

Technology Technical Note GIS&GPS FL-05

Planner's Guide for GPS: 2008 GeoXT



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Acknowledgements

This manual has been prepared using information contained in *Technical Note MO-2* from NRCS-Missouri. Additional sources used include *Taking GIS to the Field with ArcPad 8* from the NGMC, the *GeoExplorer 2008 Series User's Guide* by Trimble, the *Trimble 2008 GeoXT/ArcPad 8.0 Tennessee NRCS User's Guide version 1.4*, guidance from NGMC staff, recommendations from FL-NRCS Area GPS Coordinators, and AutoCAD notes from the FL-NRCS Engineering at the State Office. Thanks to all who generously shared their knowledge, resources and wisdom for the preparation of this manual.

Introduction

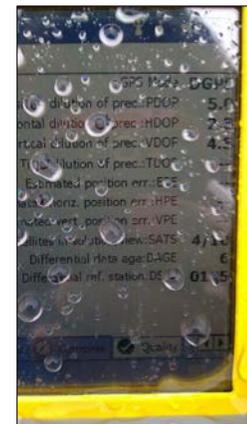
The intent of this document is to provide instructions for utilizing a Trimble GeoXT GPS unit for field data collection. The instructions include:

- An overview of the Trimble GeoXT.
- An overview of Windows Mobile 6.0
- An overview of ActiveSync 4.5
- Functional steps for using ArcPad
- Data Collection settings and standards
- Data Processing techniques

Overview of the GeoXT

Global Positioning System (GPS) Technology

GPS is a satellite based radio-navigation system. Satellites in the earth's orbit send signals that a GPS receiver can use to determine position, velocity and time. GPS provides world-wide coverage, is continuous and uninterrupted, and is available in any weather conditions, day or night.

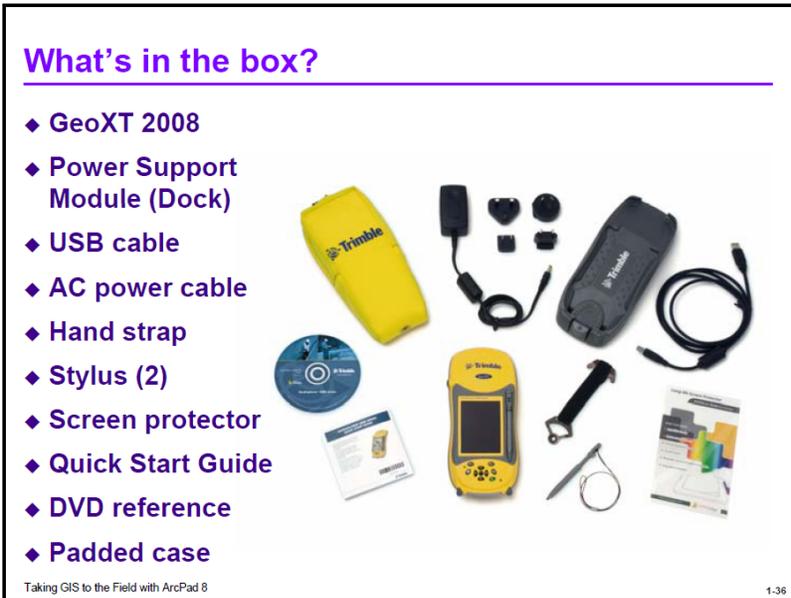


Hardware

The shipping box from Trimble includes the GeoXT 2008 unit and related accessories such as a carrying case, a Power Support Module (docking station), AC power supply and adapters, USB Cable, a Quick Start Guide brochure, Windows Mobile CD, hand strap, screen protector, and stylus. The last three accessories have already been installed for your convenience.

The GeoXT has 128Mb of internal memory and 1 GB disk storage. It is equipped with a slot for an internal SD card. The GeoXT provides real-time differential GPS capability utilizing Wide Area Augmentation System (WAAS) and Radio Technical Commission for Maritime Services (RTCM) correction support. This simply means that a correction from a WAAS satellite can be received and applied to the GPS

satellite information your unit is receiving to obtain a more accurate (sub meter) position. The GeoXT integrates GIS capabilities. Many of the GIS processes that used to be done on an office workstation can now be done in the field. When fully charged, the GeoXT can last between 7.5 to 15 hours, depending on the number of features being used. The casing of the GeoXT is dust-proof and resistant to heavy driven-wind. Additional information is available in the GeoExplorer 2008 Series User Guide available on the Windows Mobile CD (setup\DeviceHandbook.exe).



Software

In order to use the procedures contained in this document, the following software is needed:

On the device:

- ArcPad 8.0 SP2 or greater
- Microsoft Windows Mobile 6.0 or greater

On the computer:

- ArcMap 9.2 or greater
- Microsoft ActiveSync 4.5 or greater.

NOTE: The mention and/or use of any software contained in this document should not in any way be considered as an endorsement by USDA-NRCS.

Features of the GeoXT

This section gives a brief overview of the unit and how to use the basic features. For more details, users should refer to GeoExplorer 2008 Series User Guide.



Button descriptions

Power : Used to turn the unit on and off. Press and release the Power button to turn on or off (suspend) the unit. If unit is on, press and hold the power button to suspend, soft reset, or completely power off the unit. The power off choice is only available when on battery power. *Suspending* the device puts it to sleep, and when it is turned back on, the device remembers where it was. Some battery power is used. *Powering off* the device closes all programs and turns off all of the power. No battery power is used.

Navigation keys: Use these keys to navigate around the screen, scroll through menus, or to tab through options on windows and forms. Use the

- Arrow keys to move up, down, left, and right
- Action (ENTER) key to perform an application-specific action such as Enter

Application keys: By default, these keys perform the same action as the left and right softkeys in the menu bar. They can also be programmed to perform selected actions. Consult the GeoExplorer 2008 Series User Guide for more information.

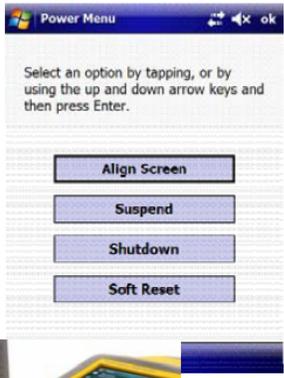
Start menu key: Displays the Windows Mobile Start menu

OK key: Press to select OK or to close an application

Reset button: Use to reset handheld device. When pressed by itself, a soft reset is performed. When pressed in combination with Power key a hard reset is performed.

Power and resets

- ◆ **Power on/off – Press Power key**
 - Power off – applications closed
- ◆ **Suspend – Quick Press Power key**
 - Applications suspended but not closed
- ◆ **Reset – Soft – Press Power key to Menu**
- ◆ **Reset – Hard – Power key + Reset button**
 - Closes applications
 - Unsaved data is lost / a last resort


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Reset to factory defaults – when all else fails

- ◆ **Press & hold two Application buttons + the Reset button**
 - Warning: Erases All user settings, installed applications, & user data
 - Warning: Encrypted files on SD card will become inaccessible because the encryption key is destroyed
 - Advice: Don't encrypt data on SD cards



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Safety Measures for the GeoXT unit

The following precautions should be observed when using the GeoXT unit.

- 1) Use only accessories intended for the GeoXT.
- 2) Do not open the casing of the GeoXT as this voids warranty.
- 3) Touchscreen is susceptible to breakage. Use a light touch.
- 4) Do not store or leave the handheld near a heat source or otherwise expose it to temperatures in excess of 70 °C (158 °F) such as on a vehicle dashboard. When heated to excessive temperatures, battery cells could explode or vent, posing a risk of fire.
- 5) Clean unit with a damp cloth – do NOT immerse.
- 6) Make sure SD card slot is securely closed to avoid exposure to environment. A SD or SDHC (*high capacity*) card may be used with the GeoXT. Do not store files at the root level.
- 7) Use Trimble authorized Dealer repair facility.

Proper Handling Techniques

- 1) Hold unit so antenna is parallel to earth and sky
- 2) Hold away from body to minimize masking
- 3) Hold unit at about mid torso
- 4) Do not cover antenna
- 5) Use handstrap to avoid dropping the GeoXT accidentally
- 6) When in full sunshine, position yourself with back to the sun so light comes from behind and above shoulders. Tilt unit to avoid direct reflection of sunlight off the touchscreen and improve readability. Changing the screen brightness level may also be useful.



Overview of Windows Mobile

The operating system used by the GeoXT units is Windows Mobile 6. This section provides basic instructions on using this operating system and would therefore be applicable to devices other than the Trimble GeoXT (e.g. ProXYZ, GeoXM, and Juno) that utilize the Windows Mobile operating system.

Touchscreen

TAP : This term will be used in this document to refer to the action of using the stylus to select an item on the screen by gently tapping the stylus on the touchscreen. This would be like left-clicking with a mouse on the desktop screen.

TAP AND HOLD : This describes the action of gently applying pressure and holding the stylus on the touchscreen until something happens (e.g., context menu appears). You can think of this as the method of right-clicking that you do with a desktop computer mouse.

TAP AND DRAG : This describes the action of gently applying pressure and dragging the stylus across the touchscreen without lifting the stylus. This technique is used for highlighting multiple files in File Explorer and for moving a point in your ArcPad map.

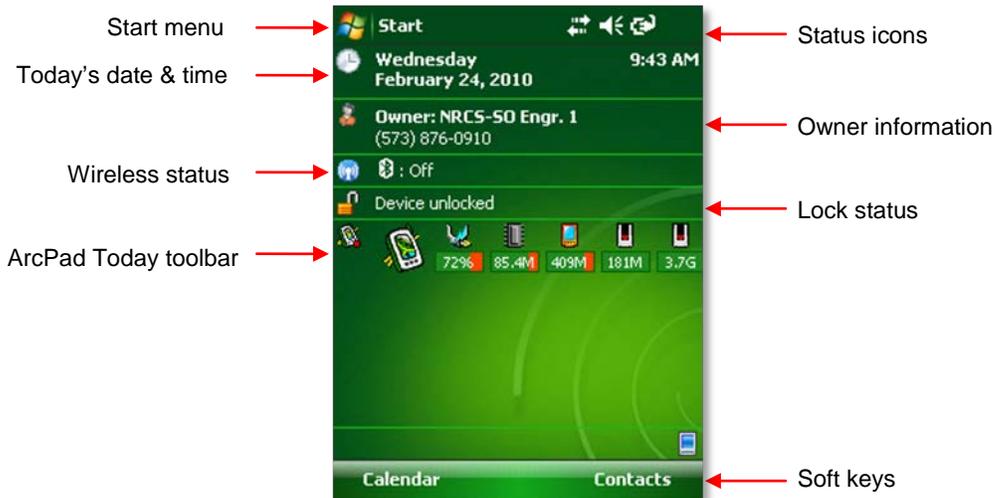
Calibrating : If the touchscreen is not responding correctly to taps, you may need to calibrate the screen. **TAP** *Start > Settings*. Select the *System* tab at bottom. **TAP** on *Screen* icon. **TAP** *Align Screen* button and follow prompts. When done, **TAP** *OK* in upper right to close screen window. **TAP** *X* in upper right to close Settings window.



Keyboard : When you need to enter any data (i.e., numbers or characters), you should see a small keyboard icon near the bottom of the screen. Simply **TAP** this icon and an on-screen keyboard should appear. **TAP** the icon again to hide the keyboard.

Today Screen

When turning on your unit, you will be presented with either the “my info” screen or the “**Today**” screen depending on how your unit is set up. The “**Today**” screen functions similarly to the Windows desktop on your computer and will look similar to that shown below. The items shown on this screen may differ based on the settings of your unit. The items shown in the screen shot are explained below.



Start menu : Tapping this provides access to programs, files, and settings on the device similar to clicking the Start button on your desktop computer.

Status icons: Icons that indicate the operating conditions of various items on the device. A few useful ones are explained below.

 : Connection. **TAP** to view or modify connection settings.

 : Speaker. **TAP** to set volume level or to turn on/off speaker.

 : Battery charging. **TAP** to view or modify power settings.

 : Battery level. **TAP** to view or modify power settings.

Today’s date & time: This shows the current date and time set on the device. **TAP** anywhere on the line to change the date and time.

Owner information: This shows the some of the current owner information. **TAP** anywhere on the line to change the information.

Wireless status: Indicates if Bluetooth is on or off. **TAP** to change settings.

Lock status: Indicates if the device is locked (taps and buttons are disabled) or unlocked. If device is unlocked, **TAP** this line to lock it. You will then need to **TAP** Unlock near bottom of screen to initiate unlocking.

ArcPad Today toolbar: This toolbar provides an icon to start the ArcPad application as well as battery and memory indicators.



: **TAP** to start ArcPad application.



: Battery and charging indicator. **TAP** to change power settings.



: Memory indicator. Number indicates memory free. **TAP** to view status.



: Device storage indicator. Number indicates free storage.
TAP to open File Explorer showing files stored on device.



: SD card storage indicator. Number indicates free storage.
TAP to open File Explorer showing files stored on SD card.

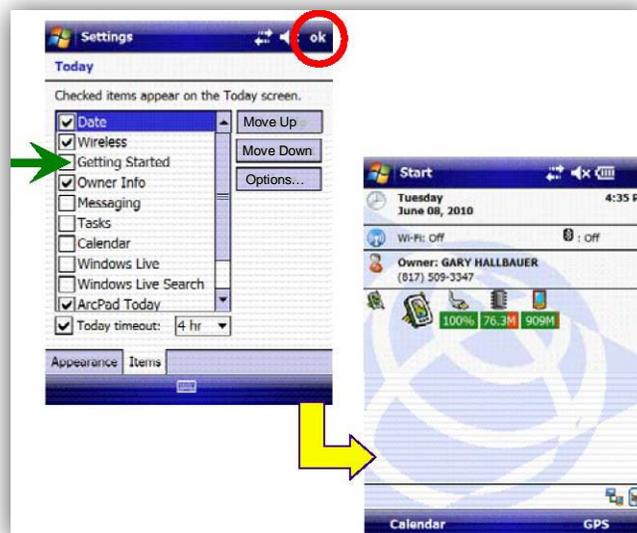
Soft keys: These are context-sensitive keys that will allow you to perform various actions or open menus. Simply **TAP** on the desired one to activate.

General Settings

Various settings can be accessed by using the Start Menu and selecting “Settings”. Some settings you might have a need to change are Backlight (brightness and non-use time), Power (non-use time), and Screen (orientation and align). These are all found on the “System” page of the Settings window.

Customizing the TODAY Page

The options that appear on the Today page can be customized by accessing the Start > Settings menu, selecting the Personal tab to open the Today icon. Then select the Items tab at the bottom of the screen to check/uncheck items that you wish to display on the Today page of your GeoXT. Use the Move Up or Move Down to change the position of selected item on the screen



Memory and Power Management

The distribution of memory capacity can be viewed through the *Start > Settings* menu and selecting the *System* tab to open the *Memory* icon. The *Main* tab shows the amount of memory available on the GeoXT unit. The *Storage Card* tab shows available memory on an SD or SDHC card, if present. Recommended memory management practices include:

- 1) Close Programs before opening new programs
- 2) Use patience when working with large datasets
- 3) Use soft resets at beginning of each work day

The amount of power available can be viewed through the *Start > Settings* menu and selecting the *System* tab to open the *Power* icon. The *Battery* tab shows a power scale indicating amount remaining. The *Advanced* tab allows users to adjust the frequency of automatic timeouts (system suspension). The *Backlight* icon offers options [*Battery Power* tab and *External Power* tab] to turn backlight on or off based on user actions or duration of user inactivity. The *Brightness* tab allows users to adjust the level of screen brightness using a slider scale. Recommended power management practices include:

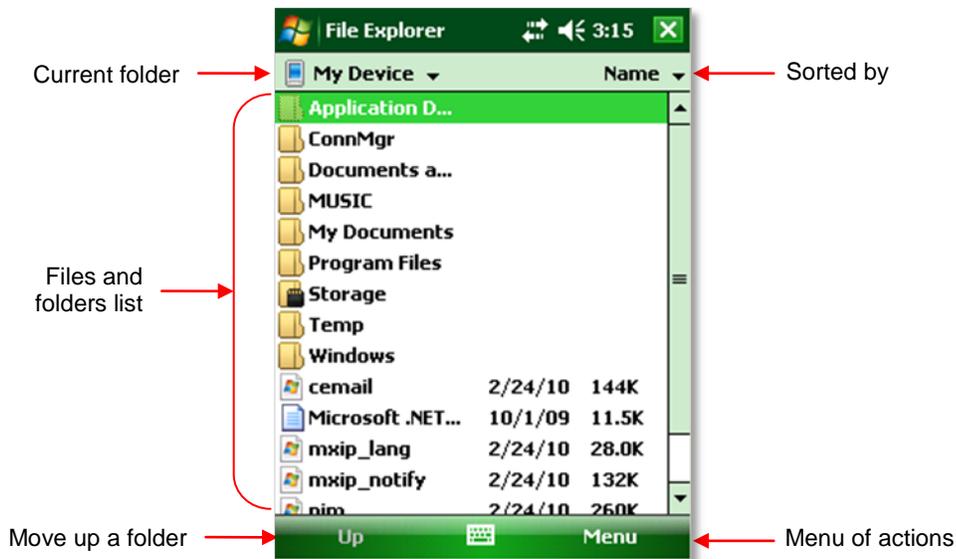
Window Mobile power management best practices

- ◆ Charge the device on the way to, from, between job sites
- ◆ Minimize number of running programs
- ◆ Tune the hibernation setting for least amount of time tolerable
- ◆ Minimize use of backlight when not connected to AC or DC power
- ◆ Turn off wireless (Bluetooth, WiFi) unless in use
- ◆ Turn off beaming altogether (also a good security practice)
- ◆ Keep in dock connected to AC when in you are at the office
- ◆ Consider charging in vehicle while traveling between work sites

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File Explorer

The File Explorer application allows you to perform file management functions (e.g., copy, move, delete, rename, etc.) on the device just as Windows Explorer does on your desktop computer. (**Note:** Since filenames are often truncated because of the small display, you may find it easier to do file management using the Explore feature of Microsoft ActiveSync on your desktop computer. This is explained later). To start the File Explorer application, **TAP** *Start > File Explorer* (or *Start > Programs > File Explorer* if not on the start menu). A window similar to that shown below should appear.



Navigating: **TAP** folder to open that folder. **TAP** Up at bottom of screen to move up to parent folder. Use the current folder drop-down to move back up to a higher folder or to switch between the SD Card and My Device.

Opening: If you **TAP** on a file that has an associated application, the application will load and open the selected file. If there is no associated application, an error message will display.

Copying, cutting (i.e., moving), deleting, renaming: **TAP AND HOLD** on a single file/folder or on the highlighted files/folders (see above). A context menu should pop-up. Select the desired action (e.g., copy, cut, delete, rename). For Copy or Cut, move to desired folder; **TAP AND HOLD** in an empty area of the screen (or use Context menu button, or select *Menu > Edit* at lower right) and select Paste from the pop-up menu. For Delete, answer yes or no to confirm the prompt.

For Rename (single files only), bring up on-screen keyboard  and enter new name.

Selecting multiple files/folders: Use the **CTRL** key on the virtual keyboard and select or unselect individual files not listed sequentially in Explorer. Likewise, use the **SHIFT** key to highlight groups of files and/or folders

Creating a new folder: Select *Menu > New Folder* at lower right of screen. Bring up on-screen keyboard  and enter new folder name.

PRACTICE: Complete Activity #1 in Appendix K

Overview of MS ActiveSync

In order to communicate (i.e., download and upload) with a desktop computer, Microsoft ActiveSync software (ver. 4.5 or newer) needs to be installed and running on the

desktop computer. If ActiveSync is running, you should see this icon  in the lower right of your screen (near the clock icon). If the icon is not there, you will need to start ActiveSync by selecting *Start > All Programs > Microsoft ActiveSync*.

