

GLOBAL POSITIONING SYSTEM (GPS) DATA PREPARATION AND COLLECTION

Purpose This ENV Water Quality and Hydrology (ENV-WQH) procedure describes the process for preparing and collection global positioning system (GPS) data using the Trimble GeoExplorer unit and Pathfinder Office software.

Scope This document applies to ENV-WQH staff, contractors, and students who use the GPS for field-based data collection.

In this procedure This procedure addresses the following major topics:

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Integrated Work Management The work specified in this procedure is conducted with applicable Integrated Work Documents, in accordance with LANL IMP 300-00-00, Integrated Work Management for Work Activities.

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General information about this procedure

Attachments There following are attachments to this document.

No.	Description	No of Pages
1	Field Cheat Sheet – Trimble GeoExplorer GPS Unit	1

History of revision This table lists the revision history and effective dates of this procedure.

Revision	Date	Description Of Changes
0	2/06	New document.

Who requires training to this procedure The following personnel require training before implementing this procedure:

- All ENV-WQH staff, contract personnel, and students who perform GPS data collection for field-based purposes

Training method The training method for this procedure is “self-study” (reading) and is documented in accordance with the procedure for training (ENV-WQH-QP-024, *Personnel Training*).

References The following documents are referenced in this procedure:

- http://www.trimble.com/support_trl.asp?Nav=Collection-5549 for a complete listing of Trimble guides and tutorials to the GeoExplorer3

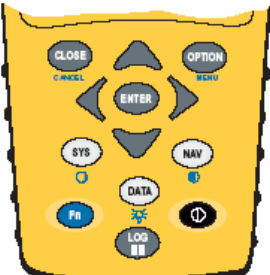
Note Actions specified within this procedure, unless preceded with “should” or “may,” are to be considered mandatory (i.e., “shall”).

GPS unit familiarization

GPS Unit

Quick reference to important buttons on the Trimble GeoExplorer GPS unit:

Trimble.
GeoExplorer 3 QuickStart
Part Number 38598-00-ENG, Rev B
Keys



CLOSE Close the current screen (and save changes)
ENTER Select highlighted item
OPTION Display more functions
SYS Go to / cycle SYS tabs
DATA Go to / cycle DATA tabs
NAV Go to / cycle NAV tabs
Fn Use second key function (blue) (see Function keys)
LOG Pause/Resume logging
Power On/Off

Status bar icons

- Number of satellites in use. If number flashes—too few satellites. If satellite flashes—poor geometry.
- GPS positions are real-time corrected. Flashes if RTCM signal is lost.
- External antenna is connected and in use.
- Some configuration settings are password locked.
- Memory is low.
- The backlight is on.
- The bright backlight is on.
- Internal power level indicator. "Fills up" when charging. Flashes when power level is low.
- Code precision data logging—the number shows how many positions have been logged. Flashes when GPS unavailable.
- Carrier precision data logging.
- Logging is paused. Press to resume.

Preparing the GPS for a project

Installing Pathfinder Office

To use the Trimble GPS unit, install Trimble Pathfinder Office on the computer. Contact the WQH IM team to install Trimble Pathfinder Office:

wqh_im_support@lanl.gov

- From Programs on your Start Menu, open the Pathfinder Office Program
-

Creating a project

When a field sampling trip to a new sampling location is planned, a GPS project file is created for the collection of location data. Location data for new sampling locations is necessary to maintain current data in the Water Quality Database (WQDB) and allowing the same sampling location to be revisited in the future.

To create a project file, perform the following steps:

Step	Action
1	Create a folder for the GPS project on the Server under Common Files.
2	Label the folder with project name and date.
3	Open Pathfinder [®] Office on the computer.

Collecting

data summary

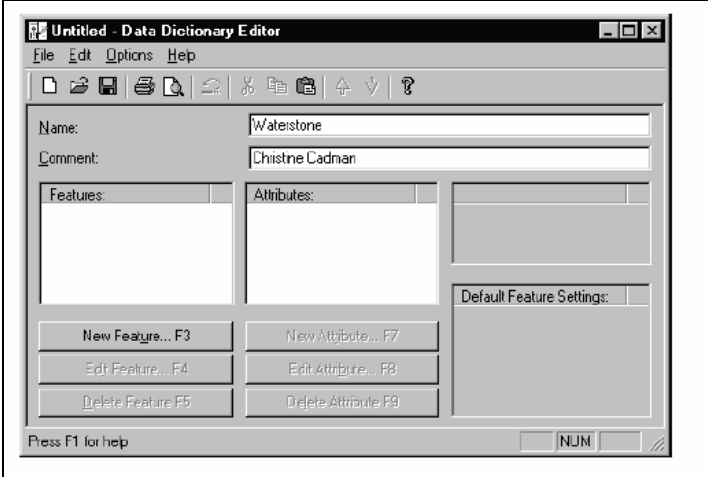
The process for collecting data using the GPS unit includes:

- Create a Data Dictionary for new projects (Preparing GPS for New Project section of this document)
 - Perform initial tasks (below)
 - Collect data, or features (below)
 - Close a file (below)
-

Preparing the GPS for a project, continued

Creating a data dictionary A data dictionary is needed to compile position information while collecting GPS data. A data dictionary makes it easy to collect the correct data in the field. Without a data dictionary, location information will be unconsolidated and unusable.

To create a data dictionary, perform the following steps:

Step	Action
1	<p>Select Utilities / Data Dictionary Editor using Pathfinder Office software. The Data Dictionary Editor screen will appear.</p> 
2	Enter project title in Name field.
3	Type your name in the Comment field.
4	Save the data dictionary in the folder created on the Server in Common Files.

Preparing the GPS for a project, continued

Creating attributes

Three types of features can be collected using the GPS: point features such as wells, line features such as stream channels, and area or polygon features such as parking lots.

Additional data about each feature (point, line, or area) can be collected and stored with the GPS data by creating attributes. The following types of attributes can be created in the Data Dictionary Editor:

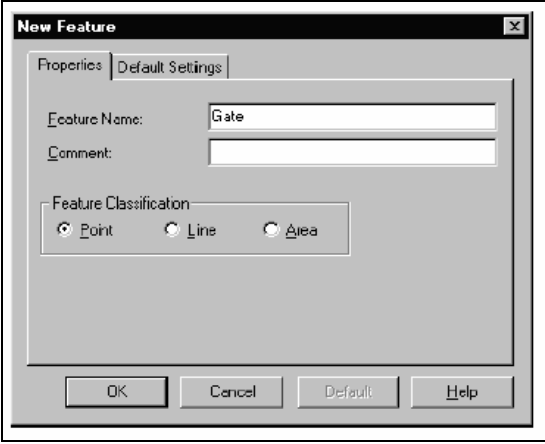
- Menu
- Numeric
- Text
- Date
- Time
- File Name
- Separator

Add desired attributes to each feature created.

Preparing the GPS for a project, continued

Creating a point feature A point feature is used for a single point in the field, such as a sampling location or a well.

