU
The black arrowhead represents you and the direction you are traveling.
Press twice for Main Menu

Or, Press and scroll to Main Menu
Set Up Menu

Using the “Thumbstick” navigate to the “Setup” Menu….
Insert a Welcome Message

► Scroll down the Setup Menu to find “Welcome Message”

► The welcome message will be displayed for a few seconds each time the Garmin unit is activated.
Learning the “Thumb Stick”

► In the Setup screen move thumb stick to “Welcome Setup”
► Enter your contact information using the thumb stick
► Press “OK” when finish
► Note how the caret can roll on the alpha/numeric pad
Setup System

Press the “Exit” button once to go back to setup screen

Scroll up to “System” Setup Menu

To get

Select

System
Setup System

Define each of the System settings...

1. For indoor use, select **GPS Off** otherwise select “Battery Saver.”

2. Choose WAAS **Enabled**
Get to Setup Units

Using the “Thumbstick” navigate to the “Units” menu…

Select

To get
Setup Units

Define each of the Unit settings...

1. Select units for position format, *hddd°mm′ss.s“*

2. Select units for Map Datum. *WGS 84* is used in this class.

3. Select *Yards* for distance/speed.
Map Datums

- Datums are grids with a defined reference starting point.
- There are lots of datums in existence dating back several decades.

Common datum include:
- World Geodetic System 1984 (WGS 84)
- North American Datum 1983 and 1927 (NAD 83 and NAD 27)

The maps and charts, like USGS topo maps, must indicated the datum that is being used.
Setup Map

Press once to go back to setup screen

To get

Select

Map Setup - General
- Orientation
- Auto Zoom
- Detail
- Lock On Road

Map
- System
- Display
- Tones
- Page Seq.
- Marine
- Time
- Geocache
- Heading
- Calibration

Pennsylvania Map
Setup Map

► Orientation controls how the map will be displayed on your unit

► North Up means the map will always be oriented with north on the upward side of the screen

► Track Up means the orientation of the map will shift so that whatever direction the unit is facing will be up. * Useful when locating objects or following tracks.
Setup Time

► Navigate to the “Time” Setup menu

► Here you can set the correct time for your geographic location

► First, choose the time format, either 12 or 24 (Military) hour

► Select time zone

► Choose either “yes”, “no”, or “auto” for daylight savings time
Setup Heading

► Navigate to the “Heading” setup menu
► Here we can select our North Reference as “True” north
► Change speed and time delay for electronic compass switching to 1m/h and 5 sec.
Helpful Hints

► When in doubt about what settings to use push the “Menu” button and select “Restore All Defaults.” This restores the manufacturer’s default settings.
Helpful Hints

► When you do not want to select any option, press the “Quit” button to get back to the previous screen.
There are 4 main pages in sequence that the Garmin unit uses:
Map Page

You can use the Map Page to do the following:

► Determine your current location and progress while moving
► Select and save a map point as a waypoint
► Locate and navigate to map items by following a Route displayed on the map
► Customize the map display to your requirements
Using Map Page Features

► Use the “Zoom In” and “Zoom Out” keys to change the map scale.

► The lower left-hand corner displays the map scale and the units the map is in (generally feet or meters).

► A circle around the positions arrow represents the accuracy circle.

► The “thumbstick” can be used to pan the map, and a panning arrow will appear to move around the map.
Map Page Menu Options

► While on the Map Page press the “Menu/Find” button to display the Map Menu Options

► These options allow the user to control the information displayed on the Map Page
Map Page Data Fields

► Data Fields add information to the Map Page Display

► 2 Data fields for this class: **Accuracy and Elevation**

► Be careful! Data Fields can quickly use up all the display space and hide the map
Pan Map

► Map page
► Move left with the thumbstick
► Distance and azimuth from your current position at the pointer tip
Compass Page

► The compass page is your guide to accurate and efficient navigation

► 3 Data fields for class: Heading, Elevation and Dist. to next

► The rotating compass ring indicates the direction you are heading
Compass Page Menu Options

► Similar to the Map Page Menu Options

► Options specific to the Compass are Sight ‘N Go, the Course Pointer, and Calibrate Compass
Compass Calibration

- The electronic compass must be calibrated outdoors when you first use the eTrex Vista C and when new batteries have been installed.
- The calibration will be adversely affected if the unit is not held level, or if you are near objects that generate magnetic fields, like cars or buildings.
Altimeter Page

- Displays current elevation, rate of ascent/descent, a profile of elevation changes over time or distance, or a profile of pressure changes over time.
- 2 Data fields for class: Barometer and Max. elevation.
- Elevation is at the bottom.
Calibrate Altimeter

- eTrex Vista C relies on barometric pressure to determine elevation
- Must be calibrated **daily** for accuracy
- Set Elevation to 1200’
Altimeter Setup

Turn the feature off to keep the same pressure/elevation relationship when profiling.