Establishing a connection

Using the provided USB cable, plug the “square” end of the cable (USB type A) into the USB port of the support module. With the computer on and logged into your desktop, plug the “flat” end of the cable (USB type B) into a USB port on the computer. Turn on GPS device

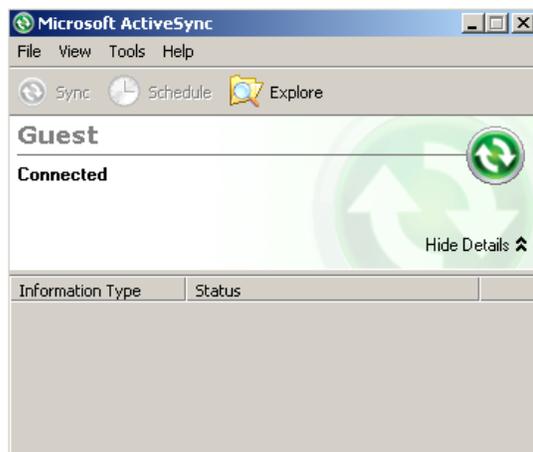


If this is the first time you have connected the device to this computer, you may see some messages displayed in “yellow bubbles” near the lower right of your monitor about finding new hardware. You will need to allow this process to complete and for a message to display that the hardware is installed and ready to use before proceeding.

ActiveSync should recognize you have connected a device. If no partnership has been set up with this device, a “Synchronization Setup Wizard” window will appear as shown at right.



Click [Cancel]. The device will connect as a “guest”. You will be able to copy and move files between the device and your computer. This is the recommended choice if the device will be used by multiple people and/or connected to multiple computers. You should then see a screen similar to that below showing that you are connected.

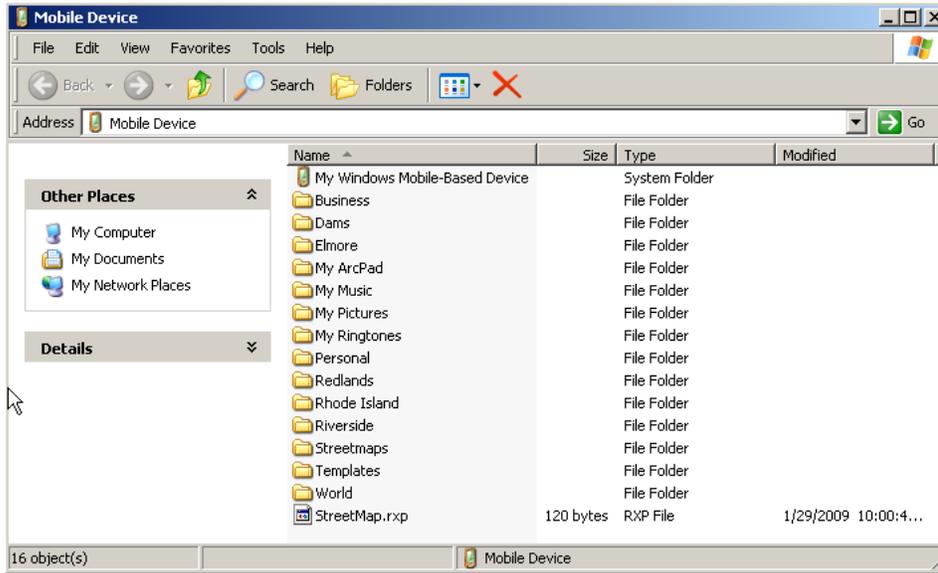


NOTE: If you click [Next >], you will be walked through setting up a “partnership” between the device and this computer. A partnership allows items such as contacts, appointments, etc. to be synchronized between the device and your computer. The items to “sync” are selected by the user during this setup wizard. Also, the next time this device is connected to this computer, it will recognize the device and

skip the synchronization setup screen. You will see the name of the device rather than “Guest”. This option is **not** recommended if more than one person is using the GeoXT in an office.

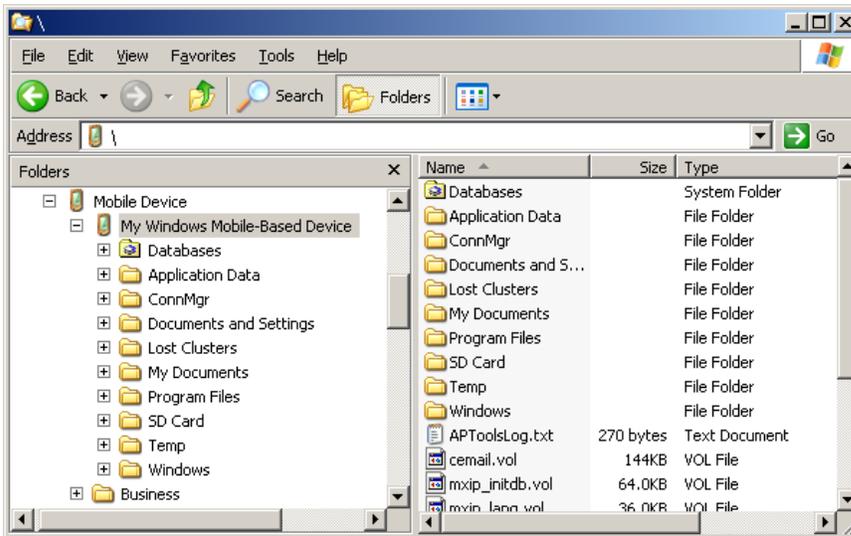
Transferring files between computer and device

Once the device is connected, you can select *Tools > Explore Device* or simply click  **Explore** on the ActiveSync toolbar. A window similar to the one shown below should appear. It will normally open to the “My Documents” folder on the device. You can now navigate the folders and perform the usual Windows Explorer actions (i.e., copy, rename, delete, etc.).



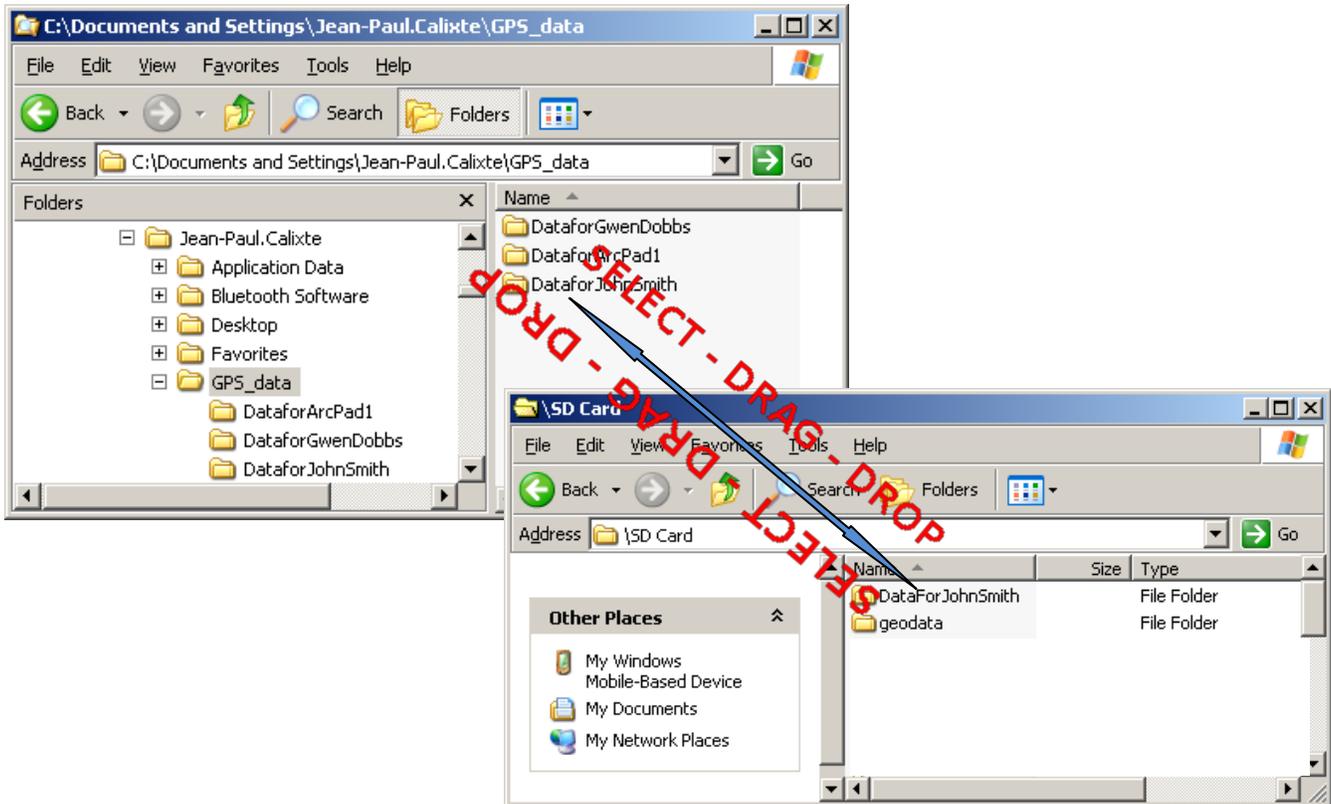
To go to the root level directory on the GeoXT, click the Mobile Device icon (“My Windows Mobile-Based Device”).

To help in navigating folders, you might want to click  **Folders** on the toolbar to open a folder tree in the left window.



This single explorer window can be used to copy files between the device and your computer using the Copy (Ctrl-C) and Paste (Ctrl-V) method. You might find it easier, however, to open a second Windows Explorer window and navigate to the desired folder on the

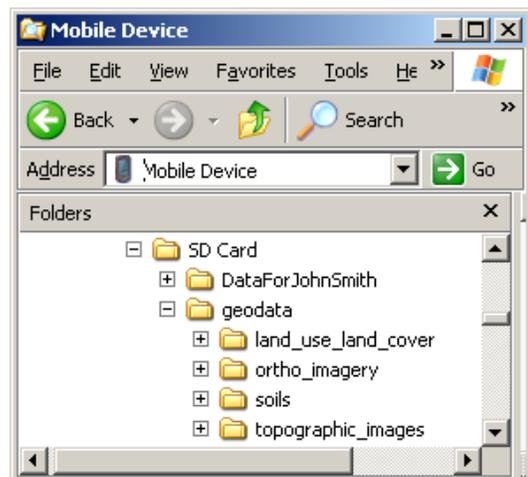
computer. Tip: An easy way to open an explorer windows is to use the  + E shortcut (on your keyboard, hold down the windows key  and then press E). You now have 2 windows that you can drag and drop files and folders from one window to the other to copy them (see below).



Recommended folder structure for workstation and SD Card

A single directory (**GPS_data**) should be created under the **C:\Documents and Settings\<user.name>** folder for the purpose of transferring client folders to and from the GeoXT. This will minimize the risk of having multiple folders for an individual user scattered throughout the workstation, and facilitate importing features by multiple users on the same workstation. To create a folder from Windows Explorer, right click on the desired parent folder and then select **File > New Folder**.

Florida-NRCS has procured an SDHC card for each GeoXT unit. This allows for storage of county wide datasets and customer folders on the card which facilitates data management. To provide some consistency in file management, the structure and naming conventions of the geospatial dataset collection on service center servers (F:\geodata) should be replicated on the SD card of the GeoXT. It is recommended to copy only data categories needed for field work.



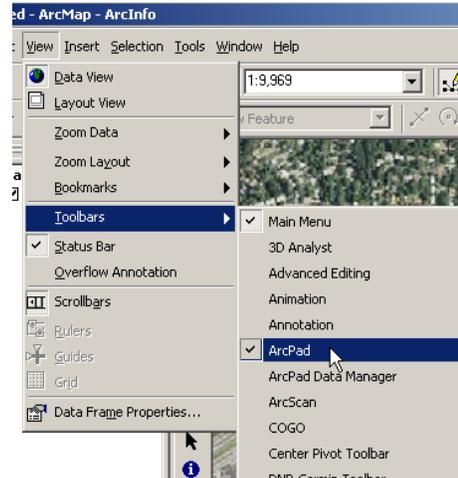
Customer folders should be stored right at the root level of the SD card as shown in the screenshot on the right. Note also the 'geodata' folder and its contents.

PRACTICE: Complete Activity #2a in Appendix K

Exporting Customer's field boundary dataset to GeoXT

GIS datasets for a customer can be prepared on your workstation in ArcMap and then packaged for transfer onto the GeoXT. In ArcMap, load layer containing field boundaries (e.g. PLU from Toolkit). If needed, activate the ArcPad toolbar by clicking *View > Toolbars* and select "ArcPad".

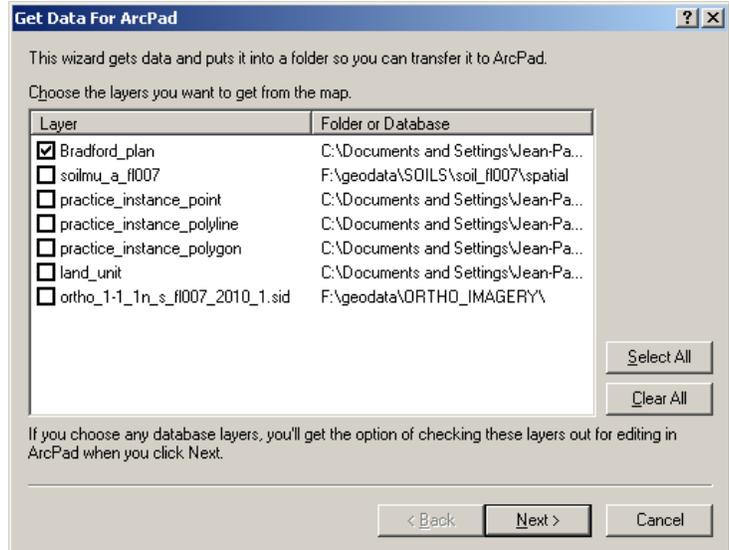
You should see a toolbar that looks like this



Click on the "Get Data for ArcPad" icon . Note that if that icon is not active (grayed out), you need to go to *Tools > Extensions* and add a checkmark to the extension for ArcPad Data Manager. The screen at right should appear.

Check on the desired layer.

Click [Next >].



For spatial extent, select “The current display extent”.

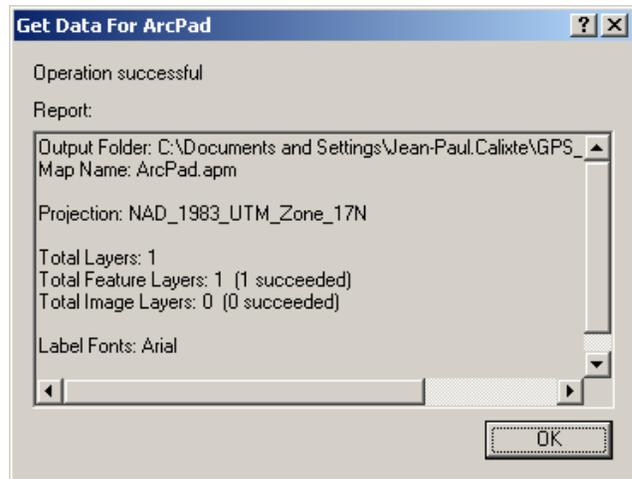
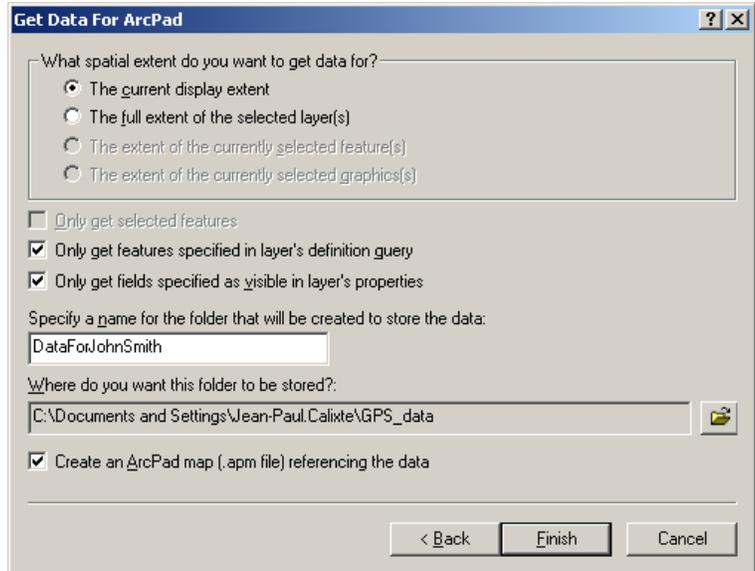
Edit the default folder name to include the customer name (e.g. DataForJohnSmith).

Click the Browse icon to select where it will be saved
**C:\Documents and Settings\
 <user.name>\GPS_data**

If not already done, check “Create an ArcPad map (.apm)...” This creates an ArcPad document in the customer folder that can be launched on the GeoXT and automatically retrieve the PLU file as shown in the next section.

Click [Finish].

A report will display the results of this process. You may want to verify that the layer(s) exported are visible in a new GIS data frame or document. The folder created can be transferred to the root level directory of the SDHC card using instructions provided in the ‘*Transferring files between computer and device*’ section.



It’s worth noting that additional layers can also be exported to the customer folder for transfer to the GeoXT by selecting any of the layers listed in the GetDatafor ArcPad dialog box. The spatial extent of layers exported can be specified, if needed. The advanced topics section in Appendix A contains a summary of those steps. However, that need should be infrequent, given the availability of countywide datasets on the SDHC card.

If a field boundary shapefile is exported/downloaded from a web application like the upcoming CDSI desktop or comes from a conservation partner, that shapefile needs to be projected to the UTM coordinate system, if necessary. A folder for the customer will have to be created manually on the desktop as per previous instructions, in order to store the shapefile.

PRACTICE: Complete Activity #2b in Appendix K

Working with ArcPad – Part I

Remember to check the battery power level the day before you plan to use it. See the “Today Screen” above on how to do this. If it is low, you can charge it overnight using the AC adapter provided.

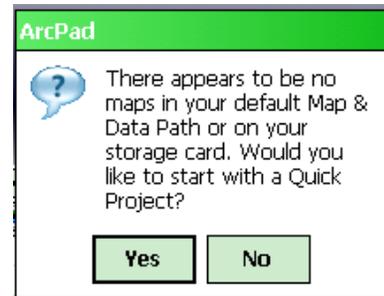
ArcPad will be used in collecting data while in the field. With this application comes the ability to collect more information (i.e., attributes) on features in the field. Let’s take a preliminary look at ArcPad to better understand how it works before jumping into actual data collection.

ArcPad Overview

To start ArcPad, you can either select *Start > ArcPad 8.0* or **TAP** the ArcPad icon on the ArcPad Today toolbar on the “Today” screen.

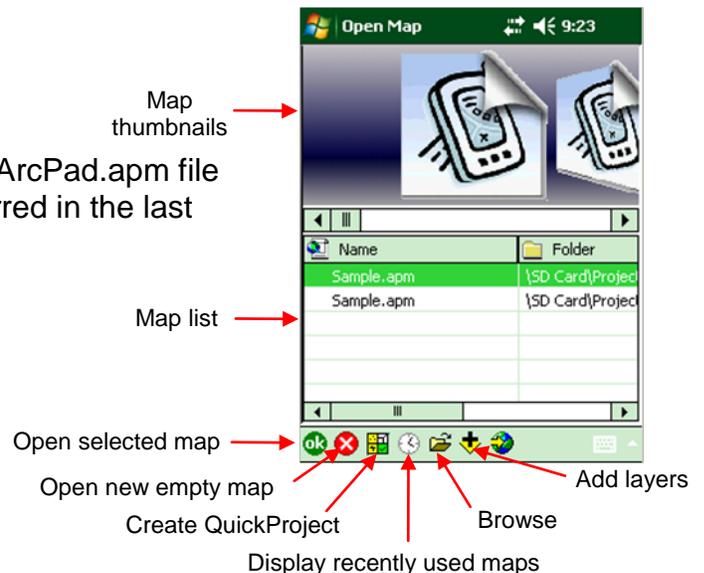


If ArcPad cannot find any maps you will get the window shown at right. For now, select “No”.