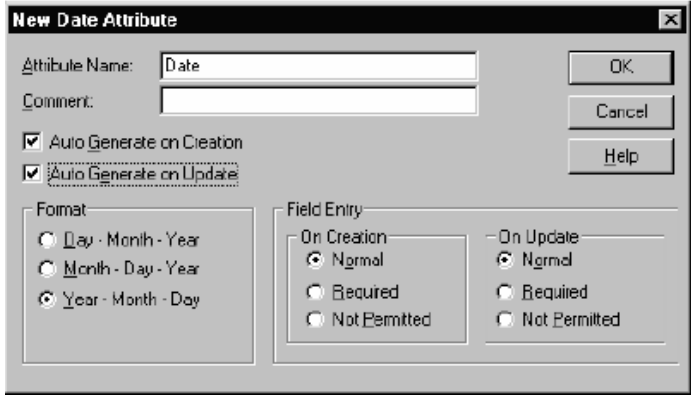
To create a point feature, perform the following steps:

Step	Action
1	Click New Feature . The New Feature screen will appear. 
2	Select Properties tab.
3	In the Feature Name field, type the name of the point feature (name is displayed in the handheld GPS unit in the field).
4	In the Feature Classification group, the Point option is the default (for a single point, this is appropriate).
5	Click OK (the name of the point feature will now be displayed in the list of features).

Preparing the GPS for a project, continue

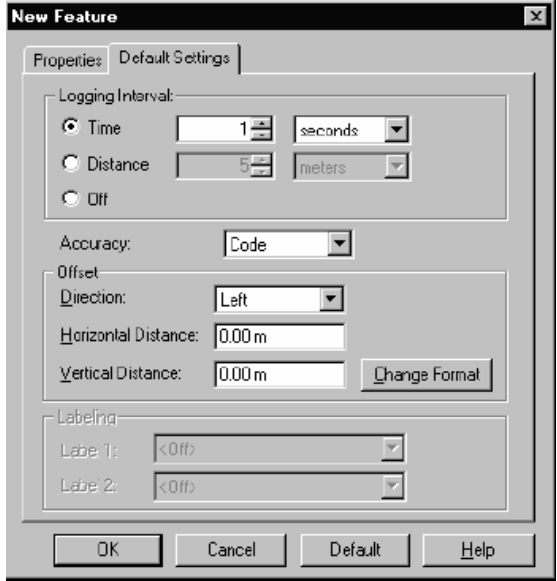
Creating a point feature with a date attribute

To create a point with a date or number associated with it, perform the following steps:

Step	Action
1	In the New Attribute Type screen, select Date option and click OK . The New Date Attribute screen will appear. 
2	Type Date in the Attribute Name field.
3	Select Auto Generate on Creation (ensures the date sampled is entered upon data collection).
4	Select the Auto Generate On Update (ensures the date sampled is entered upon data collection).
5	Click OK .
6	Click Close in the New Attribute Type screen.

Preparing the GPS for a project, continued

Creating a line feature A line feature will document a line, such as a road. To create a line feature, perform the following steps:

Step	Action
1	Click New Feature in the Data Dictionary Editor screen. The New Feature screen will appear.
2	Type the user name in the Feature Name field of the New Feature screen, Properties tab.
3	Select Line in the Feature Classification group.
4	Select the Default Settings tab to view the logging interval for this feature.
	
5	Change logging interval in the Logging Interval group. (The logging interval is the time between feature GPS positions. The default logging interval for line features is 5 seconds. This means that when you start logging a line feature, the GeoExplorer3 logs on GPS position every five seconds, until the feature logging is stopped).
6	Click OK.

Preparing the GPS for a project, continued

Creating an area feature An area can be mapped with the area feature. If there is no information about the area, attributes are not needed.

To create an area feature, select Area in the Feature Classification group. Follow steps used for point or line feature creation.

Creating a menu attribute (in a feature) Menu attributes are used to add information as a defined set of options (such as condition of the samplers: good, repair, or replace).

To create a menu attribute, perform the following steps:


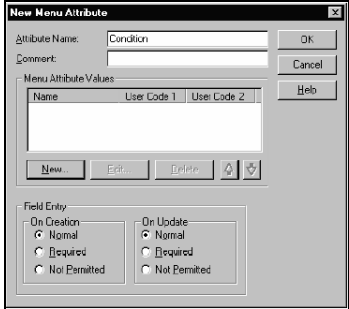
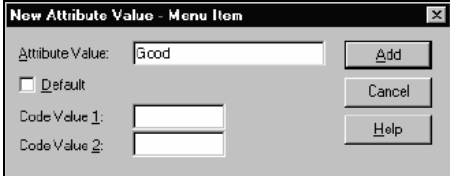
Step	Action
1	<p>Click New Attribute in the Data Dictionary Editor screen. The New Attribute Type screen will appear.</p> 
2	<p>Select Menu option and click OK. The New Menu Attribute screen will appear.</p> 
3	<p>Enter the Attribute Name and click New. The New Attribute Value screen will appear.</p> 

Table continued on next page.

Preparing the GPS for a project, continued

Creating a menu attribute (in a feature), continued

Step	Action
4	Enter values and Click Add to enter the different value choices in the menu attribute.
5	Click Close to return to the New Menu Attribute screen, which will now show the Attribute Values entered.
6	Click OK to create the attribute.
7	Click Close in the New Attribute Type screen.

Creating a numeric attribute (in a feature)

Use a numeric attribute type to enter numeric values in a field. The minimum and maximum values help eliminate incorrect entries, and a sensible default value can save time. This can also be used as an ID number associated with the point feature.

To create a numeric attribute, perform the following steps:

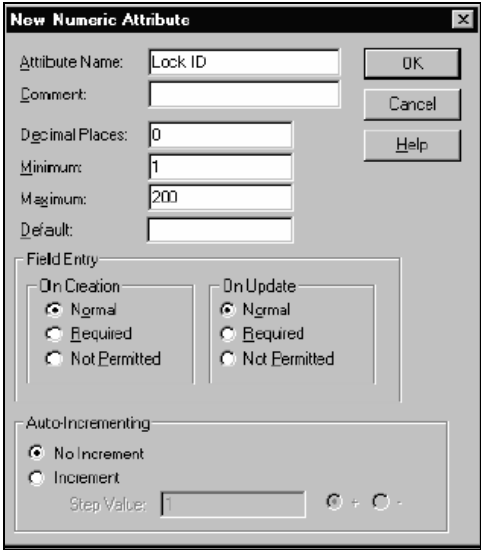
Step	Action
1	<p>Select the Numeric option in the New Attribute Type screen, and click OK. The New Number Attribute screen will appear.</p> 
2	Enter the attribute name in the Attribute Name field.

Table continued on next page.

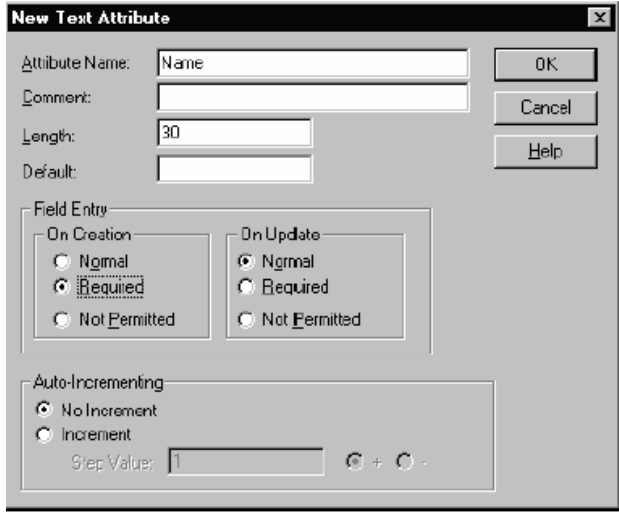
Preparing the GPS for a project, continued

Creating a numeric attribute (in a feature), continued

Step	Action
3	The default value for the Decimal Places field is 0. Do not change this, as the lock ID numbers do not have any decimal places.
4	Enter the minimum and maximum numbers to limit the range of values.
5	Click OK .
6	Click Close in the New Attribute Type screen. The attributes created now appear in the attribute field.