Caution: Should be used only when atmospheric pressures are steady or a based altimeter is used as a reference.
Adding Other Pages

For this class we will add two other VISTA pages to the page sequence.

Use the thumb stick to move to and select Page Sequence.

Scroll Down to Add Page.
Adding Other Pages

Scroll Down to Tracks
Depress the Thumb Stick

** Remove “Active Route” page
Final Pages

Page Sequence Setup

Map
Compass
Altimeter
Main Menu
Tracks
<Add Page>

Clear All
Include All
Track Page

The Tracks feature creates an electronic bread crumb trail or track log.

- **Track Log**
  - On/Off toggle
  - Tracks Log: 1%
  - Setup
  - Clear
  - Save
  - TracBack

- **Saved Tracks**
  - List of tracks
  - 20 Unused

- **Track Log Setup**
  - Wrap When Full
  - Record Method
    - Auto
    - Interval
    - Normal
    - Color
  - Data Card Setup

- **Track back**
  - Allows users to navigate to a previous location

- **Delete Track log**
  - Confirm deletion message: Do you really want to clear the track log?
Track Page

The Tracks feature creates an electronic bread crumb trail or track log.

This menu allows users to also delete track and to calculate area of a track (covered later).
Reset Altimeter and Other Data

► You can reset elevation and other data by selecting the “Reset” option from the Altimeter Page Options Menu.

► Be careful when selecting data to delete, there’s no going back!

► Easiest place to delete Waypoints and Tracks.
Questions?

Outside
- Calibrate compass
- Explore buttons
- 10 minutes + Break
Data Acquisition: Waypoints

Mark and Navigate
What is a Waypoint?

• Waypoints are locations or landmarks worth storing in your GPS. These are locations you may later want to return to. They may be check points on a route or significant ground features.

• Waypoints may be defined or obtained in the field or by taking coordinates for the waypoint from a map or other reference. This can be done before ever leaving the office.
Mark a Waypoint

- **Mark** allows you to record your current location as a waypoint
  - Displays name
  - Displays symbol
- You can mark your location at any time
- Turn on GPS, Turn off satellites
Mark Current Location

• Start by either:
  – Using the Main Menu Page: Mark Icon -- OR
  – Depress and hold thumb stick
  – Highlight field to select
Symbols

- Highlight symbol field
- Choose from a number of Waypoint symbols
- Choose small symbols that don’t use too much screen space
- Design your own custom symbols!
Name Waypoint

- Use rocker to name waypoint – “Well”
- Select – “OK”
- Select “OK” to save
- To cancel, press the “Quit/Page” button
Average Button

- A waypoint location can be averaged over time for more **precision**
- Only when the GPS has a fix a location
- Estimated accuracy will improve
- Allow a count of 50
- Save at anytime
Outside

- Waypoint Collection
- Average Locations
- Map features

Keep an eye on Accuracy!!!
(< 10 ft)
Inside

- View Map Page
- Edit Waypoints
- Measure distances
Waypoint Editing

Select Waypoints
Find in the Main Menu
Or
Menu/Find button

Select the Waypoint you wish to edit
Change the symbol, name, notes (date and time), location, or elevation

*Press the QUIT key to close and save changes
Measuring Distance

- Map page menu
- Measure distance
- Select point
- Drag arrow to highlight 2\textsuperscript{nd} point
- Distance and Bearing
Target Waypoints

- Depress and hold thumb stick
- Highlight and select Location

Enter new Coordinate
Go To Function

- Find Waypoint
- Select “Point 1”
- Use Map Page to “go to” the selected Waypoint
- Gives direction to the Waypoint
- Shows a direct pathway to the selected destination
- Follow black arrow head along pathway
TRACK LOGGING

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Intro to GPS with Garmin Etrex - Track Logging
Revised 3-16-2010
TRACKS

• “Bread crumb trail”

• Record a point at user specified intervals.