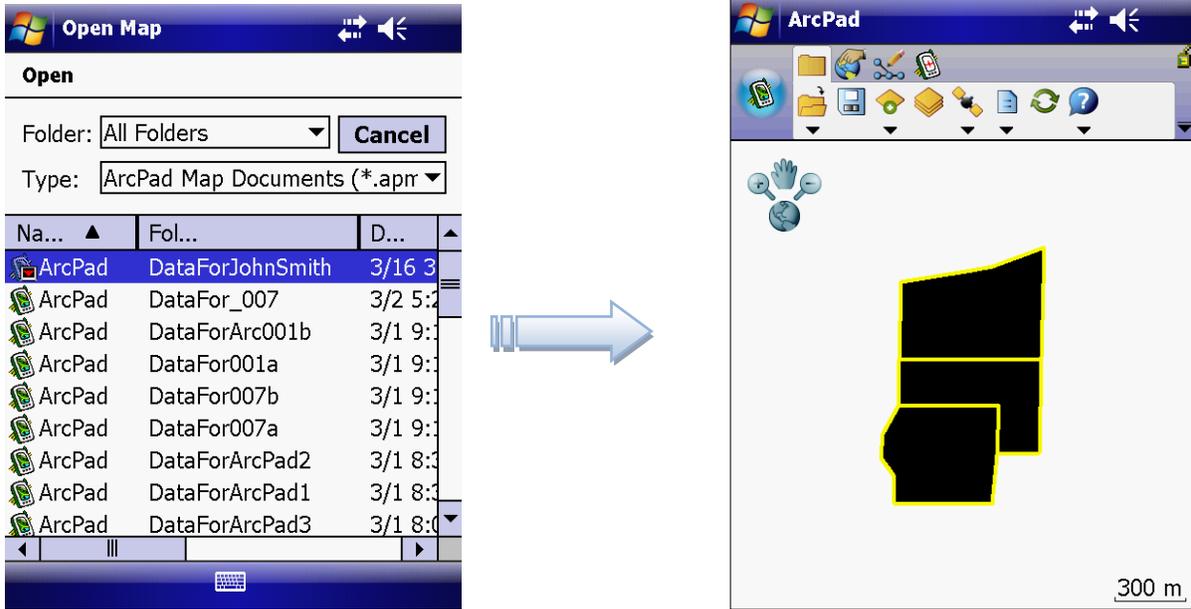


The “Open Map” window will then display (see below). In this window:

- **TAP** the folder icon  to browse for the ArcPad.apm file located in the customer folder transferred in the last exercise



Click on the ArcPad.apm file to open the map document for the customer folder transferred. Click **OK**. The PLU will automatically be loaded



The ArcPad user interface has three principal toolbars: **Main**, **Browse** and **Edit** as shown below. Each toolbar contains several tools that perform different tasks.

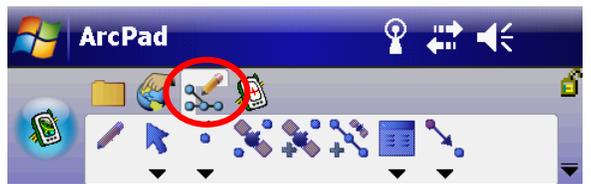
The Main toolbar has tools to open/save/close ArcPad documents, manage GIS data layers, initialize GPS, and control ArcPad settings.



The Browse toolbar has tools to zoom in/out manually or by a predetermined extent, to query attributes of features, or to find the location of a feature based on its attributes.



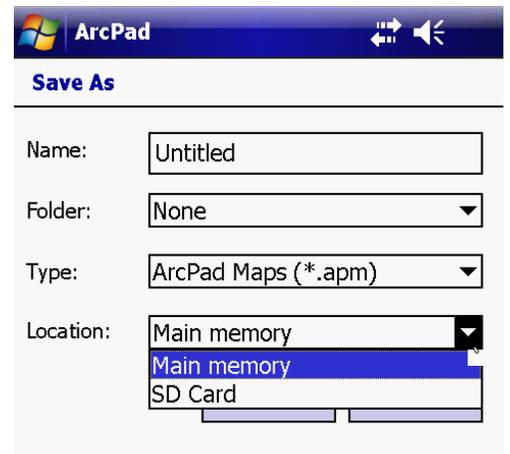
The Edit toolbar has tools to select a layer for capturing GPS coordinates, select features for editing, adding points, lines or polygon features to layers, and manipulate existing features.



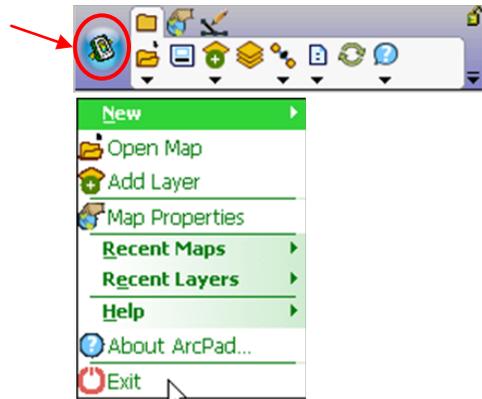
To save an ArcPad Document click on the drop-down arrow of the 'Open Map' icon, then select 'Save Map' or 'Save Map As' options



Be aware that the 'Save Map As' option offers the GeoXT's Main Memory as default storage location. You can change that location to the SD card by using the drop-down arrow in the 'Location' window. Likewise you can choose the appropriate folder on the SD card and enter a name for the document



To exit ArcPad, **TAP** ArcPad's "quick action" icon and select "Exit".



Some basic ArcPad help can be found by **TAPPING** the drop-down arrow on the help icon (blue/white question mark) on the Main toolbar and selecting

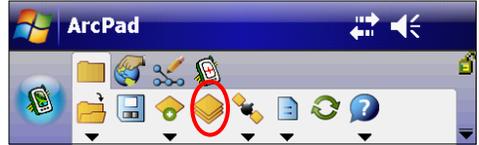
Help > Quick Reference Help.



Editing Symbology

The PLU file loaded in ArcPad has a default solid color fill. This can be changed to look like the color and fill symbol in Toolkit:

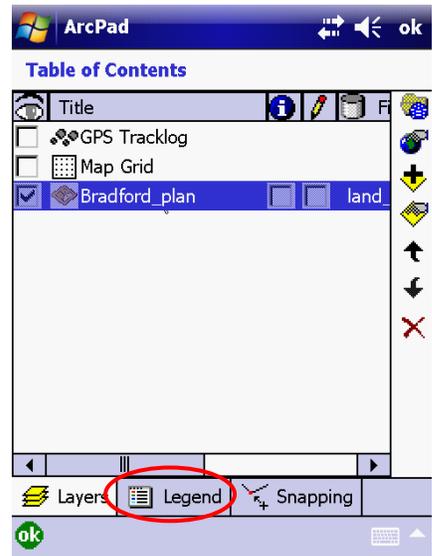
- **Tap** the 'Table of Contents' icon on the Main toolbar



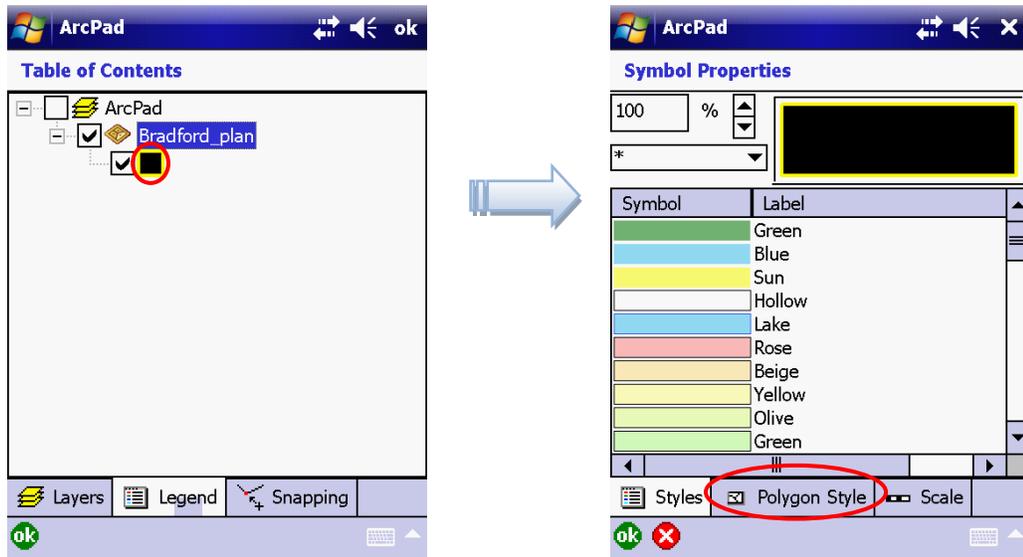
- Please note that the checkbox next a layer's name in the first column of the Table of Contents allows you to turn on/off a layer in ArcPad's display window



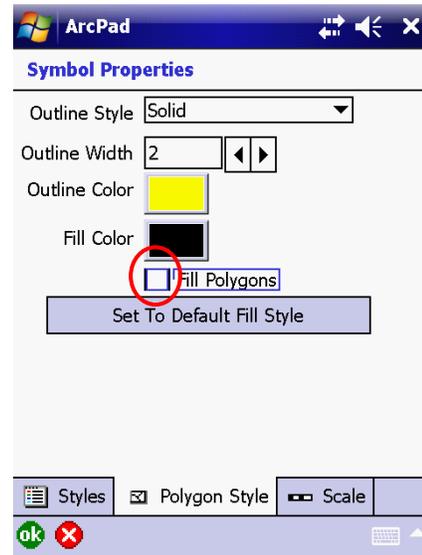
- In ArcPad's Table of Contents, select the PLU then click on Legend tab



- Click on PLU Symbol to open the Symbol Properties window then click on Polygon Style tab



- Uncheck 'Fill Polygons' , set outline to 2
- Click 'OK' to close 'Symbol Properties' and 'Table of Contents' dialog boxes



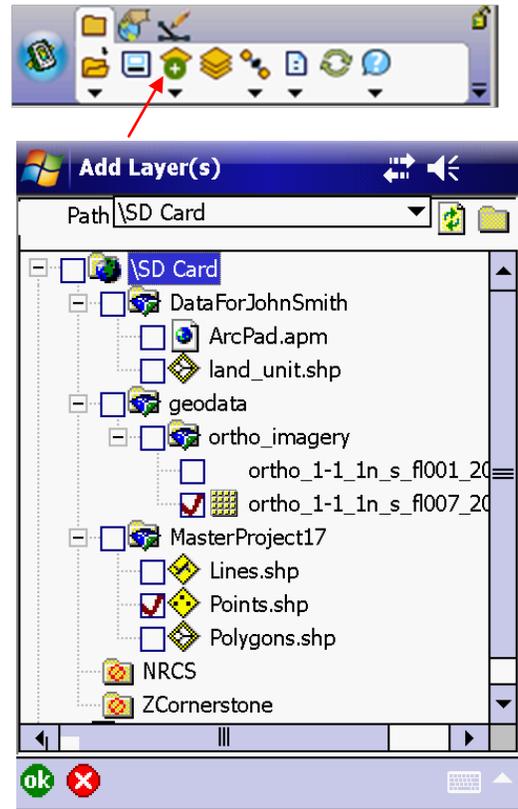
Adding existing layers to map

You may want to add an existing shapefile, imagery, street map or other reference layer to your map.

To add a layer, **TAP** the “Add Layer” icon 

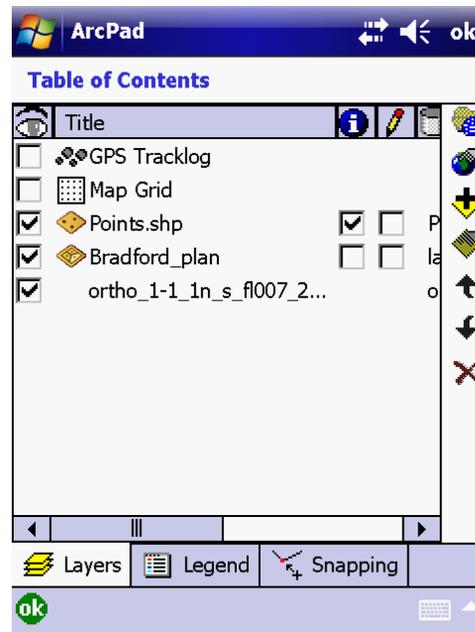
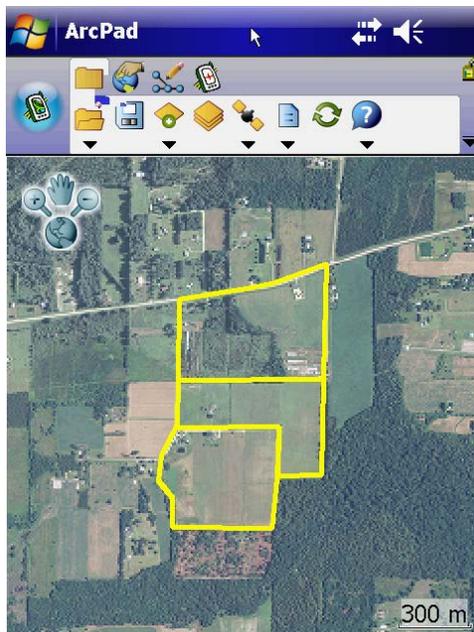
In the “Add Layer(s)” window, find the item or items you wish to add (you will need to **TAP** the “+” next to a folder to expand it). Check the box to the left of the desired item(s). The example at right shows a raster file and a points shapefile as selected.

Note: Adding a checkmark next to a directory will automatically select all files stored under that directory!!



TAP OK.

The selected layer(s) will then be displayed. This can also be verified by viewing the listing of layers in the Table of Contents. For more information about the Table of Contents, see Appendix B



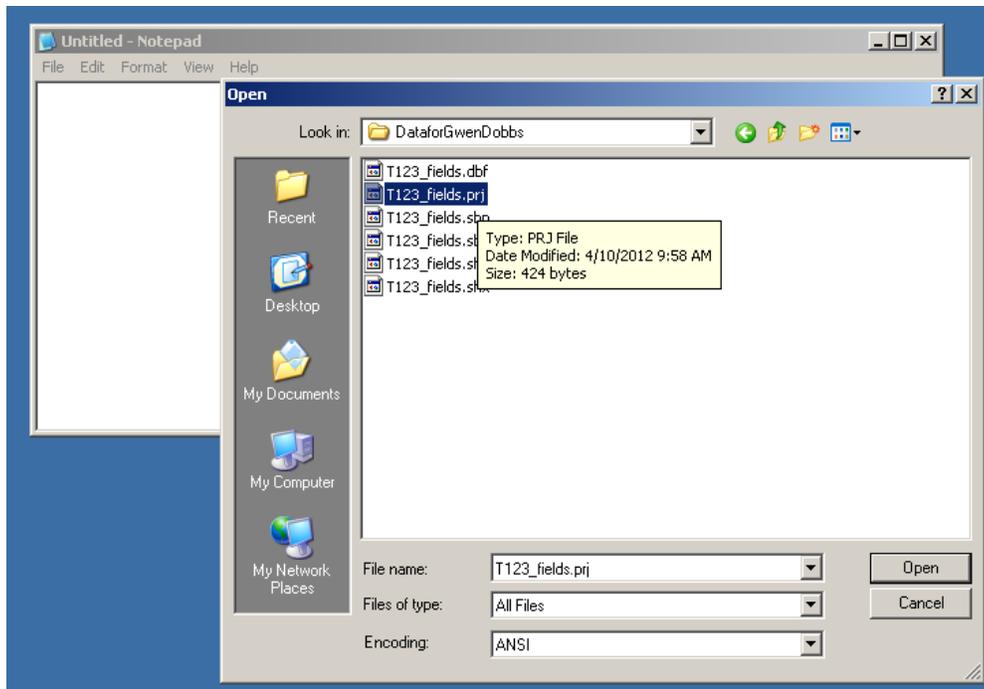
PRACTICE: Complete Activity #3a in Appendix K

So far, we've started using ArcPad on the GeoXT using a map document (Arcpad.apm) previously created and stored in the customer folder. We've used tools on the Main toolbar to add layers, view the table of Contents and manipulate symbology.

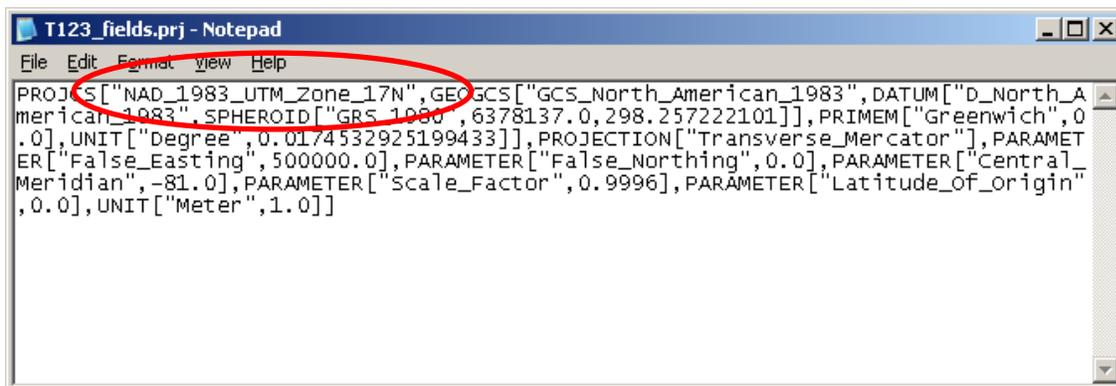
Next, we'll consider the case where a shapefile (e.g. T123_fields.shp) containing field boundary is provided by a third party without a map document.

First, verify that the shapefile is in its proper coordinate system (i.e. UTM NAD83, Zone 16N or UTM NAD83, Zone 17N). This can be done by using an editor such as Notepad (*Start > All Programs > Accessories > Notepad*).

Once the NotePad interface is open, Click on File > Open, browse to the directory of interest, set the '**Files of Type**' box to '**All files**'. Then select the shapefile's projection file (i.e. T123_fields.prj) to view. Click **Open**.

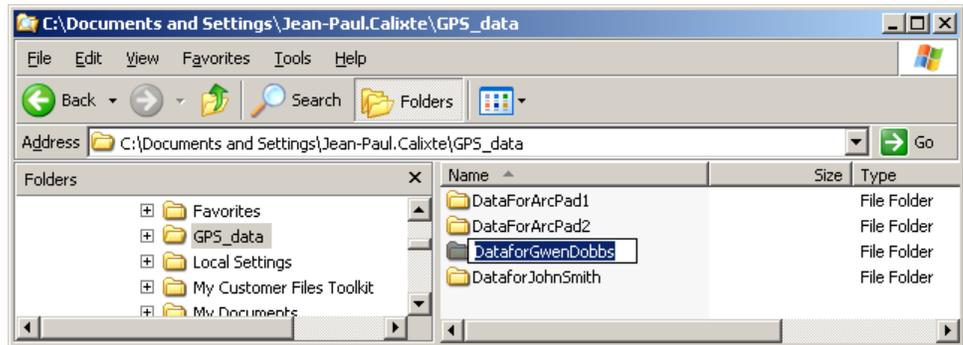


The projection information will be displayed in the Notepad interface with the current coordinate system listed on the first line.



If the projection information is incorrect, please contact the shapefile provider or your GIS Specialist.

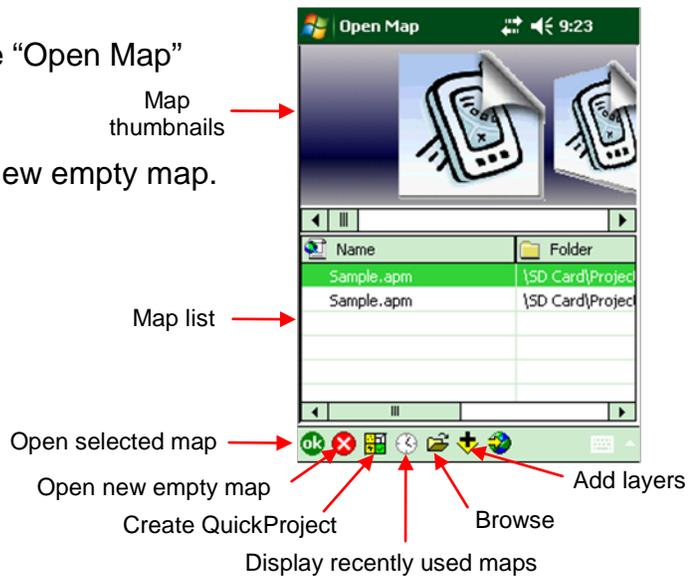
Next, create a subfolder with the customer's name under **GPS_Data** and copy the third party shapefile in to store the shapefile.