Creating a text attribute (in a feature) Text attributes are useful when the information to be stored varies for different occurrences of a feature and when a defined menu list is impractical. The text attribute feature allows entry of alphanumeric characters.

To create text attribute, perform the following steps:

Step	Action
1	Click New Attribute in the Data Dictionary Editor screen.
2	Select Text in the Type field and click OK . The New Text Attribute screen will appear.
	
3	Type the name of the text in the Attribute Name field.
4	The Length field defaults to 30 characters.
5	Select Required in the Field Entry group.
6	Click OK .
7	Click Close in the New Attribute screen.

Preparing the GPS for a project, continued

Creating a menu attribute with a default value This attribute is useful when creating a menu attribute with a known default value (such as “1 gallon glass bottle”). This saves time in the field when most of the menu options are the same.

a default value To create a menu attribute with a default value, perform the following steps:

Step	Action
1	Select Menu option in the New Attribute Type screen, and click OK .
2	Type the menu name (eg “bottle type”) in the Attribute Name field of the New Menu Attribute screen.
3	Click New . The New Attribute Value – Menu Item screen will appear. <div data-bbox="573 772 1360 1087" data-label="Image"> </div>
4	Type other entries (eg “1 gallon plastic bottle”) in Attribute Value field.
5	Click Add .
6	Type the value in the Attribute Value field and check the Default box.
7	When all values have been entered, click Close to return to the New Menu Attribute screen, which now displays the attribute values. A * symbol appears in front of the default value.
8	Click OK .
9	Click Close in the New Attribute screen.

Preparing the GPS for a project, continued

Saving the data dictionary

Save the new data dictionary by performing the following steps:

Step	Action
1	Select File/Save As on the menu bar. By default, the name of the data dictionary is the file name; for example, C:\Ppdata\Single Stage GPS Locations.ddf).
2	Click Save in the Save As screen.
3	Select File/Exit on the menu bar.

Transferring data to the GPS

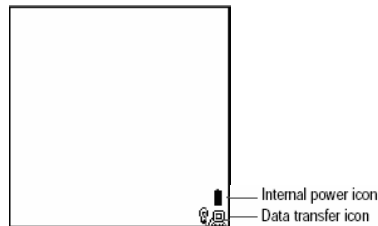
Transferring data to the GPS Before taking the unit to the field for a new project, transfer the Data Dictionary from the computer to the GPS unit in preparation for field use. To transfer the Data Dictionary, perform the following steps:


Step	Action
1	Place the GeoExplorer 3 handheld in the GeoExplorer 3 Support Module (below). Connect the Support Module to the computer via a serial cable (the GPS unit does not have to be turned on to transfer data). The Support Module charges the GPS unit as well. <div data-bbox="889 611 1045 884" data-label="Image"> </div>
2	Select Utilities/Data Transfer to start the Data Transfer utility in Pathfinder Office. The Data Transfer screen will appear. <div data-bbox="647 989 1284 1339" data-label="Image"> </div>
3	Select the Send tab in the Data Transfer screen.
4	Click Add .
5	Select Data Dictionary from the list.
6	Browse the Open screen until the data dictionary appears on the list of files. Highlight the file and click Open. The data dictionary will appear in the Files to Send box of the Data Transfer screen.
7	Click Transfer All to transfer the data dictionary to the GeoExplorer 3 handheld.
8	Click Close in the message box that shows summary information about the transfer.
9	Click Close in the Data Transfer screen.

Conducting pre-data collection equipment check

Checking the equipment Before going out in the field, check the internal power level to make sure there is enough power to complete the data collection session.

When the GPS unit is turned off and in the Support Module, a standby screen appears (below). Check that the internal power source is fully charged (internal power icon is completely black) and data is being transferred (data transfer icon appears).



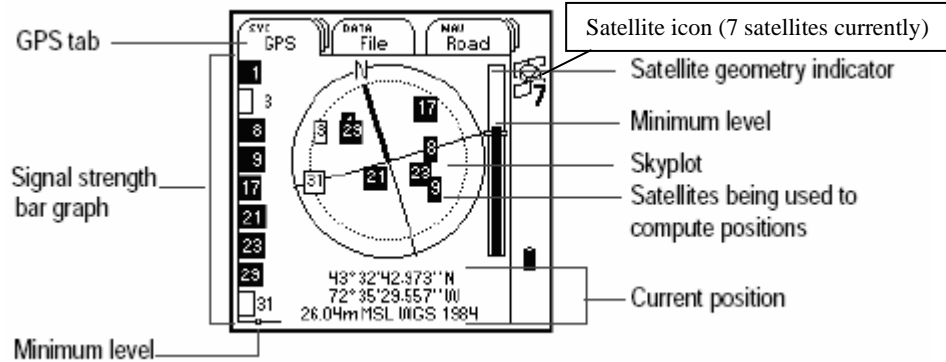
Starting the GPS unit Turn on the GeoExplorer 3 Unit by pressing the  button in the bottom right hand corner of the unit.

Obtain a clear view of the sky:

- Hold the GPS screen facing towards you and up.
 - Move clear of signal **reception** obstacles, such as people, buildings, heavy tree cover, large vehicles, powerful transmitters, and in general anything that blocks light.
 - Face south to help with the satellite configuration
-

Conducting pre-data collection equipment check, continued

Checking the GPS signal When the GPS unit is turned on, it automatically begins to track visible satellites and to calculate its current position. Use the satellite icon to check if the unit is computing positions.



Select the GPS tab on the unit to view the satellites currently tracked and those that are being used to calculate the current position.

To verify adequate GPS signal, view the GPS screen by performing the following steps:

Step	Action
1	Press SYS until the GPS tab is active. The screen above will appear.
2	View: <ul style="list-style-type: none"> • Skyplot to check the satellites that the GeoExplorer 3 is currently tracking. NOTE: Black boxes are the satellites the unit is using to compute its current GPS position. Unfilled boxes are the satellites the unit is getting signals from, but not using because the signals are too weak. In the above example 8 satellites are being tracked, and seven are being used by the computer. • Signal strength bar graph (on the left) to check the signal strength of the satellites. If the strength of a GPS signal is below the configured minimum level, there may be some obstruction blocking the signal. • Satellite geometry indicator (on the right) to view the overall quality of the GPS positions. This is determined by the geometry of the satellites. When the bar is above the configured minimum level indicator, GPS positions are being computed.
3	If, as a result of step 2 above, it is determined that the GPS signal is not adequate, adjust the minimum level (reference section below).

Conducting pre-data collection equipment check, continued

Adjust minimum level

If the bar on the satellite geometry indicator is below the configured minimum level indicator, adjust the minimum level to collect GPS positions.