• Intervals can be based on time or distance

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<th>Pit Area</th>
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<td>Work Limit</td>
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<tr>
<td>Borrow Area</td>
<td>Property Lines</td>
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<tr>
<td>Access Road/trail</td>
<td>Revegetation Area</td>
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<tr>
<td>Channel</td>
<td>Highwall</td>
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Interval

INCORRECT
LONG INTERVAL

CORRECT
SHORT INTERVAL

1 ACRE PARCEL

TRACK

1 ACRE PARCEL

TRACK
Long Interval Example

Long intervals may be used when the line or polygon defined is long and may take hours to capture with the GPS. Several items captured at long intervals may be large parcels of land, a long hiking trail, or miles of straight roads.

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Screen shots taken from GPS Utility.
http://www.gpsu.co.uk

Start 10,052’
End at summit 14,613’
Track Log Page

Main Menu

Mark
Find
Tracks
Routes
Highway
Setup
Proximity
Calendar
Calculator
Stopwatch
Sun & Moon
Hunt & Fish

Track Log
On
Off

Setup
Clear
Save
TracBack

Saved Tracks
CHANEGRADE
DUMP1
DUMP2
TP1
TP2
TP3
10 Unused
Track Log Page

Track Log Page

Track Log

On

Off

0%

Setup

Clear

Save

TracBack

Saved Tracks

20 Unused

Track Log

On

Off

0%

Setup

Clear

Save

TracBack

Saved Tracks

20 Unused
1. Select Wrap When Full to continue logging after memory has reached 100% capacity.

2. Select Time as the Record Method

3. Set the time at 3 seconds
Tracking

Return to your starting point and select the Off button on the Track Log.
Saving a Track

After the track log has been turned off, the user has the option to save the track. Select the Save button.
Saved Track Info

**Saved Track**

**Name**
- 21-MAR-06

**Distance**
- 0.14 m

**Area**
- 0.6 ac

**Color**
- [Select color]

**Show On Map**
- [Toggle]

**Track Log**
- [On/Off]
- [1%]

**Setup**
- [Save]
- [Clear]
- [TracBack]

**Saved Tracks**
- 21-MAR-06
- 19 Unused

Intro to GPS with Garmin Etrex - Track Logging
MapSource – Active Track Log
## Mapsource – Saved Track

### Track Properties

<table>
<thead>
<tr>
<th>Index</th>
<th>Altitude</th>
<th>Leg Length</th>
<th>Leg Course</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>731 ft</td>
<td>0 ft</td>
<td>300° true</td>
<td>N39.04924 W82.64234</td>
</tr>
<tr>
<td>2</td>
<td>731 ft</td>
<td>2 ft</td>
<td>306° true</td>
<td>N39.04924 W82.64234</td>
</tr>
<tr>
<td>3</td>
<td>731 ft</td>
<td>10 ft</td>
<td>266° true</td>
<td>N39.04924 W82.64235</td>
</tr>
<tr>
<td>4</td>
<td>731 ft</td>
<td>10 ft</td>
<td>238° true</td>
<td>N39.04924 W82.64238</td>
</tr>
<tr>
<td>5</td>
<td>731 ft</td>
<td>11 ft</td>
<td>238° true</td>
<td>N39.04922 W82.64231</td>
</tr>
<tr>
<td>6</td>
<td>729 ft</td>
<td>10 ft</td>
<td>231° true</td>
<td>N39.04921 W82.64235</td>
</tr>
<tr>
<td>7</td>
<td>729 ft</td>
<td>9 ft</td>
<td>233° true</td>
<td>N39.04919 W82.64237</td>
</tr>
<tr>
<td>8</td>
<td>729 ft</td>
<td>11 ft</td>
<td>233° true</td>
<td>N39.04917 W82.64240</td>
</tr>
<tr>
<td>9</td>
<td>729 ft</td>
<td>11 ft</td>
<td>233° true</td>
<td>N39.04916 W82.64243</td>
</tr>
<tr>
<td>10</td>
<td>727 ft</td>
<td>11 ft</td>
<td>233° true</td>
<td>N39.04914 W82.64246</td>
</tr>
</tbody>
</table>

### Track Details

- **Points:** 67
- **Length:** 0.1 mi
- **Area:** 27465 sq ft
- **Elapsed Time:**
- **Avg. Speed:**
Mapsourcexx | Profile Track

**Track Properties**

- **Name:** 21-MAR-06 02
- **Distance:** 0.2 mi
- **Area:** 35785 sq ft
- **Elapsed Time:** 64
- **Avg. Speed:**