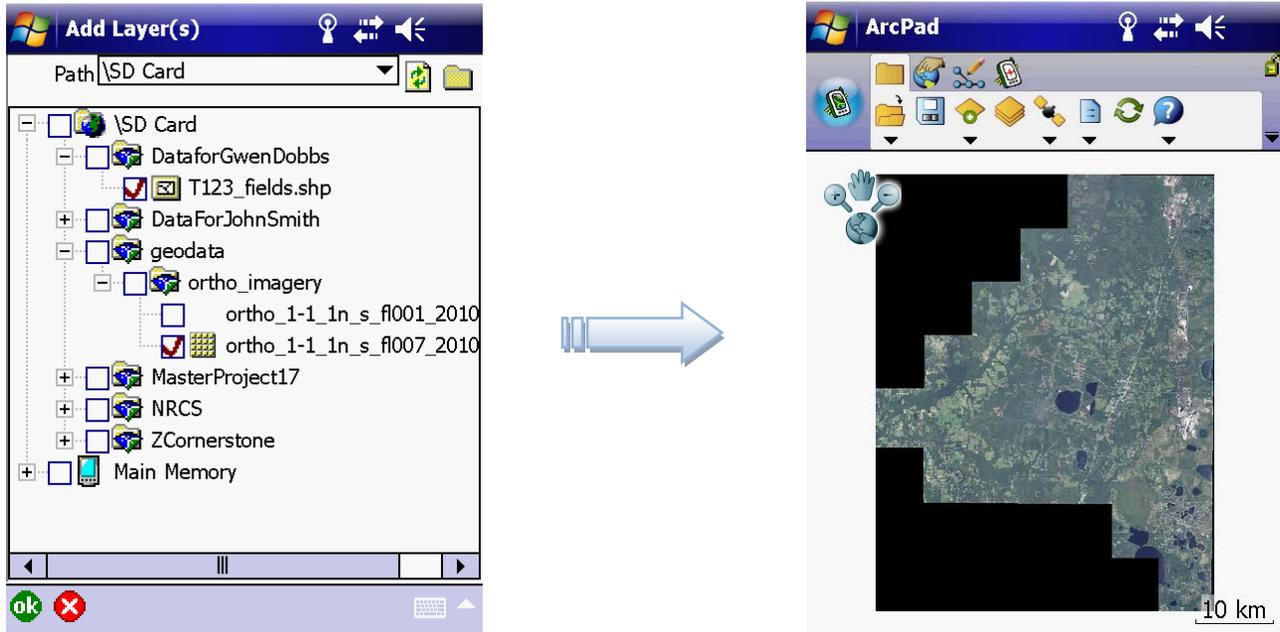
Next, transfer that customer folder to the root level of the SDHC card using instructions provided in the 'Transferring files between computer and device' section.

Launch a new ArcPad session. In the "Open Map" dialog box

- **TAP** the cancel icon  to open a new empty map.

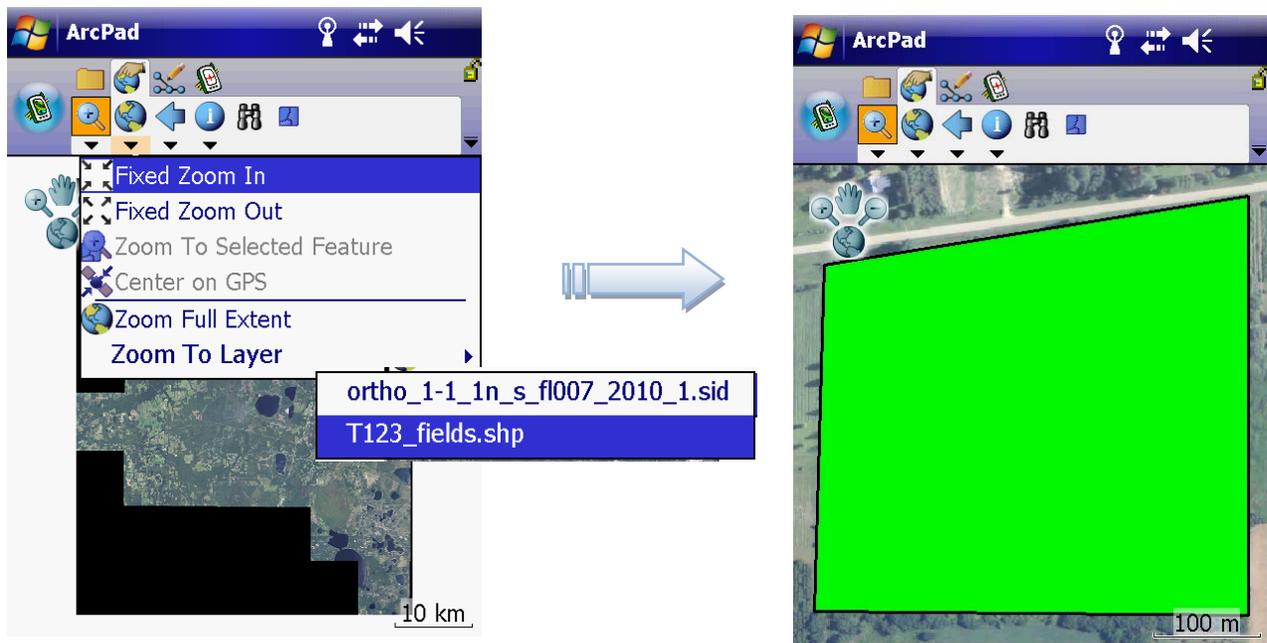


This will open a new ArcPad document into which you will add the third party shapefile and other layers, as shown below. Click OK.



The view on the screen is zoomed out to the extent of the largest layer, the county orthoimagery. The Browse toolbar has options to focus or zoom the view to a smaller area such as the field boundary shapefile.

Click on the Browse toolbar. Click the 'Fixed Zoom' dropdown  and select 'Zoom to Layer'. This option opens a menu from which the layer of interest can be selected and brought in the center of the display. Symbology can be edited as previously shown.

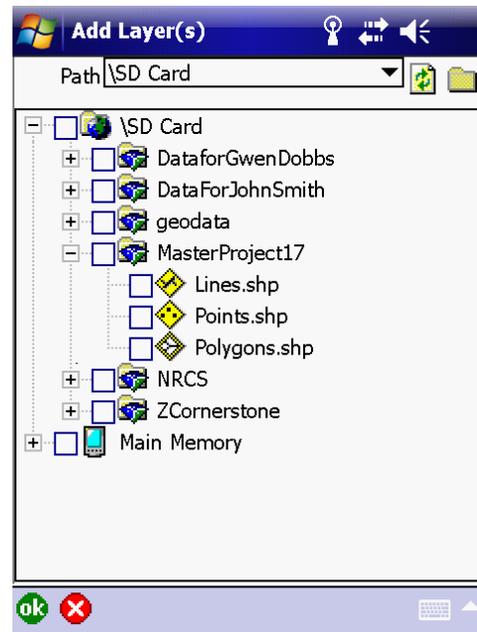


PRACTICE: Complete Activity #3b in Appendix K

Collecting Data

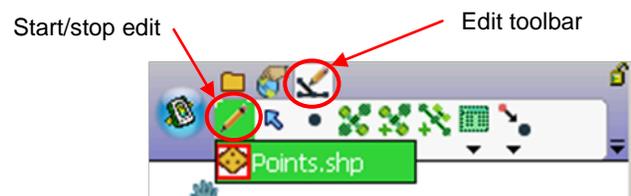
In addition to customer folders and the geodata folder, each SD card has a folder (MasterProject<utm_zone>) which contains a set of three shapefiles representing each possible type of spatial feature: points, lines, and polygons. <utm_zone> represents the appropriate UTM North zone for Florida, either **16** from the western boundary of Jefferson to the western boundary of Escambia County or **17** for the remainder of the state. For more information on projections, see Appendix C.

Those shapefiles have been customized such that when a feature is added, a list of resources and practices is presented in the attribute form to facilitate data entry. Note that ArcPad offers options to create shapefiles not discussed here. For more information, see Appendix D



Once you add a shapefile from the MasterProject<utm_zone>, you are ready to collect some data. To begin collecting data, you need to make sure the shapefile is open for editing.

To do this, select the “Edit” toolbar. **TAP** the “Start/stop edit” pencil icon. **TAP** the desired layer to start or stop editing. A red box around the icon indicates it is in edit mode.

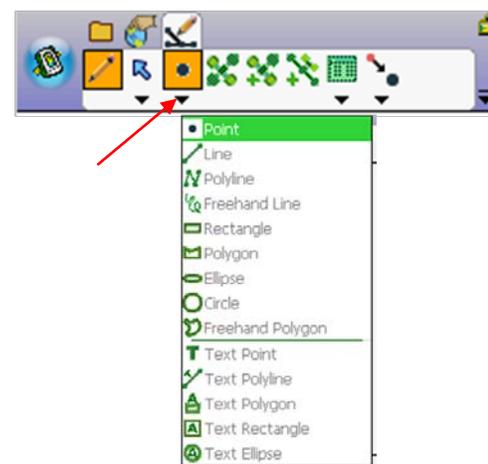


Adding features without GPS

To add features manually to your map, you should first select the sketch tool for the appropriate feature type (e.g. point, polyline, polygon, etc). To do this, **TAP** the drop-down arrow on the third icon on the Edit toolbar. Only the sketch tools that pertain to the feature types you are working on are selectable.

The icon should then change to the selected feature in an orange square.

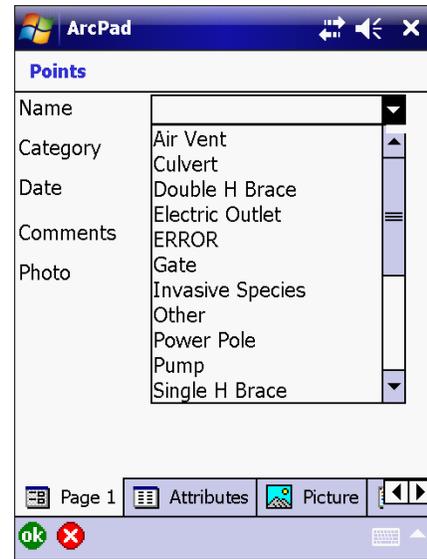
NOTE! Be very careful in using this. It can be



quite easy to inadvertently record an unwanted feature (e.g. point) by simply tapping on the screen. This technique might be useful in setting a general navigation point, but should be avoided for collecting actual features.

You can now **TAP** on the desired location on your map to add the feature (e.g. point, vertex of a polyline, etc.).

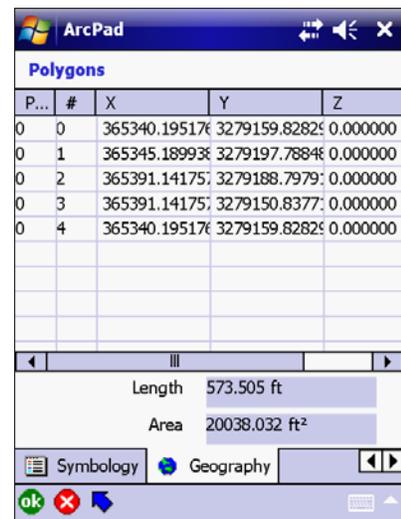
For a point, it will then bring up the form for you to enter related data (i.e. Name, Comments etc. - see example at right). Note that if the name of the feature collected is not in the customized list, users can select 'Other' for "Name" and enter proper description in the "Comments" entry.



Note: You can switch to the "Geography" page in the Points attribute form and enter coordinates of a known location rather than the location you tapped on the screen.

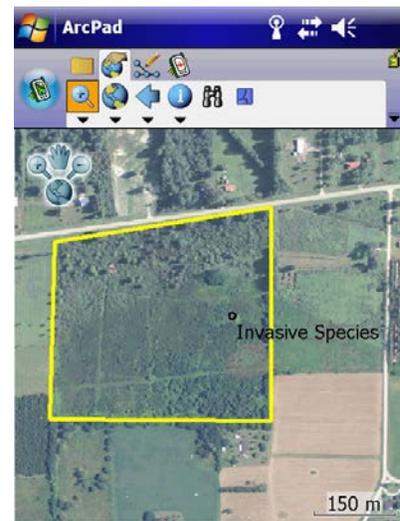
For line or polygon features, you can switch to the "Geography" page in the attribute form to view their length and/or area values.

TAP OK when finished entering data.



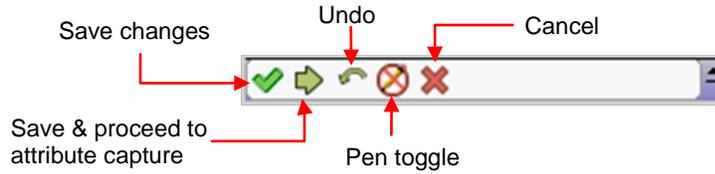
Note that after a feature is added to a shapefile from the MasterProject folder, it is shown on the screen along with a label based on the 'Name' attribute entered.

PRACTICE: Complete Activity #4a in Appendix K



Command toolbar

For a feature with multiple vertices (e.g., polyline, polygon, etc.), a “Command toolbar” will be displayed on the bottom of the screen. The toolbar along with each icon’s function is shown below.



Note: The pen toggle can be selected (orange highlight) to enable data capture with GPS only when collecting line or polygon features. This prevents accidental capture of vertices when the stylus touches the screen. Remember to remove that setting to digitize features without GPS.

For a multi-vertex feature (e.g., polyline, polygon, etc.), select appropriate sketch tool from the Edit toolbar, **TAP** on the desired location on your map to start digitizing, continue adding vertices until you are done with that feature. To end the capture of that feature, **TAP** the big right arrow icon on the “Command toolbar” (explained above). This will bring up the form to collect the attribute data for that feature.

Deleting features

If you want to remove a feature, the shapefile that contains the feature to be deleted must be in the Edit mode.

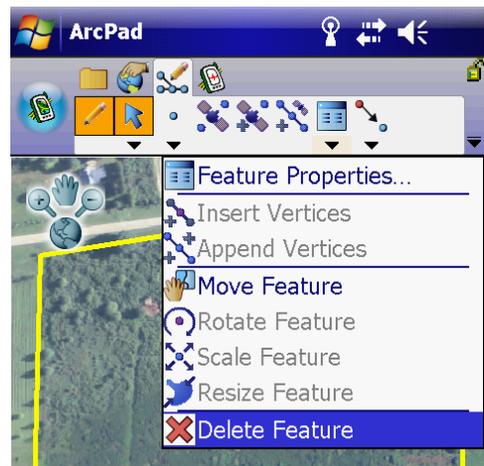
Then, on the Edit toolbar, tap the drop-down arrow on the second icon of the Edit tool bar and click on the ‘Select’ tool.

Then, using the ‘Select’ tool click on the feature to be deleted.



Click on the drop-down arrow of the ‘Feature Properties’ button and select ‘Delete Feature’ If the ‘Delete Feature’ option is not selectable, you may need to zoom in closer to the feature to be deleted in order to make sure it is selected with the ‘Select’ tool.

Additional Zoom options are available as shown on the following page.



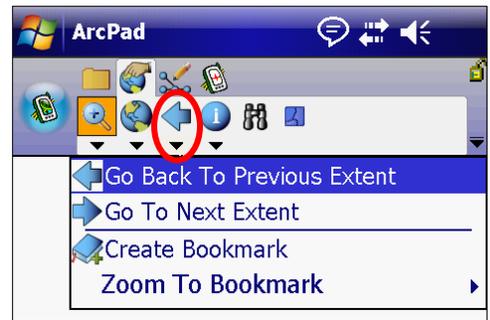
Manual Zoom options can be accessed from the Browse toolbar or the Map Navigator:



Manual Zoom Options on Browse
Toolbar



Map Navigator



Previous Extent button has options
to set or change geographic
windows

PRACTICE: Complete Activity #4b in Appendix K

Device Settings for using GPS

Before we capture geographic features with GPS, we need to discuss two important procedures: 1) setting the GPS Controller and 2) setting GPS preferences in ArcPad. The setup steps detailed here should only need to be done one time. If the device has to be reset to factory defaults, the software has to be reinstalled, or the unit does not seem to be working as it should, you should check the setup again.

GPS Controller

The GPS Controller software allows users to configure the GeoXT unit to receive signals both from satellites and real time correction sources. The following steps are necessary to setup the GPS controller.

1. Make sure the GeoXT is turned on
2. Click START-> GPS Controller
3. Click SkyPlot -> Setup
4. Click on GPS, when prompted to disconnect -> YES
5. Click GPS settings. Close keyboard. By a click on icon at bottom of screen
6. Set GPS Receiver Port-> COM3
7. Scroll down and set NMEA output -> ON

8. Click on wrench icon next to NMEA
9. Set Output interval -> 1s; Baud Rate -> 9600; Data Bits -> 8; Stop Bits -> 1; Parity -> None
10. Checkmark sentences: GSA, GSV, RMC
11. Click OK to exit NMEA SETTINGS
12. Click OK (next to GPS setting)
13. Click Real Time Setting
14. Set CHOICE 1-> Integrated SBAS (Space Based Augmentation Service, i.e. WAAS)
15. Set CHOICE 2-> Use Uncorrected GPS
16. Set Real Time Age limit -> 2 minutes
17. Click on wrench icon
18. Set tracking mode to auto
19. Click OK

ArcPad Preferences

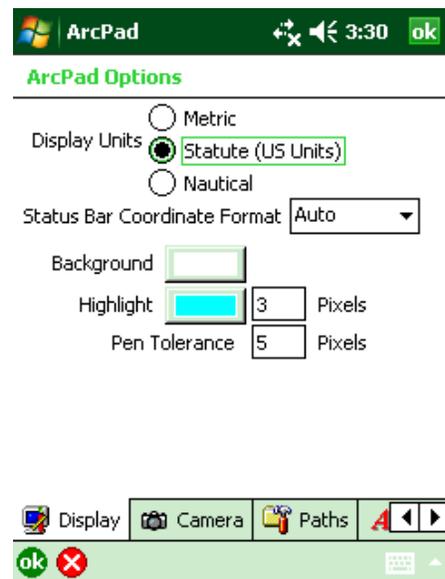
ArcPad can be used to set user preferences for GPS. If ArcPad is not already open, you can start the software as follows: select *Start > ArcPad 8.0* or **TAP** the ArcPad icon  on the Today screen. When the “Open Map” window appears, **TAP** the red/white X icon  on the bottom toolbar.

To set up or check ArcPad options, **TAP** the Options



icon on the Main toolbar.

The only two option screens that really need to be checked are “Display” and “Paths”. The “Display”



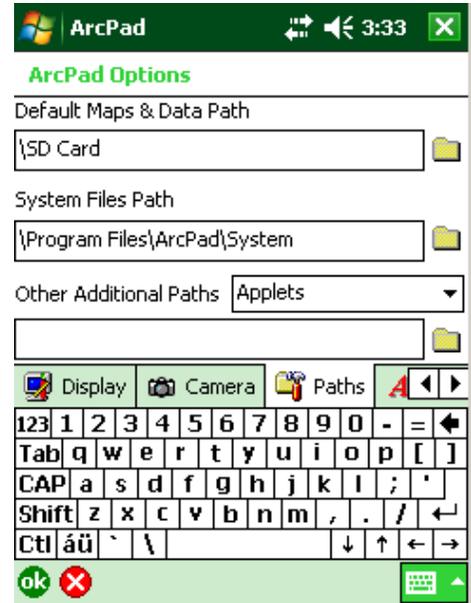
screen comes up first. Recommended settings are shown below.

To switch to “Paths” screen, **TAP** on “Paths” tab near the bottom of screen.

The “Default Maps & Data Path” should be set to **\SD Card** shown at right. This can be done either by using on-screen keyboard or by **TAPPING** yellow folder icon to right of input field and then navigating to **\SD Card**.

The other values should be left as shown.

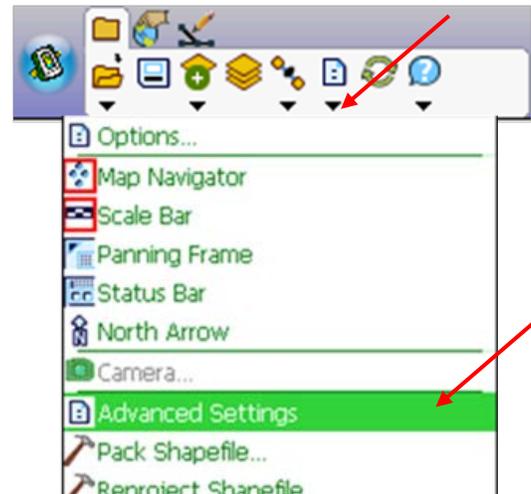
TAP the ok icon  in lower left of screen.