To make Minimum Level adjustment, perform the following steps:

Step	Action
1	Press SYS until the tab on the top left part of the screen displays "SYS Setup".
2	Select the Configuration tab.
3	Select the GPS tab. "GPS precision" will appear on top of the screen.
4	Using the left and right arrow buttons, adjust the GPS precision from low to high.
5	Press SYS to tab back to the GPS screen and determine if precision setting will allow you to collect data. Repeat steps above if needed.

Collecting data

Creating a new file

Before starting a data collection session, create a new file by performing the following steps:




Step	Action
1	<p>Press DATA. The File Tab appears:</p>  <p>The GeoExplorer 3 Data Collection System automatically enters a name in the File field, which may be changed.</p> <p>The file number starts with a generic “R” and then the two digit month, two digit day, the two digit hour in Greenwich Mean Time, and a letter starting with A that signifies the number of files collected that hour. For example File R080723A was the first file collected on August 7th at 23:00.</p>
2	In the Dictionary field, check that the Data Dictionary appears.

Table continued on next page.

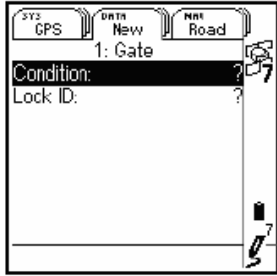
Collecting data, continued

Creating a new file, continued

Step	Action	
3	<p>IF</p>	<p>THEN</p>
	<p>all information in the form is correct</p>	<p>Press ENTER. The file is create and the New Feature list appears.</p> 
	<p>the incorrect data dictionary is displayed</p>	<ul style="list-style-type: none"> • Highlight 'data dictionary' and press ENTER. A new window will open. • Highlight the correct data dictionary and press ENTER • Move up to the Create New File box and press ENTER. The file is created and the New feature list appears: 

Collecting data, continued

Collecting a Point Feature To collect a point feature, perform the following steps:

Step	Action
1	<p>Select the point in the data dictionary you want to collect and press ENTER. The feature will now appear on the main screen, and the GPS unit starts logging position points.</p>  <p>When the GeoExplorer 3 starts logging GPS positions the logging icon appears at the bottom of the status bar. The number above the icon indicates how many positions have been logged for the selected feature.</p> <p>Logging icon</p>
2	12 points minimum should be collected at one point.
3	Press ENTER on each attribute to open up the list or options for each. Enter the attributes for the point.
4	Press CLOSE to close the point feature. The message Feature stored appears briefly at the bottom of the screen to confirm that you have saved the feature.
5	Press CLOSE in the New Feature Screen.
6	When prompted “Please confirm Close rover file?”, select “yes” and press ENTER .

Collecting data, continued

Collecting a line feature using the Later button

To collect a line feature using the Later button, perform the following steps:


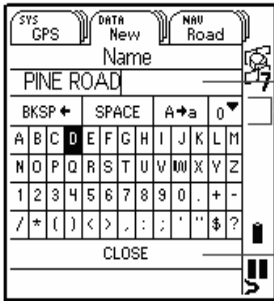

Step	Action
1	From the New Feature list, press ∇ to highlight the line feature
2	Press \triangleright to highlight the Later button
3	Press ENTER . The Line feature you entered appears. <div style="display: flex; align-items: center; margin-top: 10px;">  <div style="margin-left: 20px;"> <p>In order to record a line feature, travel along the line you do so, the GeoExplorer 3 will log a GPS position the configured interval set when the feature was created in the Data Dictionary Editor. These positions are joined together to form a line.</p> </div> </div>
4	The field entered as the first attribute for the line feature is highlighted. Press ENTER .
5	Type the name of the line feature in the Text Entry field. <div style="display: flex; align-items: center; margin-top: 10px;">  <div style="margin-left: 20px;"> <p>Use the arrow keys on the GeoExplorer 3 handheld to highlight the letter P and then press ENTER. A "P" appears in the edit bar near the top of the screen. Continue selecting appropriate letters until you have completed the word PINE. Use the SPACE function (in the function bar) to add a space between words in the edit bar. To do this, highlight SPACE and press ENTER. Then enter the word ROAD.</p> </div> </div>
6	Press CLOSE . Alternatively, highlight CLOSE (at the bottom of the screen) and press ENTER .

Table continued on next page.

Collecting data, continued


Collecting a line feature using the Later button, continued

Step	Action
7	<p>If the Name attribute was specified as required during GPS preparation, the GPS unit may provide a warning that the Name field is required.</p>  <p>To clear an "Error" message from the screen, press CLOSE.</p>
8	Press LOG to begin logging GPS positions for the road feature.
9	At the end of the road, press CLOSE to close the line feature.

Collecting a point feature using the Later button


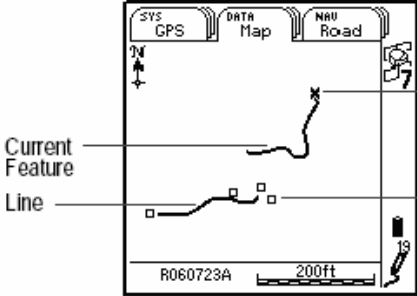
The feature below is used when the destination point has not yet been reached. It allows the user to enter information prior to reaching the location.

To collect a point feature using the Later button, perform the following steps:

Step	Action
1	<p>From the New Feature list, press ∇ to highlight the point feature</p>  <p>Use the Later button to start recording the attributes for a feature before you actually get to it.</p>
2	<p>With the Later button highlighted, press ENTER. The point feature will appear (and when the Later button is used, a pause icon flashes over the logging icon).</p>
3	Enter the attributes of the point using the Data Dictionary.
4	When the location is reached, press LOG .
5	Record at least 12 points.
6	Press DATA to close and store the feature.

Collecting data, continued

Collecting an area feature To collect an area feature, perform the following steps:


Step	Action
1	From the New Feature list, press ∇ to highlight the area feature.
2	Press \triangleleft to highlight the Now button.
3	Press ENTER .  <p>In order to record an area feature, you travel around the perimeter of the area. As you do so, the GeoExplorer 3 will log a GPS position at the configured interval set when the feature was created in the Data Dictionary Editor. These positions are joined together to form the perimeter of the area. The first and last GPS positions are joined together to close the area, so there is no need to return to the start point.</p>
4	To view the DATA map while collecting feature, press DATA until the Map tab is active. The features collected are displayed on the map, along with the lake perimeter currently being collected.  <p>You can view the map at different scales. To do this, press OPTN. Select the Zoom in/Zoom out option.</p>
5	To pause logging, press, LOG . To resume logging, press LOG again
6	Press DATA to go back to the New tab. The area form is still active and the GPS unit is still logging positions for the feature.
7	When finished traversing the perimeter, press CLOSE to close the feature.

Closing the file

Closing a File When the data collection session is completed, turn off the GPS unit handheld. This automatically closes the file.