**Vertical Profile**

- **Elevation:**
  - 660
  - 665
  - 670
  - 675
  - 680
  - 685
  - 690

- **Distance:**
  - 0.0
  - 0.1
  - 0.2

**MapSource**

- **Maps:** US Topo - East
- **Waypoints:**
  - ACTIVE LOG
  - ACTIVE LOG 001
  - ACTIVE LOG 002

**Map Source**

- **Start Time:** 3/21/2006 1:17:03 PM
- **End Time:** 3/21/2006 1:17:04 PM

**Info:**

- **Location:**
  - N39.04947 W82.64243
  - N39.04946 W82.64245
  - N39.04943 W82.64256
  - N39.04941 W82.64252

**Legend:**

- **Legend Points:**
  - 121-MAR-06 02
  - Points:
    - 67
    - 64
  - **Start Time:**
    - 3/21/2006 1:17:03 PM
    - 3/21/2006 1:17:04 PM
    - 3/21/2006 1:49:09 PM
Method 2: Track + Waypoint Tagging

The previous method of track logging allows a user to save a track and assign a name to the feature. The downfall of this method is that the GPS is limited to saving only 20 tracks and if not saved properly, results may not be what was intended.

By tagging the track with a waypoint, it is possible to collect lines and polygons without actually saving separate tracks. By using this method, the GPS user can collect data faster and is only limited by the maximum number of waypoints and trackpoints, not by the number of saved tracks.
Method 2: Track + Waypoint Tagging

Go to the starting point of the line or polygon you wish to track. Check the satellite page to ensure that GPS has an accurate location. Return to the Track Log page and select the On button and begin walking the area. Remember that the GPS is recording a point at your set interval, 3 seconds in our case. If an angle point is approached, pause at least 3 seconds to allow the GPS to record a point at the corner. Switch to the map page to see the area being defined as a series of dots.

Return to your starting point and select the Off button on the Track Log.
Method 2: Track + Waypoint Tagging

After switching off the track log and while still at the start/end point, mark a waypoint. In this example a track was developed for a street block. A waypoint was placed at the start/end point of the track and called Block1.

Once the waypoint is placed, return to the map page and see that the track is now tagged with the waypoint “Block1.”

By using this method the polygon was quickly tracked and without saving the track, the track is identified by the waypoint tag.
Area Calculation

One of the most useful tools of the Garmin is the capability to calculate areas in the field without having to dump your track into your computer first. Area calculation allows for immediate sizing of ponds, parcels, project limits, borrow areas, etc.

POND

2.34 ACRES
Start Area Calculation

Intro to GPS with Garmin Etrex - Track Logging
Save Area Calculation

![Diagram showing GPS track and area calculation](image)

**Saved Track**
- **Name:** 21-MAR-06
- **Distance:** 412 ft
- **Area:** 0.1 ac
- **Color:** ac
- **Show On Map:** [ ]

**Options:**
- **Delete**
- **Map**
- **TracBack**
- **OK**
MapSource

• MapSource icon
  – Most of you will need IT to install program
• Launch MapSource v6.15.4.0
• Help menu - Check for software updates at home
• All software updates are free of charge
• Check at least quarterly
Welcome to TopoFusion.com

TopoFusion is GPS Mapping software for Windows. It downloads maps (Topo, Aerial Photo and Satellite) automatically from Microsoft's TerraServer and NASA's OnEarth server, storing them on the hard drive for offline use.

Please download and use the free version. It is fully functional except that 1/3rd of the map tiles are obscured with the word DEMO. It is not time limited, so you are free to keep and use it. If you like what we are trying to accomplish with our software and would like to support our efforts, please register to remove the DEMO tiles.

Our aim is to continuously nudge the state of the art in mapping software forward. A few examples:

- Efficient, versatile map display engine: TopoFusion runs the way a modern mapping application should—fast and smooth.
- Combo Topo/Aerial Maps: Topo and photo maps are combined using alpha blending to visualize both at the same time.
- Image Processing: Adjust brightness, contrast, sharpness and blurring on aerial, topo and combo maps.
- PhotoFusion: Geo-reference digital photos using EXIF timestamps. Places photos along GPS tracks and produces HTML pages with clickable image maps.
- Multi-track playback: Visualize multiple trips recorded by GPS simultaneously.
- Networks: Create and manage networks of GPS data. Combine multiple GPS tracklogs into a network, with duplicate portions of track logs averaged.
- Spinning/Simplifying GPS data: Increase or decrease the number of points in a track log.

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