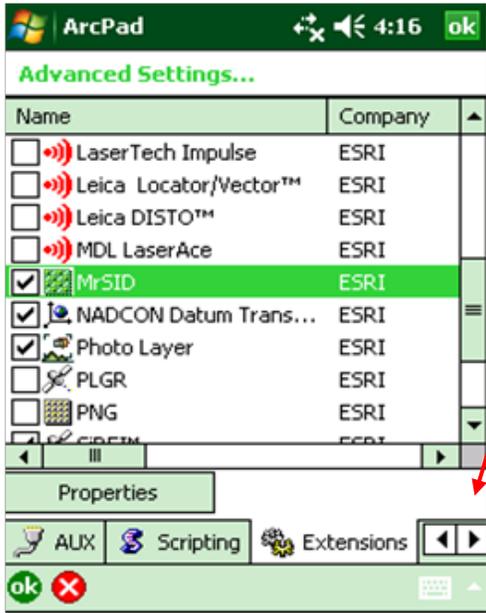


ArcPad Extensions

To ensure MrSID images (e.g., orthoimagery) display, the MrSID extension needs to be turned on. This should already be set.

To verify this, **TAP** the drop-down arrow under the Options icon on the Main toolbar and then select Advanced Settings on the menu.





TAP the right arrow at lower right of screen to scroll over to “Extensions” tab.

Using vertical scroll bar, scroll down to “MrSID” and make sure the box is checked.

If there are any other extensions you know that you need, you can check them as well.

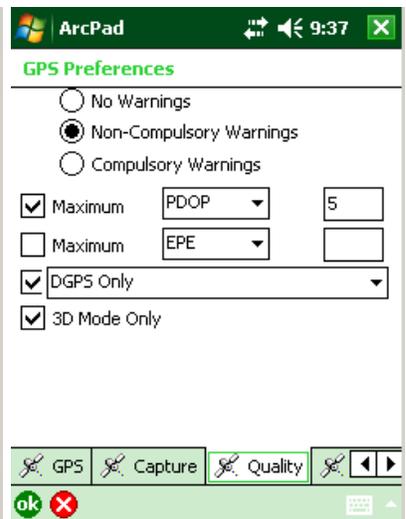
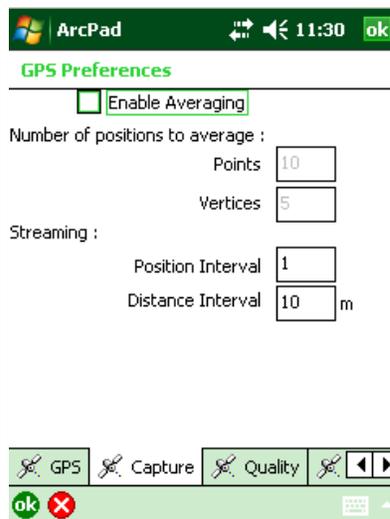
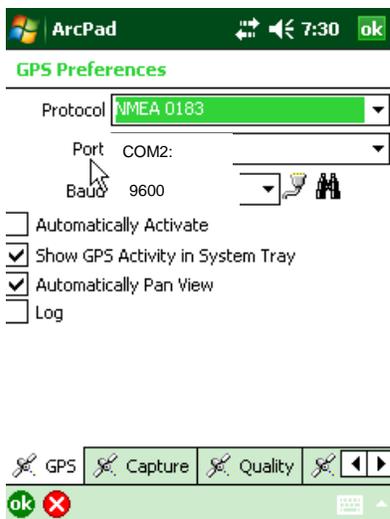
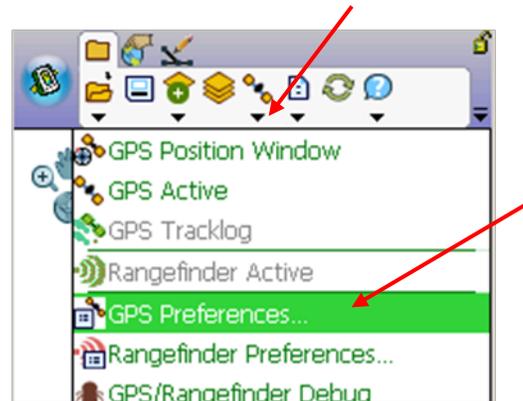
TAP the ok icon  in lower left of screen.

GPS Preferences

In order for the GPS receiver to work with ArcPad, the GPS preferences need to be set correctly.

To set these, **TAP** the drop-down arrow under the GPS icon on the Main toolbar and select “GPS Preferences” on the menu.

The first 3 screens of GPS Preferences are shown below – GPS, Capture, and Quality.



The items that **MUST** be set as shown above are as follows:

GeoXT : GPS – Protocol: NMEA 0183 ; Port: COM2: ; Baud: 9600

The **recommended** settings of items shown above are as follows:

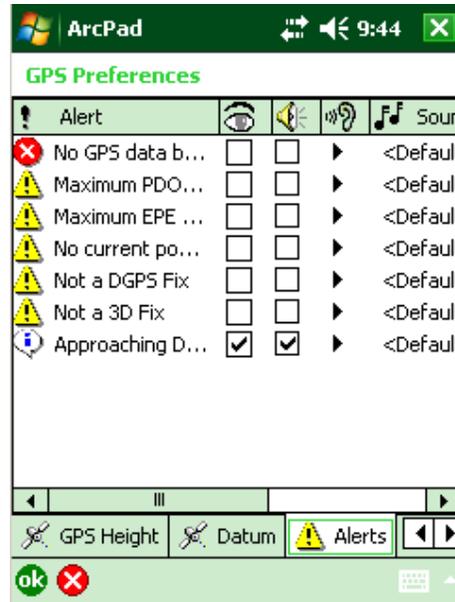
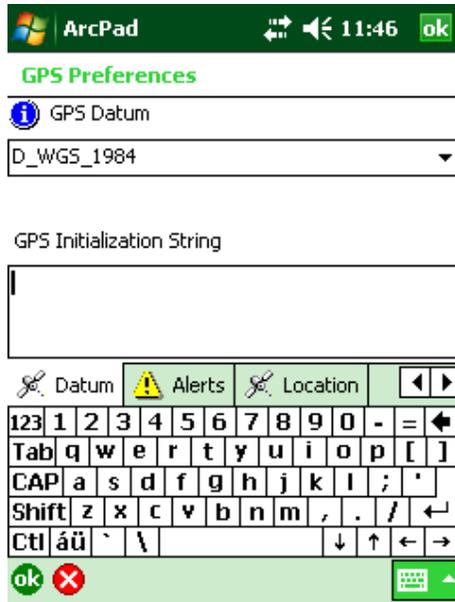
GPS – Automatically Activate: unchecked
 Show GPS Activity in System Tray: checked
 Automatically Pan View: checked
 Log: unchecked

Capture – Enable Averaging – may be left unchecked. For greater precision, add a checkmark and set the number of positions to average points for vertices as recommended later in the Position Standards section. **Note:** The distance interval should be set to a smaller value (e.g. 3m) when capturing vertices at intervals smaller than 10 meters

Quality – Non-compulsory Warnings selected. This setting will provide a warning when trying to record a GPS measurement that does not meet the criteria set on this screen. You will still be able to store the point by responding Yes to the prompt given.

Check and set the other values as shown: Max PDOP=5, DGPS Only, 3D Mode Only.

The remaining items are “user preference” (i.e., set as you desire). The other 2 screens of preferences you should check are “Datum” and “Alerts” (see below). To move to these screens, **TAP** the right arrow button  to the right of the tabs on the bottom of the screen.

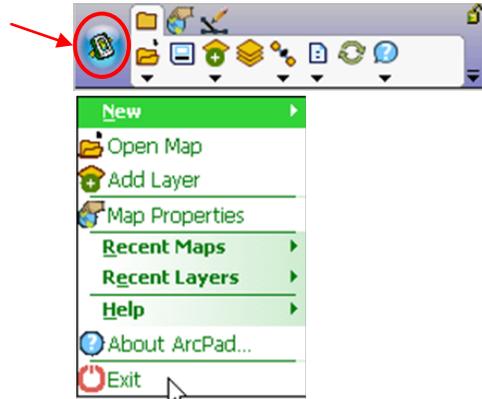


Datum – GPS Datum should be set to D_WGS_1984.

Alerts – The items on this screen can be set as you desire. These alerts can be quite annoying, so you might want to turn most of them off as shown above. A check in the first column will cause a message to display on the screen when that alert condition occurs (e.g. Maximum PDOP exceeded). A check in the second box will cause a sound to play when the condition occurs.

TAP the ok icon  in lower left of screen.

To exit ArcPad, **TAP** ArcPad's "quick action" icon and select "Exit".



PRACTICE: Complete Activity #5 in Appendix K

Data Capture Standards

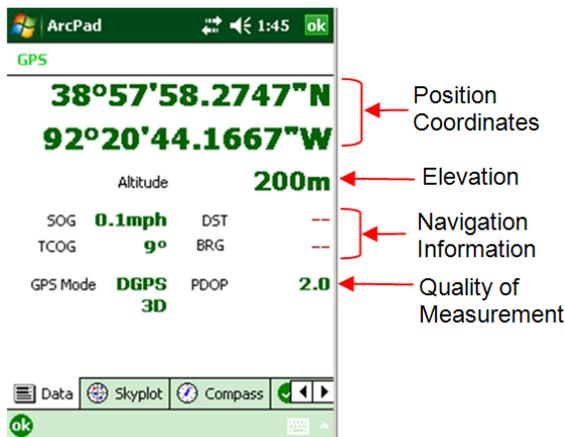
GPS collection standards are needed to ensure consistency in the method of collection, data quality, and the accuracy and repeatability of measurements.

Position Quality Indicators

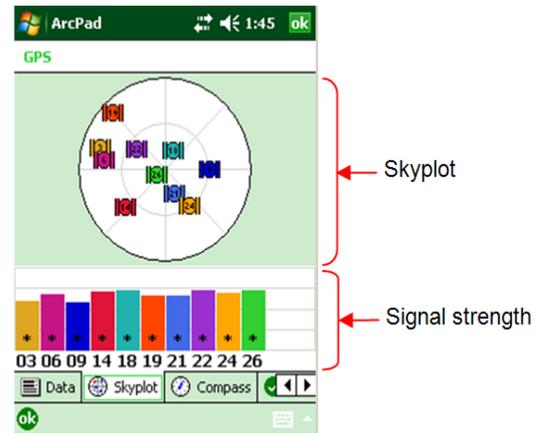
Several parameters are used to gauge the quality of position (QOP) provided by the Trimble GeoXT. These parameters include:

1. **GPS Status:** method of computing horizontal positions based on 3 satellites (**2D**), or both horizontal and vertical positions based on 4 or more satellites (**3D**).
2. **Positioning Mode:** positions are computed using satellites signals alone (**GPS**) or augmented by ground or air-based sources of differential corrections (**Differential GPS**)
3. **Position Dilution of Precision:** numeric value representing satellite geometry, i.e. the positioning of satellites relative to each other and to user. GPS receiver computes accurate positions when satellites are well spaced and cover a large portion of the sky.
4. **Strength of Satellites:** shown as bar chart of relative signal strength of satellites in the almanac
5. **Number Satellites in Solution:** number of satellites being used to calculate positions
6. **Differential Data Age:** Age, in seconds, of the differential signal and correction used by the GPS receiver to correct GPS position
7. **Horizontal Accuracy:** Estimated accuracy of the current GPS position, in meters

Parameters 1- 3 are displayed on the 'Data' tab in ArcPad's GPS Position window. To access the GPS Position window, **TAP** the drop-down arrow under the GPS icon on the Main toolbar and select the first option on the menu. Parameter 4 is on the Skyplot tab

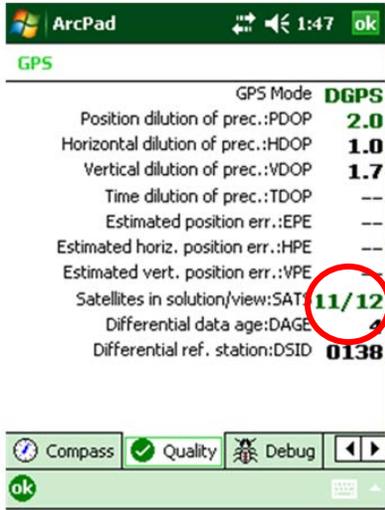


Data Tab: Parameters 1 - 3



Skyplot Tab: Parameter 4

Parameters 5-6 are located on the Quality Tab. More information about the GPS Position window is available in Appendix E. Parameter 7 is displayed in the GPS Controller's Skyplot Status Bar above the satellite icon.



GPS Controller-Skyplot: Parameter 7

Quality Tab: Parameters 5 - 6

Positioning Standards

Guidelines for Positioning Requirements and Standards are listed in the following documents: GM 170 Part 400 Subpart D (35); National Geospatial Manual Part 581 Subpart C (draft Oct. 2011), and GM 450 Part 407 Subpart D (FL-Amendment 14). The table below shows current positioning standards for resource inventory and practice certification tasks.

QUALITY OF POSITION INDICATORS	RESOURCE INVENTORY	PRACTICE CERTIFICATION
GPS STATUS	3D	3D
POSITIONING MODE	DIFFERENTIAL GPS	DIFFERENTIAL GPS
POSITION DILUTION OF PRECISION	5 or less	3 or less
SIGNAL STRENGTH OF EACH SATELLITE	50% or more	50% or more
NUMBER OF SATELLITES IN SOLUTION	6 or more	7 or more
DIFFERENTIAL DATA AGE (Maximum)	120 seconds	60 seconds
HORIZONTAL ACCURACY	10 meters or less	6.1 meters or less

The first positioning meeting all criteria is acceptable for use in the capture of geographic features. In practice, those parameters may fluctuate as users move in and out of challenging environments, e.g. under tree canopy, in areas where augmentation

is lost, or satellite geometry declines). When operating in challenging environment, users should follow these guidelines:

- 1) GPS positions should be averaged for **15 seconds** when any **two** of the following situations occur:
 - a. Number of satellites in solution is less than standard, but not less than 5
 - b. Signal strength is less than standard, but the majority of satellite signals is greater than 50%
 - c. PDOP is greater than standard, but not greater than 6
 - d. Canopy closure is between 10 to 40%
 - e. Terrain masking is between 10 and 30°
- 2) GPS positions should be averaged for **30 seconds** when any **three** of the following situations occur:
 - a. Number of satellites in solution is less than standard, but not less than 5
 - b. Signal strength is less than standard, but the majority of satellite signals is greater than 50%
 - c. PDOP is greater than standard, but not greater than 6
 - d. Canopy closure is between 10 to 40%
 - e. Terrain masking is between 10 and 30°
- 3) GPS positions should be averaged for **60 seconds** when any **four** of the following situations occur:
 - a. Number of satellites in solution is less than standard, but not less than 5
 - b. Signal strength is less than standard, but the majority of satellite signals is greater than 50%
 - c. PDOP is greater than standard, but not greater than 6
 - d. Canopy closure is between 70 to 100%
 - e. Terrain masking is greater than 45°
- 4) Beyond those considerations and under ‘No Fix’ conditions, users should consider using a “hybrid “ collection techniques such as:
 - a. Using Trimble GeoXT, locate position where QOP indicators are within acceptable levels, capture endpoint, measure direction and distance from that point to end of segment to be measured. Direction is displayed as TCOG [True course over ground] in Data tab of ArcPad GPS window. Distance can be measured with a tape. Likewise, using a calibrated laser range finder is an acceptable practice.
 - b. Using High Accuracy GPS in open areas to set an accurate point and traditional survey techniques to tie the point to the data collection site.

When “hybrid” data collection techniques are used, the estimated accuracy for the GPS position and the traditional technique should be noted in the features attributes

Limitations on Measurements

As per GM170 Part 400 Subpart D (35)(C) GPS technology should not be used for NRCS measurement applications when:

- 1) PDOP is greater than 6.0
- 2) Number of satellites in Solution is less than 5
- 3) Signal strength of the majority of the satellites is less than 50%
- 4) No differential corrections are available (i.e. GPS unit is not operating in DGPS mode)

In addition, the following restrictions are in place until additional field testing is completed

Area Measurements

GPS can be used for measuring any area for practice certification. Strict adherence to quality of position standards is recommended for areas less than 2 acres.

Length Measurements

GPS can be used to measure lengths greater than 500 feet for practice certification. For lengths less than 500 feet, an alternate method of measurement (i.e. 300 ft chain, measuring wheel, etc) shall be used in order to ensure that the measurement will meet current NRCS certification tolerances. When Survey Grade GPS systems are used, there is no limitation on measurement of lengths.

PRACTICE: Complete Activity #6 in Appendix K

Working with ArcPad – Part II

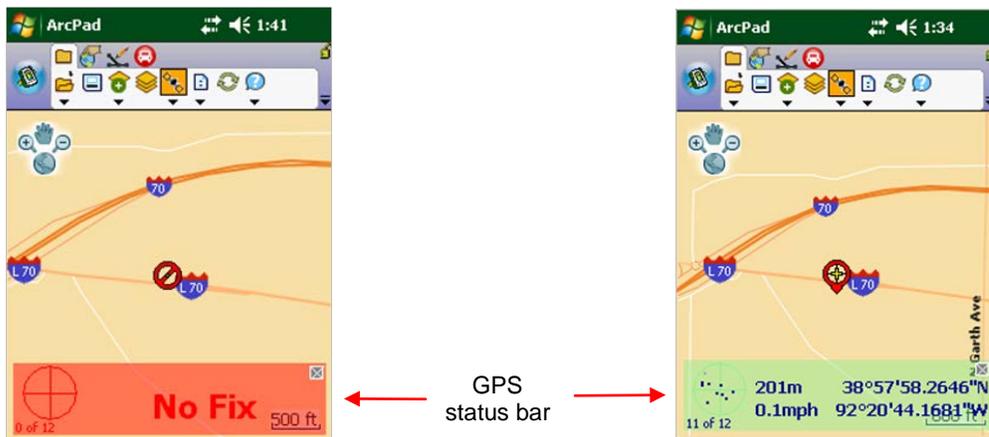
If needed, launch ArcPad on the GeoXT either using an existing map document (*.apm) in the customer folder, or opening a new document and centering the view on the area of interest (e.g. PLU). For better screen refresh rates, you may want to turn off the imagery.

Initiating GPS data collection

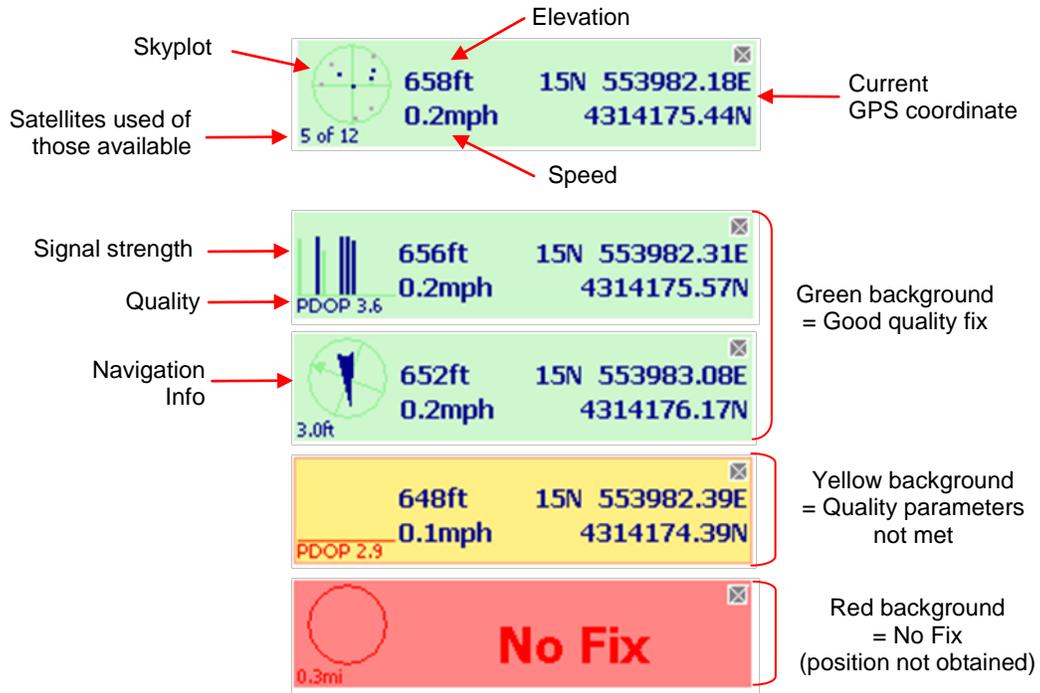
In order to record a feature at your current GPS location, you first need to activate GPS. Do this by **TAPPING** the “GPS Active” icon on the Main toolbar.