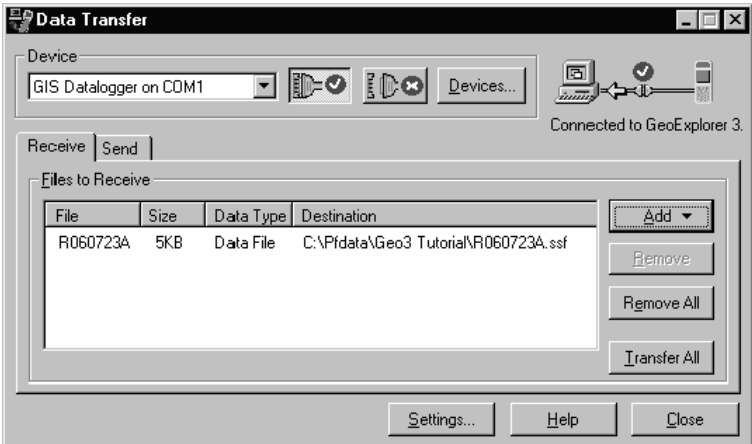
- Press  (the data file is closed, and the handheld is turned off)

OR

- Press  until the File tab appears. This will close the current data file and start a new file.

Post data collection processing

Transferring data After field data collection is complete, download the data from the GPS unit to the desk top computer by performing the following steps:

Step	Action
1	Place the GPS unit in the Support Module that is connected to the computer.
2	Using Pathfinder Office, select Utilities / Data Transfer. The Data Transfer screen will appear. 
3	Select the device name from the Device list that represents your GPS unit.
4	Select the Receive tab.
5	Click Add and select Data File from the list. The Open screen appears. The files shown are the current files on the data collector/hand-held unit.
6	The software will default to a file on the C: drive. Browse in the Destination field to the specific project folder on the Server.
7	Select one or more files to be transferred. Highlight the filename(s) and click Open . The Open dialog disappears, and the selected data files appear in the Files to Receive list.
8	Click Transfer All . The data files are transferred from the GPS unit. The files are transferred to will default to the current project folder.
9	Click Close to close the message providing transfer information.
10	Click Close to close the Data Transfer screen.

Post data collection processing, continued

Differentially correcting data The data collected by GPS receivers is subject to errors, including satellite clock and atmospheric errors. Differential correction can remove much of the error from the data, and can improve the accuracy of GPS positions to the specified accuracy of the receiver. In the field, the B.O.B (Beacon On a Belt) can be used to improve accuracy, but it will also be necessary to differentially correct the data on the desk top computer.

To download correction data, perform the following steps:

Step	Action
1	Access http://nmeri.unm.edu/ and click GPS data . Current days data is displayed under the date (e.g. 7/20/05).
2	Click Data . Hourly data is displayed.
3	Click each file created? while in the field.
4	Save the file when prompted. Browse to Pfdata \ (name of the project should be in this folder) \ base If in the field previous days, the data is now stored in one large file per day.
5	Click on the number (e.g. 07) associated with the month. Displayed are all the days in the month.
6	Select the day in the field.
7	When prompted, save the large file in the base folder as in step 4.
8	Using Pathfinder Office software, double click on the file in the base folder to extract the hourly data from the large daily file.

Post data collection processing, continued

Differentially correcting data, continued To use the differential correction utility, perform the following steps:

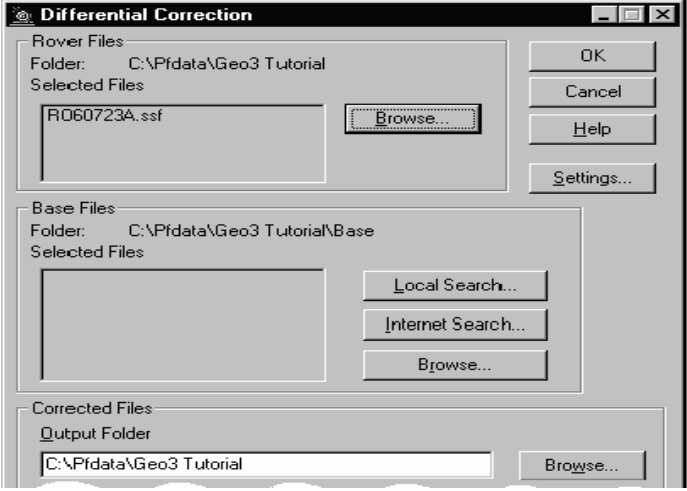
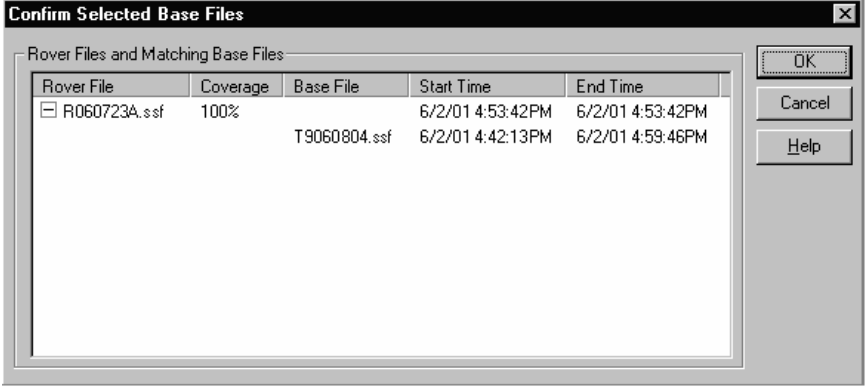
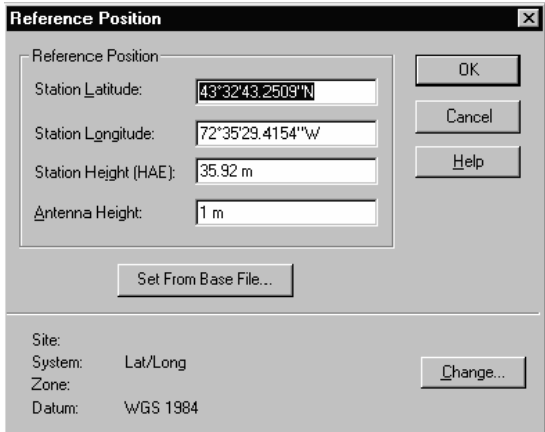
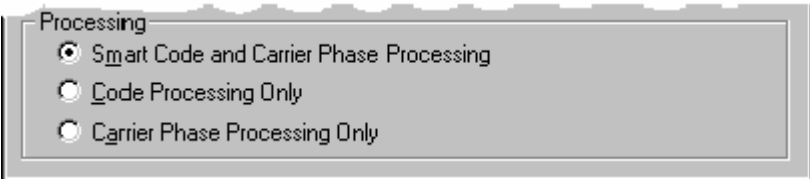
Step	Action															
1	<p>Select Utilities/Differential Correction in the Pathfinder Office software. The last file(s) transferred from the GPS unit appears in the Selected Files field.</p> 															
2	<p>Specify the location of your base files by using the search/browse buttons in the Base Files box.</p>															
3	<p>Browse for the differential correction data downloaded into the base folder in step 1 above. Select the folder for corrected files. The Confirm Selected Base Files screen appears.</p>  <table border="1" data-bbox="560 1339 1263 1423"> <thead> <tr> <th>Rover File</th> <th>Coverage</th> <th>Base File</th> <th>Start Time</th> <th>End Time</th> </tr> </thead> <tbody> <tr> <td>R060723A.ssf</td> <td>100%</td> <td>T9060804.ssf</td> <td>6/2/01 4:53:42PM</td> <td>6/2/01 4:53:42PM</td> </tr> <tr> <td></td> <td></td> <td></td> <td>6/2/01 4:42:13PM</td> <td>6/2/01 4:59:46PM</td> </tr> </tbody> </table>	Rover File	Coverage	Base File	Start Time	End Time	R060723A.ssf	100%	T9060804.ssf	6/2/01 4:53:42PM	6/2/01 4:53:42PM				6/2/01 4:42:13PM	6/2/01 4:59:46PM
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			6/2/01 4:42:13PM	6/2/01 4:59:46PM												

Table continued on next page.