The “GPS Active” icon should be displayed in an orange square to show it has been activated. A red circular marker will be displayed in the map view area showing your current GPS location with a pointer showing the direction you are moving. A translucent GPS status bar will show at the bottom of the screen. See the two examples in the screenshots below.



The GPS status bar contains information as detailed in the images below. The background color of the GPS status bar is used to indicate the current condition of the GPS measurements as stated below.



Adding features using GPS

Once the GPS has been activated and you are receiving quality GPS measurements (patience may be needed!), you can begin adding features. As instructed in the section, “Adding features without GPS”, you should first ensure that the proper shapefile(s) is (are) in the ‘Edit’ mode. Then, use the Sketch tool on the Edit toolbar to select the feature type (e.g., point, polyline, polygon, etc.) you will be adding. The left image below shows the Sketch tool when in “point” collection mode, while the right image shows the Sketch tool in “polyline” collection mode.



Notice the 3 GPS icons in the toolbars above. When in “point” collection mode, the first icon (“Capture point”) is the only one active. When in polyline or polygon mode, all 3 may be active. Each of these icons uses the current GPS position in the following way:

-  : Captures a point.
-  : Captures a single vertex in the current line or polygon feature
-  : Continuously captures vertices in the current line or polygon feature (determined by Capture settings in GPS Preferences).

Point

To capture a point, your screen might look similar to that shown at right. You are in point edit mode (pencil and point icons highlighted), you are at desired location, and GPS status bar is green with good quality info shown.

TAP the “GPS Capture Point” icon.

You will then be presented with the form to enter attribute data for that point.

Enter the appropriate data and **TAP** OK.

Repeat this process to collect additional points.



Polyline

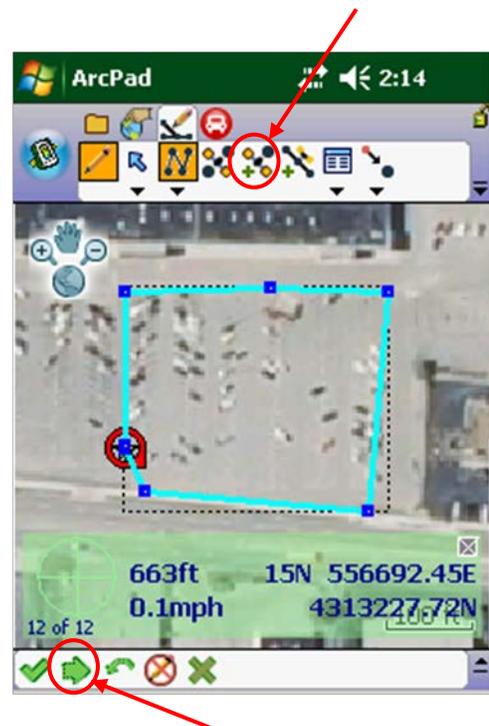
To capture a polyline, your screen might look similar to that shown at right. You are in polyline edit mode (pencil and polyline icons highlighted), you are at desired location, and GPS status bar is green with good quality info shown.

TAP the “GPS Capture Vertex” icon. Move to next location and **TAP** the icon again. Keep doing this until you are finished with the line.

TAP the right green arrow  on the command bar at the bottom of screen to end and save the feature.

You will then be presented with the form to enter attribute data for that line.

Enter the appropriate data and **TAP** OK.



Polygon

The procedure for capturing a polygon is the same as that above for a polyline with the exception that the feature type selected is “polygon” so the toolbar looks like that shown here.



Continuous

You can capture polyline or polygon vertices continuously by using the third GPS capture icon as shown at right. The procedure is similar to that above for polylines and polygons except that vertices are automatically recorded rather than you having to manually **TAP** the capture icon at each location. The recorded locations are based on the “Streaming - Position and Distance Interval” settings on the Capture page of GPS Preferences (mentioned earlier).

The “Position Interval” setting is the number of readings received from the GPS receiver. Since the GeoXT is set to take GPS readings every second, this number correlates to number of seconds.

The “Distance Interval” setting is the distance you must move before the next vertex is recorded. This is entered in the units of the current projection (which will most likely be meters if using the default UTM83 projection).

Both of these conditions must be met before the vertex is recorded. For example, if the position setting is 10 and the distance setting is 30 meters, ten seconds must have elapsed **AND** you have moved at least 30 meters.

You can stop the continuous mode by **TAPPING** the icon. You can then continue to manually add vertices to the polyline or polygon by using the “GPS Capture Vertex”.

Once you are finished with the polyline or polygon, **TAP** the right green arrow  on the command bar at the bottom of screen to end and save the feature.

You will then be presented with the form to enter attribute data for that line.

Enter the appropriate data and **TAP** OK.

If you are finished collecting GPS data and no longer need the GPS, you can deactivate the GPS by **TAPPING** the GPS icon  on the Main toolbar.

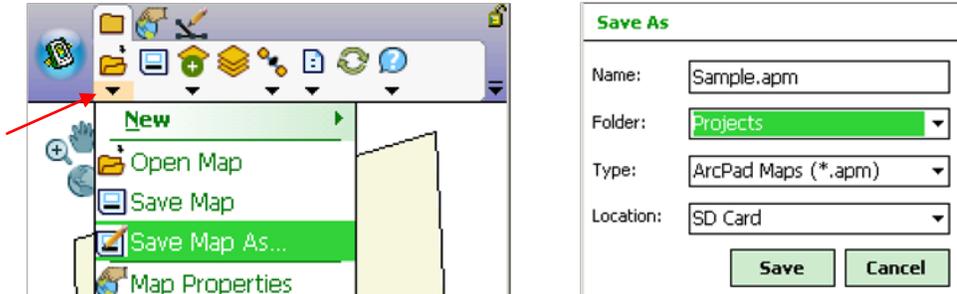
ArcPad offers more complex tools for capturing and editing data with GPS. For more information about the Offset and Editing tools, see Appendix F. Likewise, ArcPad has tools to identify, measure and navigate to features listed in Appendix G. A set of field guide index cards is available in Appendix H. Troubleshooting topics are discussed in Appendix I. The potential of using an external antenna is under evaluation.



PRACTICE: Complete Activity #7a in Appendix K

Saving a map

To save a map that you are currently working on, simply **TAP** the drop-down arrow of the “Open Map” menu on the Main toolbar and select “Save Map” or “Save Map As...”. Select “Location” (e.g. SD Card); “Folder” (e.g., Projects) and then enter “Name”. **TAP** Save. It will be saved with an *.apm* extension.



Preparing for Practice Certification

Make sure the GeoXT unit is fully charged before leaving the office. If a vehicle charger is available, use it to recharge the battery between sites.

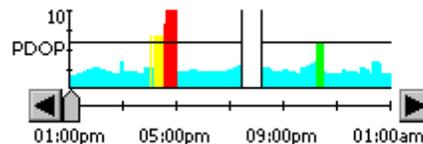
Use the GPS Controller DOP graph to evaluate projected PDOP values during the next 12 hours at your current location as shown below. The DOP Graph is accessed by clicking on Start > GPS Controller > use the drop-down arrow next to Skyplot and select Plan

DOP graph values

Bar appearance

Bar appearance	PDOP
Cyan	< 4
Green	4 to 6
Yellow	6 to 8
Red	> 8

Blank with black left and right borders Not enough satellites are available to compute a position.



Before starting practice certification, wait until all the QOP indicators are settled within acceptable range and record their initial values on paper or in an electronic file. These parameters should be included in a text box on maps of certified practices.

If using a county orthomosaic and screen refresh is slow, you may want to turn off the imagery and turn it back on for double checking your position as needed. For very large areas, it may be worth exporting a smaller subset of the county image to facilitate screen refresh rates, as explained in Appendix A.

PRACTICE: Complete Activity #7b in Appendix K

Importing GPS Data into GIS

Downloading

Once you have collected your data, you are ready to return to the office and download the data. Downloading is actually just a matter of copying folders and files from the device using Microsoft ActiveSync software. The details of connecting your device and copying files were given earlier in the section “Overview of MS ActiveSync”. You should refer to that section for detailed steps. A brief summary of those steps is as follows:

1. Turn on computer and log-in.
2. Connect device to computer using USB cable.
3. Turn on handheld device.
4. Microsoft ActiveSync will activate. Press *Cancel* if Synchronization Setup window appears. A “Guest” partnership will be invoked.
5. On the ActiveSync window, click “Explore” on the toolbar or select *Tools >Explore Device*. An Explorer window will open
6. Open another Explorer Window on your workstation. Navigate to the root level of the SD card and copy the MasterProject<utm_zone> folder to your workstation’s **C:\Documents and Settings\user.name\GPS_data** folder. If you have made any changes to the PLU delineation on the GeoXT, you need to also copy the customer’s folder back to the same target directory on your workstation

Using the Data

Once your data has been copied to your computer, it can now be used in any software that can utilize an ESRI shapefile. Below are some brief instructions on loading a shapefile in ArcMap. Instructions for importing shapefiles into AutoCAD are provided in Appendix J. For more complete help in using shapefiles in each of these programs, you should refer to the help resources of each program.

ArcMap

With ArcMap open, first load the property boundary layer, using Toolkit’s “Select a Plan” button to select a PLU or in ArcGIS, click the “Add Data” icon on the toolbar to select the appropriate shapefile.

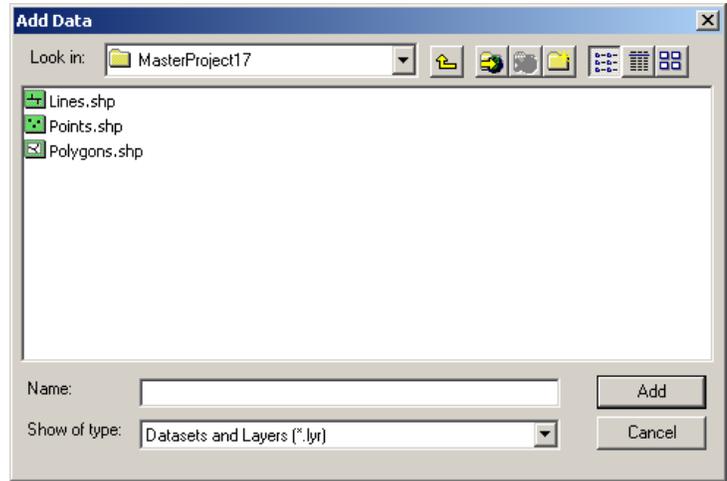
Use Zoom options to bring that layer into the center of the Data View,



Then load the shapefiles from the MasterProject<utm_zone> folder where you have collected GPS data (i.e., points.shp, lines.shp, or polygons.shp)

On the ArcGIS button bar, click 'Add Data'. Navigate to the MasterProject<utm_zone> folder.

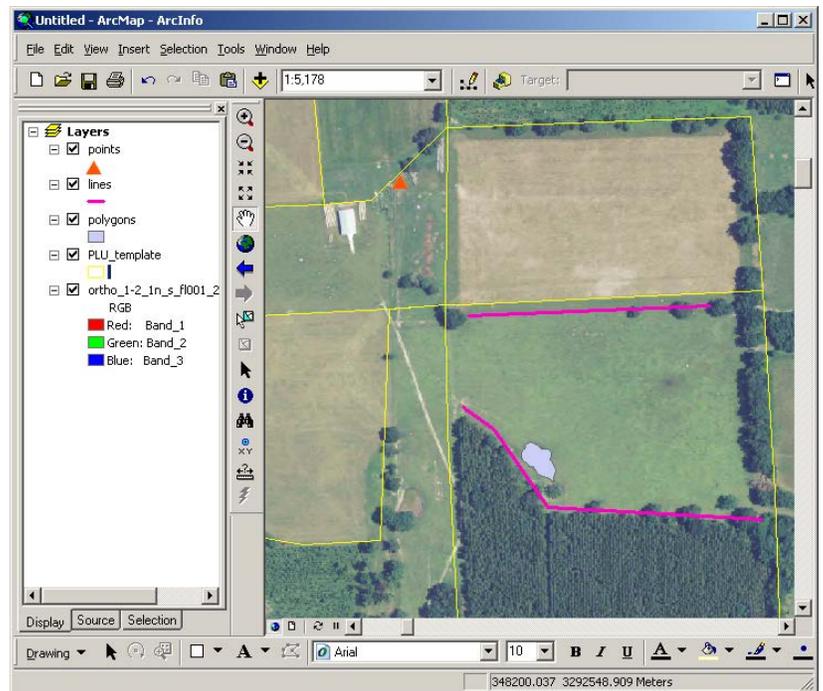
Select file(s) and click [Add].



The shapefile(s) will be added to your table of contents and be available to use in whatever way you desire.

At this point, you should extract features from the larger datasets (.i.e. shapefiles from MasterProject<utm_zone> into customer specific layers that you can store within a customer folder and share those files with another user.

First select the desired features using the standard selection tools (e.g., clicking on the features, windowing around the features, querying the data, etc.)

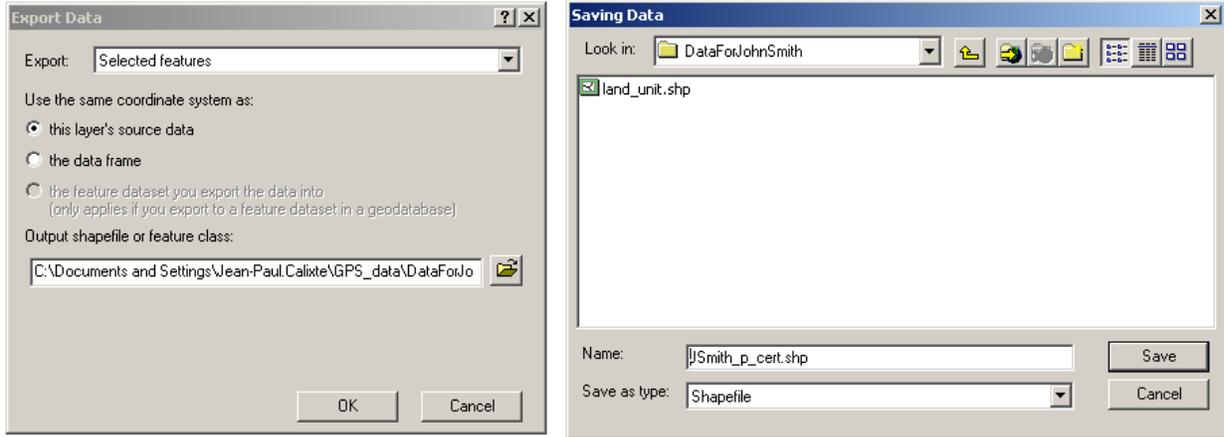


Once selected, right-click on the layer in the table of contents on the left, select "Data -> Export Data".

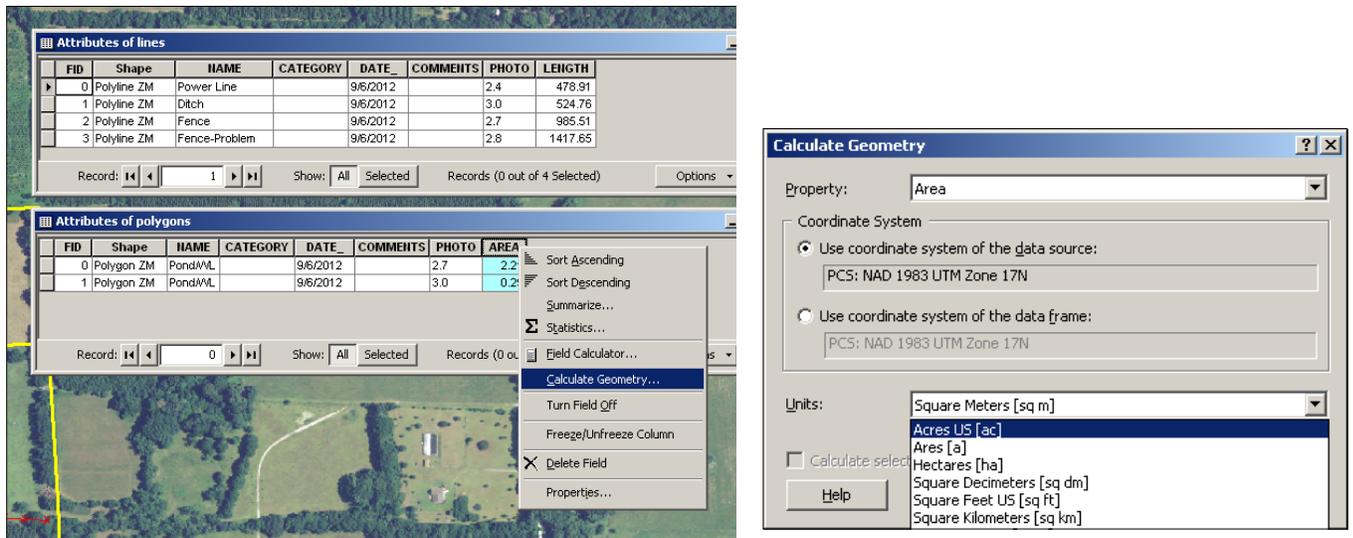


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Choose “Selected features” for Export. Select coordinate system and specify the customer folder where the shapefile will be stored. It is recommended to use the following convention for naming exported features: **customer name_<feature type>_cert.shp**, where feature type can be *p* for points, *l* for lines; and *a* for polygons. Click OK.



In addition, you will need to calculate length and area of features in those shapefiles. To do so, open the attribute table of each respective shapefile (i.e., customer name_<feature type>_cert.shp) and use the ‘Calculate Geometry’ function for the LENGTH or AREA fields, as shown below. The calculated values represent certified measurements from the Trimble GeoXT data and can be used as map labels.



Incorporating features from GeoXT into Toolkit layer

Open a Toolkit Customer ArcGIS document and add shapefile(s) from MasterProject<utm_zone>, as indicated above. Create a new Toolkit Resource Inventory layer or bring an existing Resource Inventory layer into the 'Edit' mode.

Set the GeoXT-generated [source] shapefile from which you want to copy features as the selectable layer. This can be done by clicking on *Selection -> Set Selectable Layers* on the ArcGIS toolbar or by using the Selection tab in the Table of Contents and adding a checkmark to the source shapefile.

Click the *Select Features* tool on the ArcGIS toolbar to select features to copy from the shapefile. On ArcGIS button bar, click the *Copy* button and then the *Paste* button to copy features into the Toolkit layer.

Save Edits and Stop Editing. Use the Attribute tool in Toolkit to enter relevant attributes for features copied. The 'Label' window can be used to enter the type of feature certified. The 'Notes' window can be used to indicate that values were obtained with GPS, e.g. "GPS Certified".

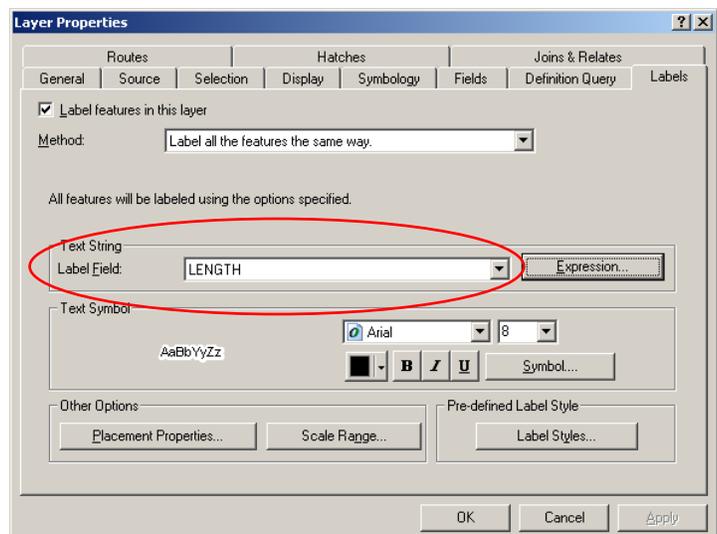
Considerations for Practice Certification

After loading the GPS data into a GIS document, develop a 'Practice Certification' map that shows location and extent of certified practices, using NRCS planning symbols whenever possible (see example at the end of this section).

If you're using Toolkit Resource Inventory shapefiles, the length and area values are automatically calculated and stored in respective attribute table in columns [field] **FEET** (for line features) and **ACRES** (for polygon features). The Map Label tool can be used to add measured values on the map. The '*legal description*' box can be used to enter initial values of QOP indicators. Remember to remove the "Legal Description" expression from the text box before printing your map.

If you're using shapefiles derived from MasterProject<utm_zone> to create practice certification maps, the calculated values for the LENGTH or AREA fields represent certified measurements from the Trimble GeoXT data and can be used as map labels.

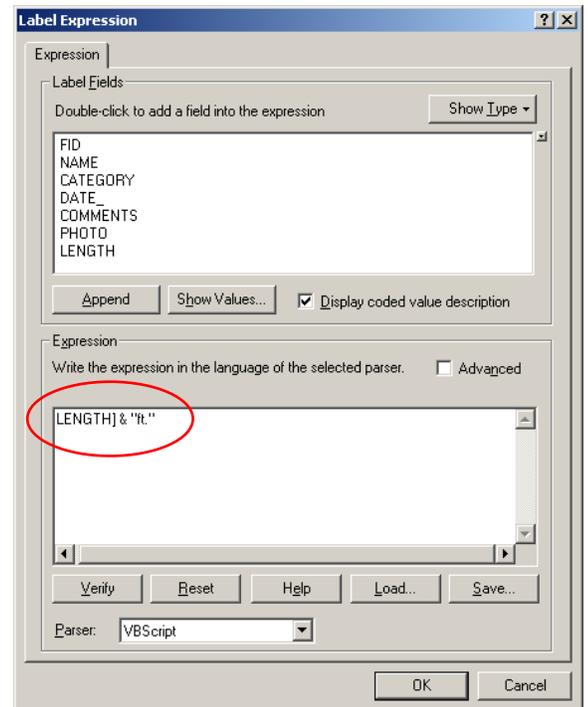
To do so, open the Properties dialog box of a shapefile (double click on layer name in Table of Contents) and select the field to use as label and other formatting parameters.



You may also want to add the units of measurements as part of the label. This can be done by clicking on the “Expression” button next to the Label field and entering the appropriate units of measurement within double quotes preceded by an ampersand (e.g.: & “ft.”).

Click on *OK* to close the Label Expression dialog box.

Click on *Apply* in the Layer Properties dialog box to check your labels. You may further edit your map labels as needed and click on *OK* when done to close the Layer Properties dialog box.



In general, a practice certification map should follow the same formatting guidelines as a conservation plan map (see Title 180-Part 600 Subpart C.31 of the National Planning Procedures Handbook). The title should be listed as “Practice Certification Map”. In addition, the initial values of QOP indicators recorded in the field should be included in a text box. The name of the person who completed practice certification and date must be listed on the map.

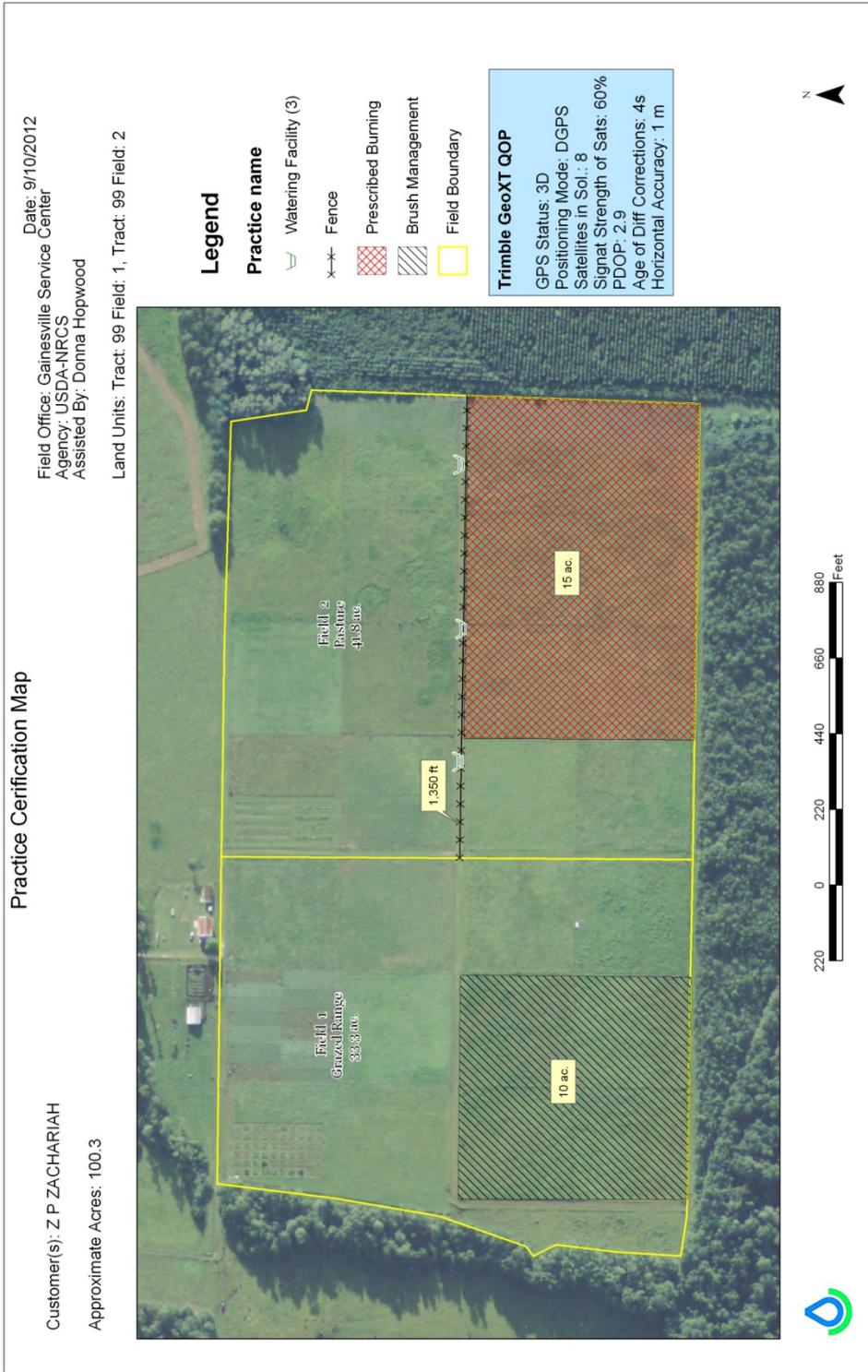
If multiple practices are applied to the same area, those practices should be represented by a single symbol and in the map legend, the definition of that symbol will list the different practices included. This will reduce clutter on the map.

If there are too many practices to be represented on a single map, consider developing a series of maps to represent different groups of practices.

If a management practice is applied to the entire extent of a planning unit (e.g. prescribed grazing on a 40-acre field already delineated on an FSA map), then the extent of that practice does not need to be delineated with GPS. However, if a practice is applied to a lesser extent than previously known, then GPS technology must be used as per FL-NRCS policy (FL Supplement to GM 450 Part 407 D – GPS Technology for Practice Certification), regardless of cost-share status of practice.

For additional assistance, please review software documentation or contact your State GIS Specialist

PRACTICE: Complete Activity #8 in Appendix K



Appendix A – ArcPad Data Manager

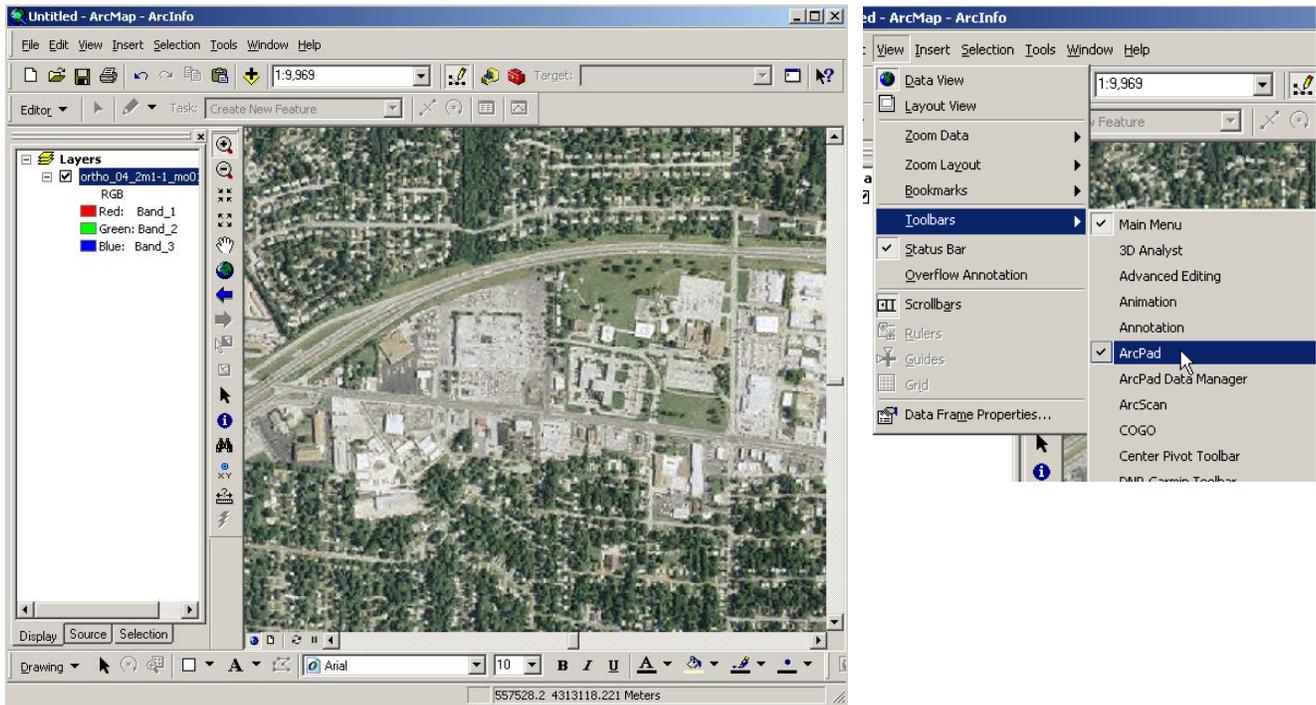
Creating Image Subset using Display Area

This can be done in ArcMap using the procedure described below. One limitation of this method is that there is a maximum area you can clip. This area is dependent, among other things, on the resolution of the image you are using. A rough guide of the maximum areas is as follows:

Image Resolution	Max. Area, acres	Square Dimensions, miles
1 meter	4,000	2.5 x 2.5
2 meter	16,000	5 x 5
2 ft.	1,500	1.5 x 1.5

Launch ArcMap and add the desired layer (e.g. orthoimagery) to the View. Zoom to the extent you wish to transfer to ArcPad. Keep in mind that the image is clipped to what is shown in the display window. So, if you want an image that is tall and narrow, size your window accordingly.

The example shown in the window below is basically square. Select *View > Toolbars* and select “ArcPad” if it is not checked.



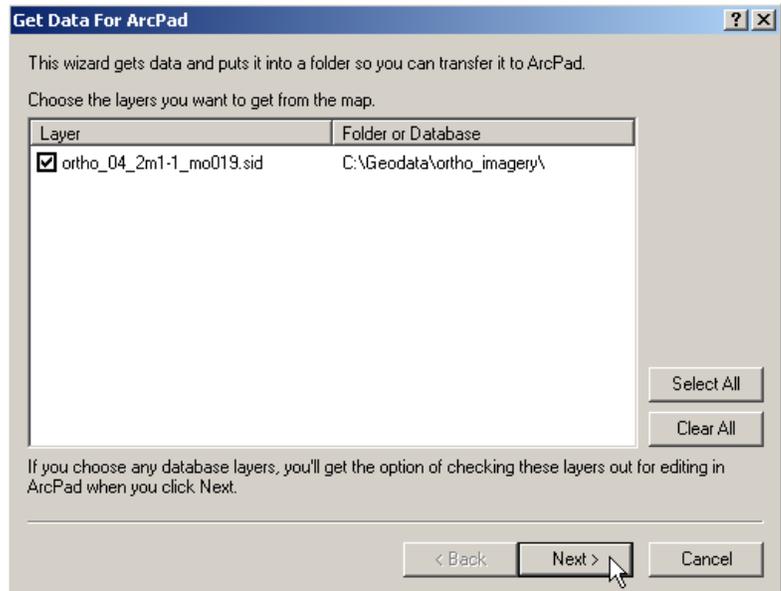
You should see a toolbar that looks like this

Click on the “Get Data for ArcPad” icon . Note that if that icon is not active (grayed out), you need to go to *Tools > Extensions* and add a checkmark to the extension for ArcPad Data Manager.

The screen at right should appear.

Check on the desired layer(s).

Click [Next >].

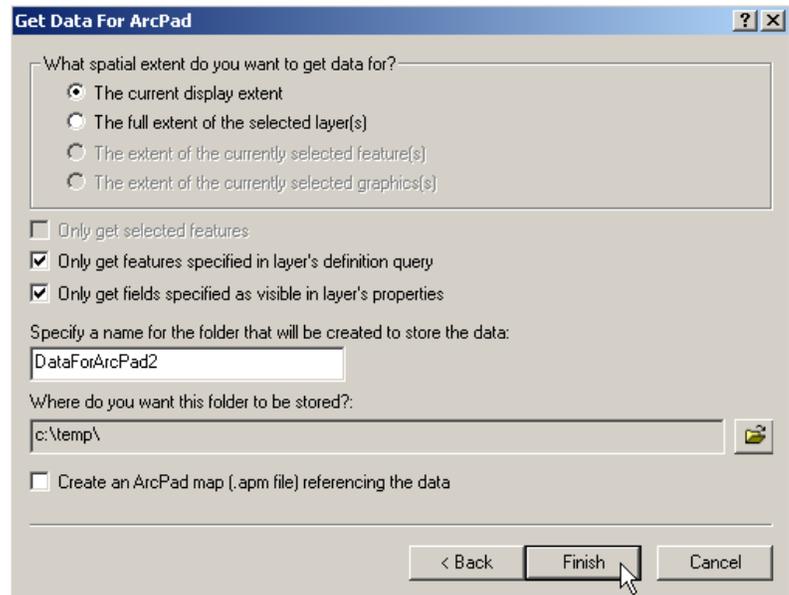


For spatial extent, select “The current display extent”.

Note folder name (e.g. DataForArcPad2) and where it will be saved (e.g., c:\temp) or change these as desired.

Uncheck “Create an ArcPad map (.apm)...”.

Click [Finish].



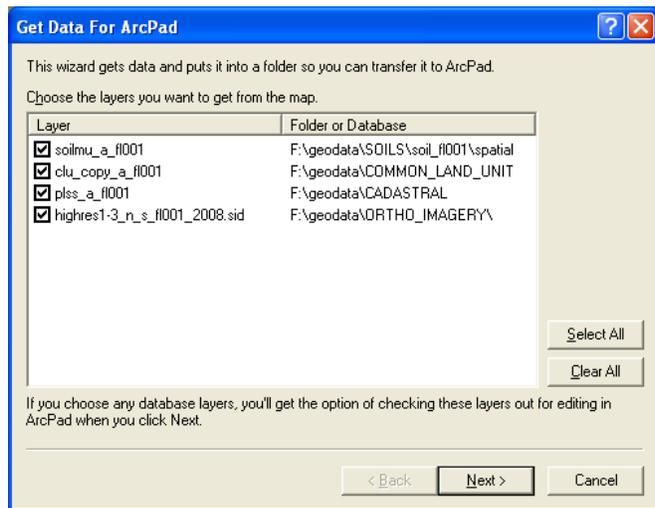
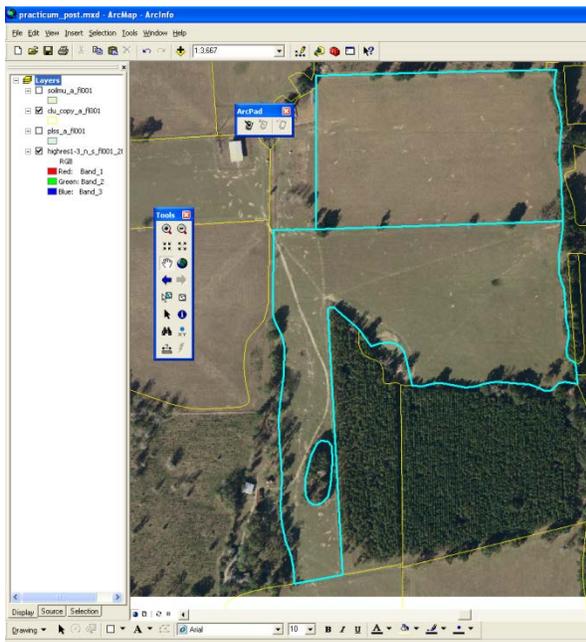
Once finished, transfer the partial files created in the specified folder to your device using technique described earlier. They will be named the same as the full file names with an additional file extension added (e.g., ortho_04_2m1-1_mo019.sid.sid). When clipping 2 or more areas from the same image, be aware that the filenames will be identical, so the folder specified should be unique for each one. You then will need to either rename all the files before transferring them to the device’s geodata folder or transfer folder along with the clipped files.

With this method, the files are smaller, transfer quicker, you can store more, and they process faster in ArcPad. On the downside, you only have that specific area

(i.e. no coverage for a different area should you decide to make an unscheduled stop while out of the office).

Customer Specific GIS Data Subsets using Geographic Features or Graphics

In addition to orthoimagery, additional layers can also be prepared for transfer on the GeoXT. For instance, the CLU layer can be used to select a landowner's tract and field boundaries. Those boundaries can, in turn, be used to define the extent of GIS data that will be part of the subset package. So, if other layers such as soils, PLSS etc. are loaded into the ArcMap document, each of those layers can be intersected with the extent of the selected boundaries and be part of the subset



of layers. Notice that the default folder name (e.g. DataForArcPad1) should be changed to the customer name following this convention DataFor<Customer_Name>.

In the dialog box, for spatial extent, users would select "The extent of the currently selected feature(s)" option. Similarly, the ArcMap graphic tool can be used to define the extent of GIS data to be exported in the subset package. In the dialog box, for spatial extent, users would select "The extent of the currently selected graphic(s)." Both of these options can result in smaller files being created if the extent defined is smaller than the display area. The "Create an ArcPad map.." option should be checked. Please note that the symbology set in ArcMap for shapefiles will be available in ArcPad. This means that if you have a soil layer, for example, set to draw all features using a single symbol, you will **not** be able to change this setting later in ArcPad to multiple categories of symbols.



Appendix B – Table of Contents

Viewing Data

The various layers in your map can be controlled (as described below) by **TAPPING** on the “Table of Contents” icon on the Main toolbar.



Layers

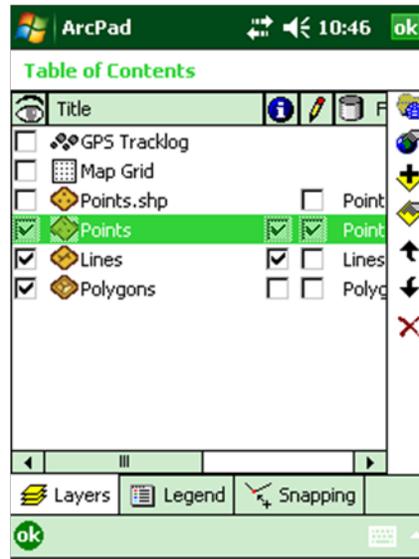
On the Layers tab, you can then check or uncheck the boxes under the appropriate columns for each layer.

The columns are as follows:

-  - visibility of layer (checked=visible)
-  - enable identify tool (checked=on)
-  - edit mode (checked=on)

Note: You can only select one of each type for editing.

The functions of the side toolbar are shown at right. The bottom four icons are layer specific and require you to select a layer before the icon is active.



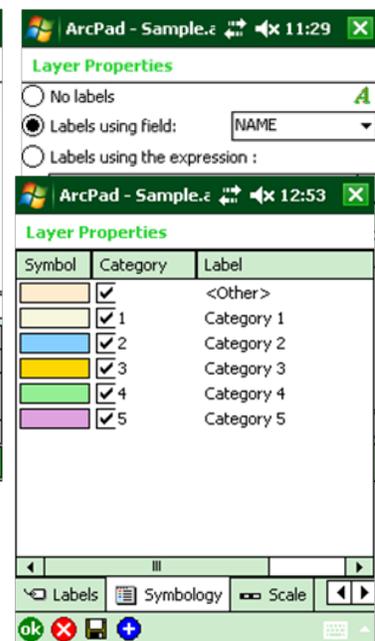
-  Select projection
-  Map properties
-  Add layer
-  Layer properties
-  Move layer up or down in display order
-  Remove layer

Layer Properties

Upon picking a layer and **TAPPING** the “Layer

Properties” icon  , you will be presented with a screen with several tabbed pages.