Post data collection processing, continued

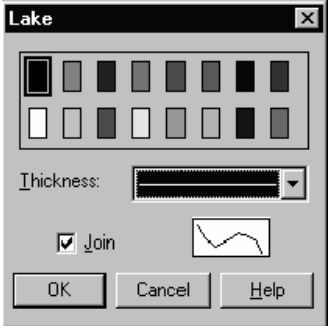
Differentially
correcting
data,
continued

Step	Action
4	<p>Ensure the selected base files provide coverage for the rover files. Click OK. The Reference Position screen appears.</p> 
5	Click OK to confirm the reference position.
6	Specify the output folder. By default, the output folder is the current project folder.
7	<p>Select a processing option.</p> 
8	Click OK to differentially correct the selected files. The Differential Completed dialog appears providing details of the differential correction.
9	Click OK .

Post data collection processing, continued

Viewing Data When the data has been transferred and differentially corrected, it can be displayed, edited, and plotted. View field data using the Pathfinder Office Map, which can be used to make graphical queries and measurements on the collected data. Color, symbols, and line styles can be specified for each feature. The Map window provides an easy way to verify the integrity of the field data.

To view the data:

Step	Action
1	Select File / Open using the Pathfinder Office menu bar.
2	Select the data file(s).
3	Select View / Map. The Map window displays the selected file.
4	To display the attributes of any feature on the map, double-click the feature. The Feature Properties screen appears. It provides attribute information about the selected feature.
5	To change the color of the Area (“Lake”) feature. Right click on the map, and from the shortcut menu, select Lake Layer Style. The Lake style screen appears. Use this dialog to change the color of the lake area. 
6	To measure between positions and features and to compute areas, select Data / Measure from the GPS Pathfinder Office menu bar. The cursor becomes a ruler when the Map window is displayed. Click a point on the Road feature. Then click a point on the Lake feature. The distance between the two points is computed and displayed at the bottom of the screen.

For more information about the Pathfinder Office Map window display, refer to the View menu topic in the Pathfinder Office online help

Post data collection processing, continued

Changing the coordinate system Coordinate systems are three-dimensional reference frames used to describe the location of objects in space. The GeoExplorer 3 data collection system provides position anywhere on the earth’s surface in relation to the configured coordinate system. Before comparing geographic data obtained from different sources, the data must be referenced to the same datum and coordinate system because different datums and coordinate systems provide different coordinate values for a single geographic location.

To set the coordinate system in Pathfinder Office:

Step	Action
1	Open the project.
2	Select Options / Coordinate System. The Coordinate System screen appears. <div data-bbox="665 819 1274 1501" data-label="Image"> </div>
3	Change the Coordinate System to: <ul style="list-style-type: none"> • System: US State Plane 1983 • Zone: New Mexico Central 3002 • Coordinate and Altitude Units: Feet
4	Click OK.

Preparing GPS data

Post processing GPS data

Provide all data points collected in the field to the WQH IM Team for entry into the Water Quality Data Base (WQDB). The data should include:

- Location Name
- Location Type
- The X or Northing of the location
- The Y or Easting of the location
- The Elevation of the location

This information can be found by selecting the point of interest on the map and pressing the “+?” button on the toolbar while viewing data in Pathfinder Office.

- The units of measurement for X, Y, and Elevation. This is usually FEET
- Watershed the sampling location is in
- If the location is Differentially Correct (DGPS) or Uncorrected (UGPS)
- The Location Type:

MON = Monitoring Well

NOC = Well not Otherwise Classified

OUT = Outfall

SPR = Spring

SUP = Supply Well

WCS = Watercourse

WIP = Water from an Industrial Process

UA = Unassigned

WTF = Water Treatment Facility

Creating waypoints for navigation

GPS data transfer to waypoints

In some cases there may be pre-existing sources of coordinate information to use with the GPS to find locations. The Trimble GPS units are equipped with navigational tools that allow the user to load coordinates, or waypoints, onto the GPS and then use the GPS to navigate to the location in the field.

There are two ways to create a waypoint file.

- Enter in the coordinates by hand creating a .wpt file.
- Choose the coordinates from an imported map (in most cases, an ArcMap Shapefile [.shp]). Then convert the Shapefile to a waypoint (.wpt) file before transferring to the GPS unit.

Entering waypoints by hand

To enter waypoints by hand, perform the following steps:

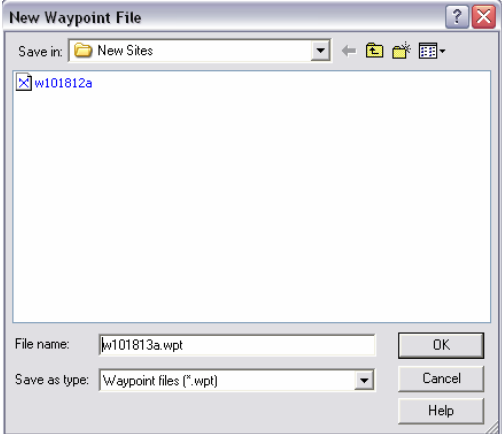
Step	Action
1	<p>Select File / Waypoints / New in the Pathfinder Office software. The New Waypoint File screen will appear.</p> 

Table continued on next page.

Creating waypoints for navigation, continued

Entering waypoints by hand, continued

To enter waypoints by hand, perform the following steps:

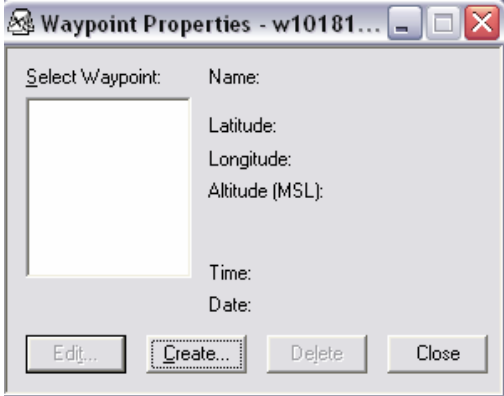
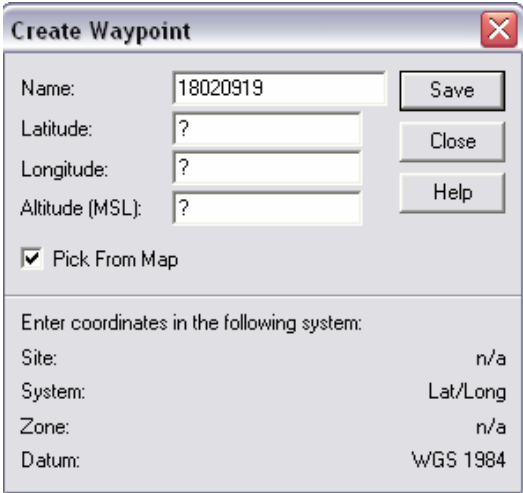
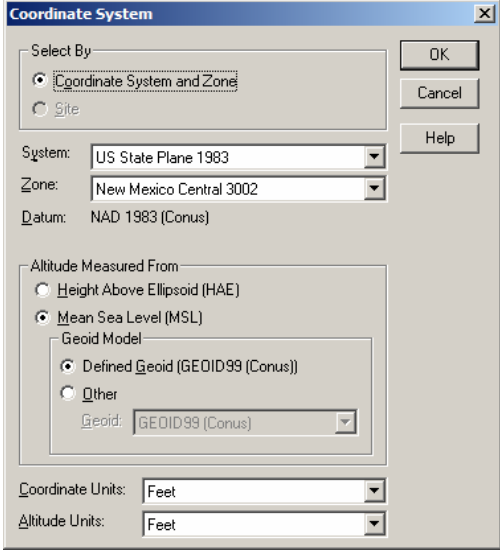
Step	Action
2	<p>Click OK to save your waypoint file under the created file directory. The Waypoint Properties screen will appear.</p> 
3	<p>Click Create. The Create Waypoint screen will appear.</p> 

Table continued on next page.

Creating waypoints for navigation, continued

Entering waypoints by hand, continued

Step	Action
4	<p>Enter coordinates in the boxes. If coordinates are different than the Create Waypoint screen fields (ex, coordinate system used by NMED is State Plane 1927), change the coordinates by selecting coordinate system on the Options – Coordinate System menu in Pathfinder Office.</p> 
5	Rename the waypoint in the Name field.
6	Click Save .
7	Repeat steps 3 through 7 for all waypoints.
8	Save the waypoint file (what screen is this save button?)
9	Export waypoints to the GPS unit (steps provided later in this document).
10	Close Create Waypoint screen.
11	Close Waypoint Property screen.

Creating waypoints for navigation, continued

Importing map coordinates/Shapefile

To import an ArcMap Shapefile file, perform the following steps:

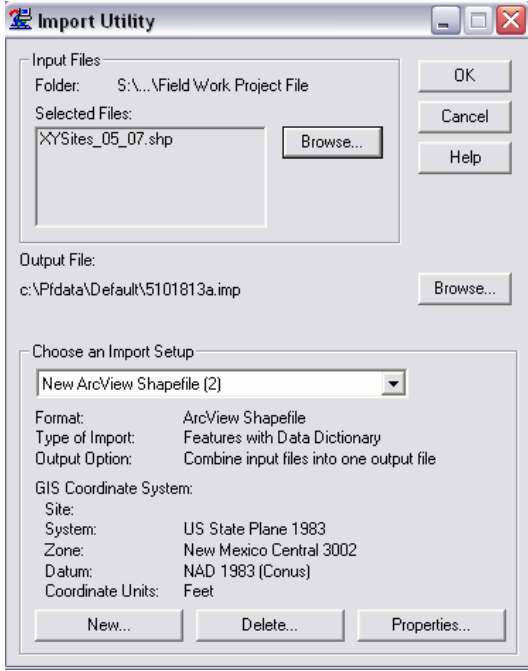
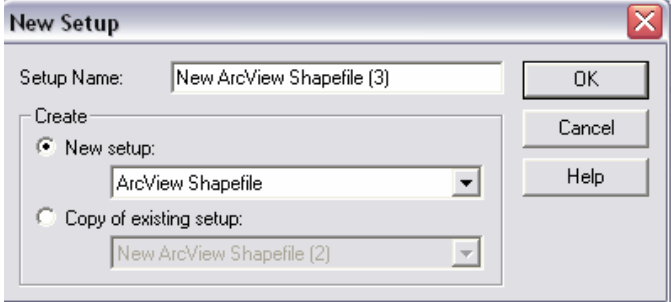
Step	Action
1	<p>Select Utilities / Import in the Pathfinder Office software. The Import Utility screen will appear.</p>  <p>The screenshot shows the 'Import Utility' dialog box. It has a title bar with a close button. The 'Input Files' section shows 'Folder: S:\...\Field Work Project File' and 'Selected Files: XYSites_05_07.shp'. There are 'Browse...' buttons for both. The 'Output File' section shows 'c:\Prdata\Default\5101813a.imp' with a 'Browse...' button. The 'Choose an Import Setup' section has a dropdown menu set to 'New ArcView Shapefile (2)'. Below this are fields for 'Format: ArcView Shapefile', 'Type of Import: Features with Data Dictionary', and 'Output Option: Combine input files into one output file'. The 'GIS Coordinate System' section includes 'Site:', 'System: US State Plane 1983', 'Zone: New Mexico Central 3002', 'Datum: NAD 1983 (Conus)', and 'Coordinate Units: Feet'. At the bottom are 'New...', 'Delete...', and 'Properties...' buttons.</p>
2	Browse and select the shapfile (.shp) that was saved in the input files.
3	Create the output file. Browse to the appropriate folder. Create a new folder for the project.
4	<p>In the Choose an Import Setup group, click New. The New Setup screen appears.</p>  <p>The screenshot shows the 'New Setup' dialog box. It has a title bar with a close button. The 'Setup Name' field contains 'New ArcView Shapefile (3)'. There are 'OK', 'Cancel', and 'Help' buttons. The 'Create' section has two radio buttons: 'New setup:' (selected) and 'Copy of existing setup:'. Below 'New setup:' is a dropdown menu set to 'ArcView Shapefile'. Below 'Copy of existing setup:' is a dropdown menu set to 'New ArcView Shapefile (2)'. There are also 'New...', 'Delete...', and 'Properties...' buttons at the bottom.</p>

Table continued on next page.

Creating waypoints for navigation, continued

Importing map coordinates/Shapefile, continued


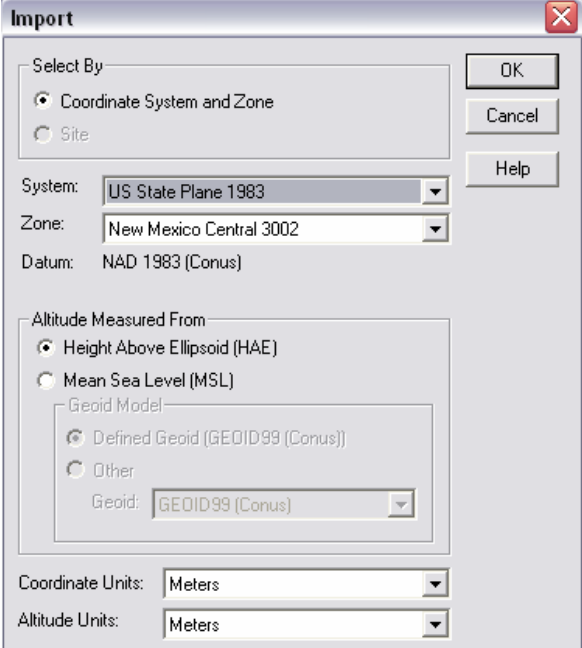
Step	Action
5	<p>Click OK. The Import Setup Properties screen will appear.</p> 
6	Select Coordinate System tab.
7	<p>Click Change.... The Import screen will appear.</p> 

Table continued on next page.

Creating waypoints for navigation, continued

Importing map coordinates/ Shapefile, continued

Step	Action
8	Change the coordinate system to: <ul style="list-style-type: none"> • System: US State Plane 1983 • Zone: New Mexico Central 3002 • Coordinate and Altitude Units: Feet
9	Click OK until the main Pathfinder Office screen appears.
10	Open the imported file and map it.

Create waypoints from the Shapefile data

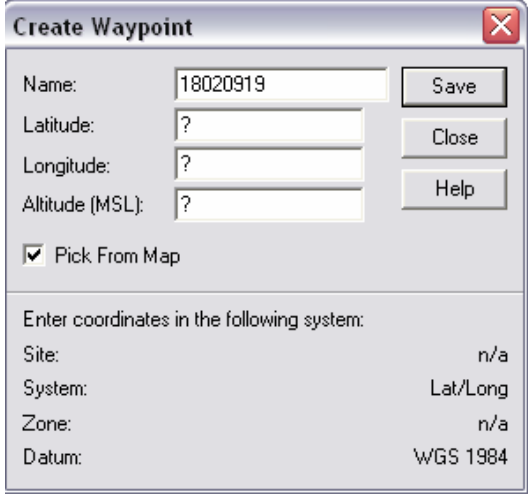
To create waypoints using the imported Shapefile, perform the following steps:

Step	Action
1	Select File / Waypoints / New in the Pathfinder Office software. The New Waypoint File screen will appear. <div data-bbox="711 890 1214 1325" data-label="Image"> </div>
2	Save your waypoint file under the created file directory.
3	Click OK . The Waypoint Properties screen will appear. <div data-bbox="711 1419 1219 1818" data-label="Image"> </div>

Table continued on next page.

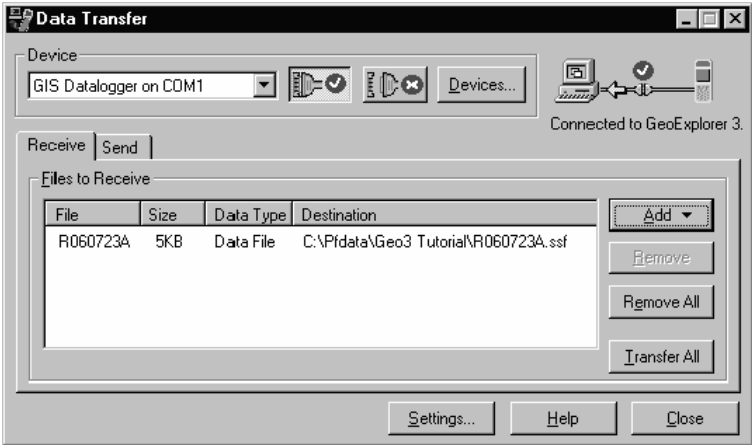
Creating waypoints for navigation, continued

Create waypoints from the Shapefile data. continued

Step	Action
4	<p>Click Create. The Create Waypoint screen will appear.</p> 
5	Check the Pick from Map box, and click on the imported location using the 'Importing map coordinates/Shapefile' section of this document.
6	Double click on each point. The attributes, including the name, will appear.
7	Rename the waypoint in the Name field
8	Click Save .
9	Repeat steps 3 through 8 for all waypoints
10	Export waypoints to the GPS unit (steps provided later in this document).

Creating waypoints for navigation, continued

Transferring waypoints to the hand-held GPS unit Transfer the waypoints from the computer to the GPS unit by performing the following steps:

Step	Action
1	Place the GPS unit in the Support Module that is connected to the computer.
2	The software will default to a file on the C: drive. Browse to the specific project folder on the Server.
3	Using Pathfinder Office, select Utilities / Data Transfer. The Data Transfer screen will appear. 
4	Select the device name from the Device list that represents your GPS unit.
5	Select the Send tab.
6	Click Add and select waypoints from the list. The Open screen appears.
7	Select one or more files to be transferred. Click Open .
	Click OK in the Waypoint Filter box.
8	Click Transfer All . A message will appear displaying summary information about the transfer.
9	Click Close .
10	Click Close in the Data Transfer screen.

Creating waypoints for navigation, continued

Navigating to a waypoint Navigating with the GPS unit is fairly accurate and easy and will normally guide the user to within 40 feet of the target. When user is within about 40 feet of the target, the GPS unit will beep. At this point, maps, field notes, sampling stakes, and/or visual confirmation should be used to find the exact location.

To navigate to a waypoint, perform the following steps:

Step	Action										
1	Press the NAV button on the GPS unit. The window will display a small person on a road. If not, press the NAV button to page through the tabs until the ROAD tab is displayed.										
2	Press the OPTION button on the upper right side of the GPS.										
3	Using \triangleright s, move to SELECT TARGET.										
4	Press the ENTER button. A drop down menu of all the waypoints stored in the GPS will appear.										
5	Use \triangleright s to highlight the desired waypoint.										
6	Press ENTER . All drop down menus will disappear. The ROAD screen will appear displaying waypoints in text towards the bottom of the screen.										
7	Select the distance and arrow direction information windows (recommended) at the bottom of the screen for guidance to the waypoint. If the information windows are not displayed: <table border="1" data-bbox="532 1247 1409 1482"> <thead> <tr> <th>Step</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Press OPTION on the upper right side of the GPS.</td> </tr> <tr> <td>2</td> <td>Move to INFO WINDOWS using the arrows.</td> </tr> <tr> <td>3</td> <td>Select or deselect the INFO WINDOWS as needed.</td> </tr> <tr> <td>4</td> <td>Press CLOSE. The ROAD screen will appear.</td> </tr> </tbody> </table>	Step	Action	1	Press OPTION on the upper right side of the GPS.	2	Move to INFO WINDOWS using the arrows.	3	Select or deselect the INFO WINDOWS as needed.	4	Press CLOSE . The ROAD screen will appear.
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4	Press CLOSE . The ROAD screen will appear.										

Click here to record self-study training to this document.

FIELD CHEAT SHEET

TRIMBLE GEOEXPLORER GPS UNIT

Instructions for Data Collection

1. Press DATA Key.
2. To appropriate Dictionary
 - a. Use arrow keys to move down to Dictionary.
 - b. Press Enter key
 - c. Use arrow keys to find dictionary.
 - d. Press Enter key to select dictionary.
3. Use arrow keys to move up to: Create new file.
4. Select: Create new file by pressing enter.
5. Use arrow keys to select Feature.
6. Press ENTER button
7. Attribute window will open.
8. If you want to make a Comment, press ENTER key.
9. Make comment using the arrow keys to move around the letter screen.
10. When finished with comment press CLOSE key.
11. Collect 12 points, look in lower right of screen to see how many points you have collected.
12. Press CLOSE key to stop collecting points.
13. Press CLOSE key Again.
14. GPS will ask if you want to Close rover file, choose yes and Press ENTER key.
15. Repeat all steps for next data point.

Instructions for Finding a Location

1. Press NAV key.
2. Make sure you are in Road window.
3. Press OPTION key.
4. Use arrow keys to Select Target.
5. Press enter key.
6. Select waypoint you want to go to from list.
7. Navigate to waypoint, notice Accuracy is only +/- 30m (100 ft.).
8. Repeat for next waypoint.

Instructions for SYS key

1. GPS screen will display number and Location of satellites.
2. Press SYS key until Setup window Is active.
3. Select configurations.
4. Select GPS.
5. Here you can adjust GPS Precision.