You can change the name of the layer and enter comments on the “Information” page. This does not change the shapefile name.



The “Labels” page allows you to change how the feature is labeled.

The “Symbology” page is used to change the symbol(s), control visibility, and edit the label.

To change the symbol, simply **TAP** on the symbol you wish to change.

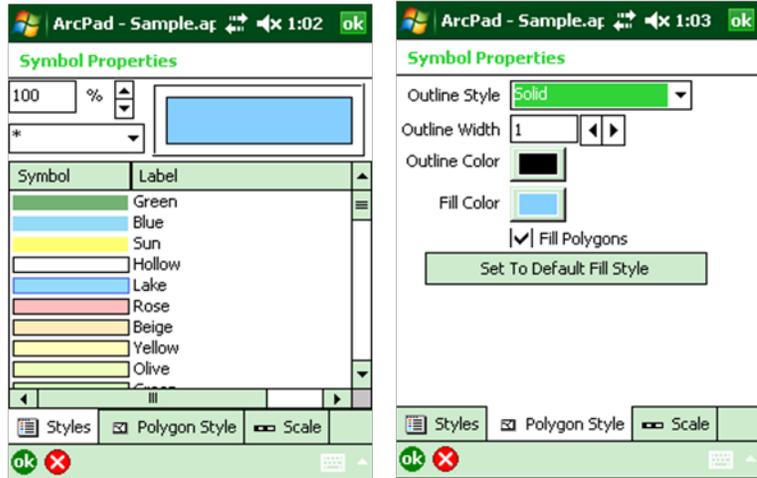
A screen with three different pages will then display.

A pre-defined style can be selected from the “Styles” page. If you want to specify your own custom style, use the “Point Style”, “Line Style”, or “Polygon Style” page depending on the type of symbol you are changing.

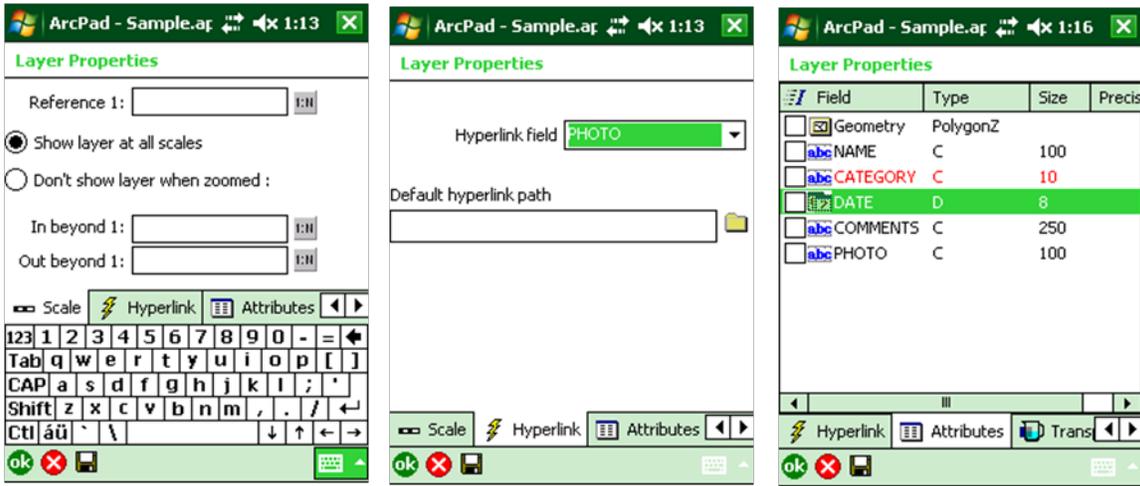
If the options are grayed-out, you will need to **TAP** on the “Set to Default Style” button and then you should be able to change the settings.

The “Scale” page allows you to change at what scales the symbol displays.

TAP OK when done with your changes.



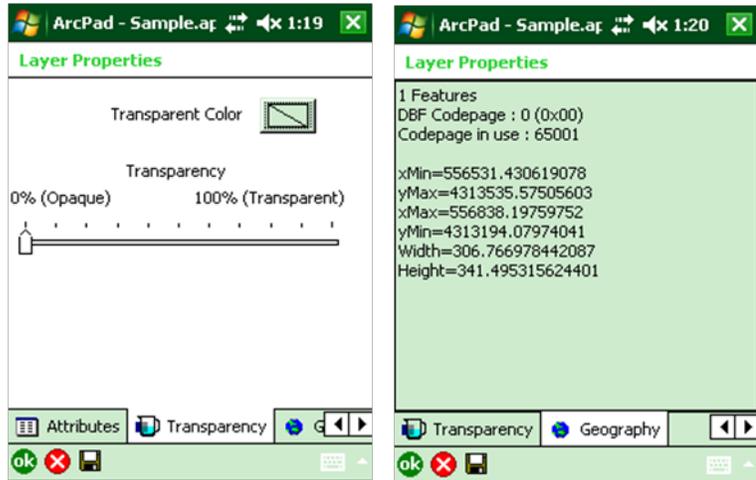
Use the “Scale” page to set visibilities at different scales. The “Hyperlink” page is used to specify a field to be a hyperlink field. The “Attribute” page is basically for viewing the attributes of the layer and to manage indexes.



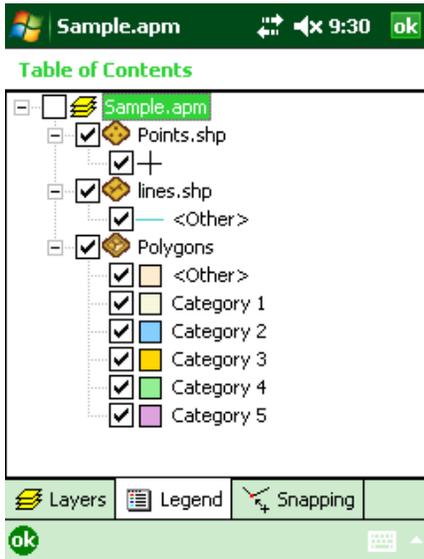
The “Transparency” page can be used to specify a particular color as being transparent.

The “Geography” page simply provides information for the chosen layer. It provides the total number of features in the layer as well as the layer extents. Nothing is editable on this page.

TAP OK when finished.



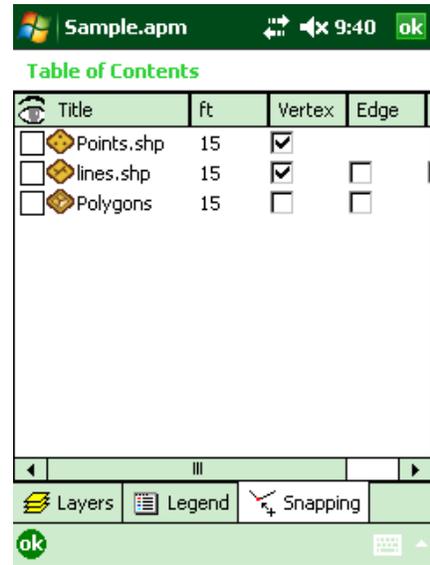
Legend and Snapping



The Legend tab allows you to change visibility (using check boxes) and also the symbology (e.g., style and color) of a feature. **TAP** on the symbol to change style or color of that symbol.

The Snapping tab allows you to turn on/off snapping to a particular location (vertex, edge, end) on a feature and set the snapping tolerance.

TAP OK to close window.



Appendix C – Projections in ArcPad

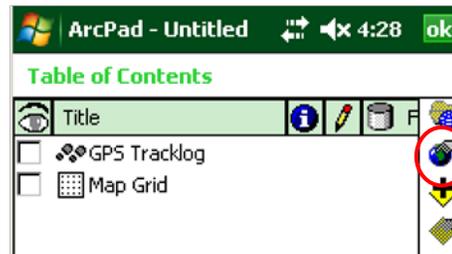
Projections

The first thing you need to be aware of when starting a new map is the projection you wish to work in (e.g. UTM NAD 83-Zone 16N-meters or UTM NAD 83-Zone 17N-meters). ArcPad, unlike ArcMap, can only use one projection for a map. This means that any layer you create or add needs to be in the same projection to be used in the same map. If a projection file named *arcpad.prj* exists in the *My DocumentsMy ArcPad* folder, ArcPad will use it as the projection for the new map. If a different projection is needed for a NEW map, you can add a layer (e.g., orthoimagery, shapefile, etc.) that has an associated projection. This will set the current projection to that of the added layer. An alternative method is to perform the following steps. These steps **should not be done** if a map has been created and layers have already been added.

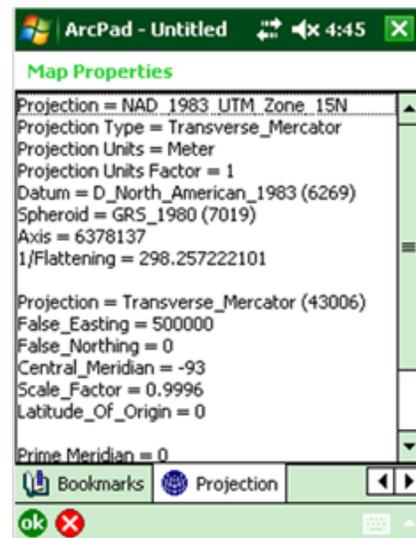
1. The first thing to do is check what the current projection is. Do this by **TAPPING** the “Table of Contents” icon on the Main toolbar.



2. On the “Table of Contents” screen, **TAP** the “Map Properties” icon on the toolbar on right side of screen.

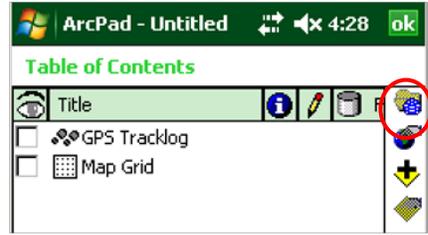


3. Use the right arrow button near the lower right corner of screen to scroll to the right and select the “Projection” tab. This will show the information for the current projection selected.



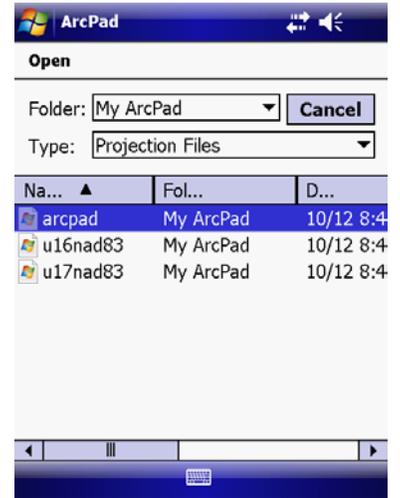
TAP ok to return to the “Table of Contents” screen.

4. Trimble GeoXT units in Florida have been updated with projection files (arcpad.prj) set to the appropriate UTM Zone where Service Centers are located. If you need to change the projection, **TAP** the top icon (“Select Projection”) on the toolbar at right side of screen.



5. Select the folder where you have a projection file (i.e., .prj) that defines the desired projection you wish to use. The example to the right shows a couple that were made and stored in the “My ArcPad” folder. Select the desired file.

You can repeat steps 2 and 3 above to check that it did in fact change the current projection.



6. **TAP** ok to close the “Table of Contents” window.

Appendix D – Creating Shapefiles in ArcPad

Preparing a Shapefile

The first step we need to do is to create or add a shapefile to store our data. There are several different options to accomplish this:

- create shapefile in ArcCatalog/ArcMap or AutoCAD and copy to device
- create shapefile on the device (“on-the-spot”).
- use ArcPad’s “Quick Project” feature (this creates a folder with 3 different pre-defined shapefiles- points, lines, and polygons)

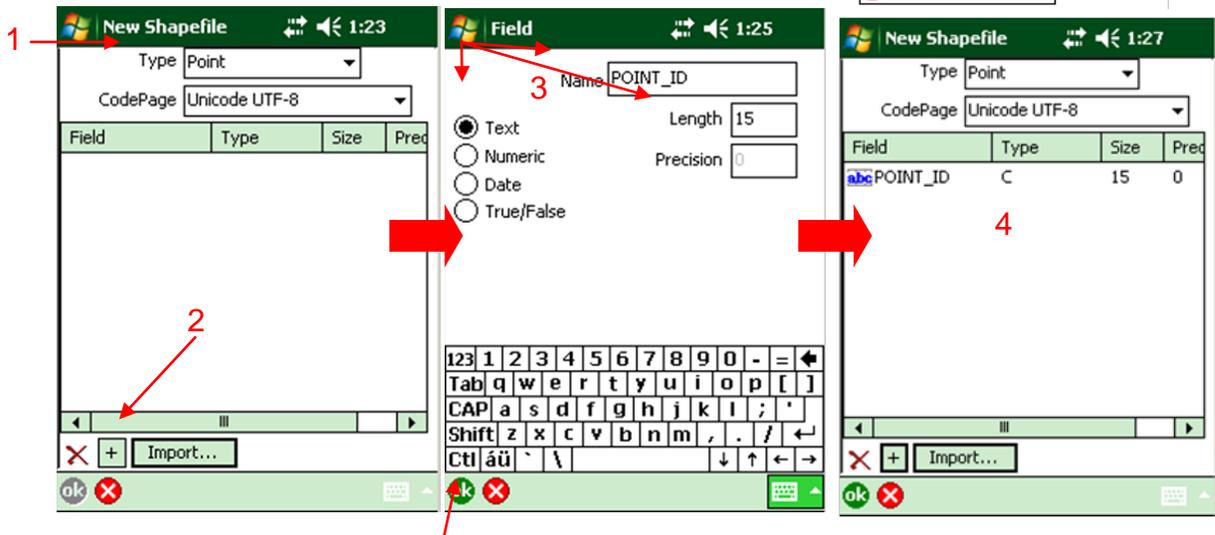
Some of these, but not all, are discussed in this document.

Create a new shapefile on the device

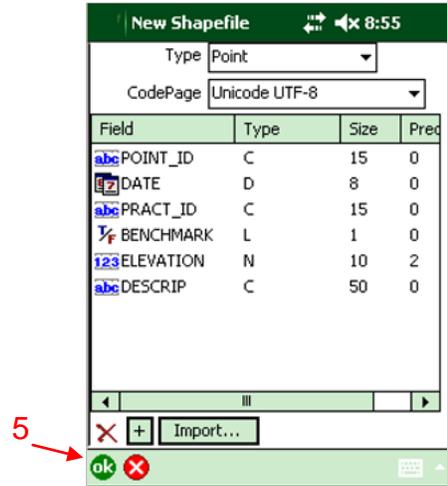
To create a new shapefile, **TAP** the drop-down arrow below the open folder icon on the Main toolbar.

Select *New > Shapefile*

The new shapefile window will appear (see below).

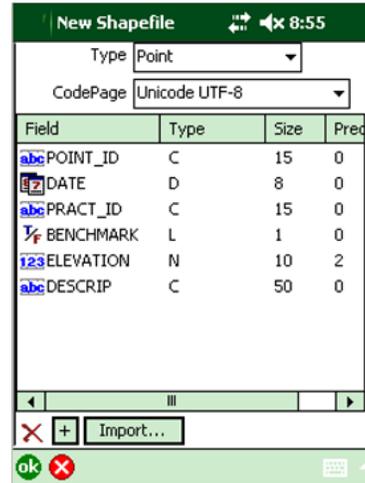


1. Select the type of shapefile you are defining from the “Type” drop-down list. Note: All types store x,y coordinates. Types with an M on the end (e.g., PointM) will also store an “m-measure-value” (sort of a time stamp) and types with a Z on the end (e.g. PointZ) will store a z-value (elevation) and an m-measure-value.
2. **TAP** the “+” icon at the bottom.
3. For the “Field” window that appears, enter a name for the field (i.e., attribute), select the type of field, and enter length and precision if applicable. **TAP** OK.
4. You are returned to the “New Shapefile” window with the new field added to the list. Repeat steps 2 and 3 for each field you wish to add.



NOTE: Utilizing these fields to collect data about the recorded features is an added capability over what you were able to do with the Garmin equipment. It is highly recommended that you take full advantage of this capability by setting up fields appropriate to the task that you are trying to complete.

Here is a screen showing a sample list of fields created for a shapefile.



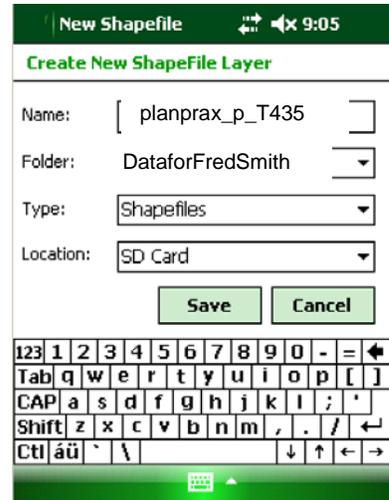
5. When done adding fields, **TAP** OK.

Enter a name for the shapefile. Try to be as descriptive as possible. Use existing naming convention, i.e. <theme>_<feature type>_<location>. The location could be a tract or field number instead of the typical state and county FIPS codes.

Select a Location and then select a Folder, e.g. DataFor<Customer_Name>.

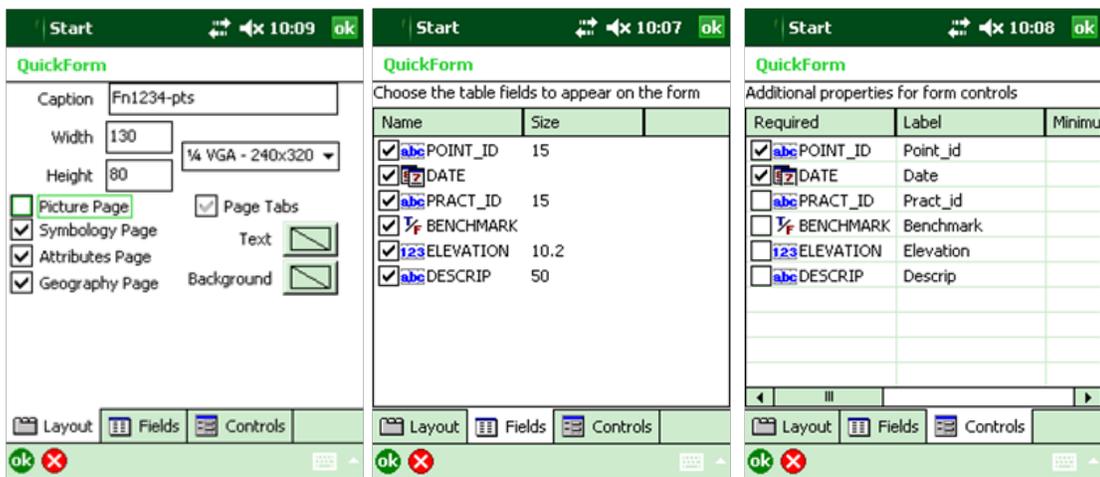
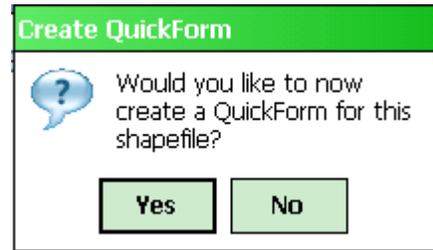
Type should be Shapefiles.

TAP Save.



You will be asked if you wish to create a Quickform. This is a form that will be used to enter attribute data for the feature. You will normally want to answer “Yes” here.

After answering “Yes”, you will define the Quickform using the screens shown below.



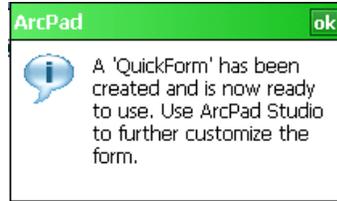
Use “Layout” tab to define form properties: caption, size, pages (if any), text and background. You might find the symbology, attribute, and geography pages useful when viewing feature properties.

Use “Fields” tab to specify which fields to display on form.

Use “Controls” tab to specify required fields, min-max values, list values, and tooltips.

TAP OK when done.

A message displays informing you the form was created.



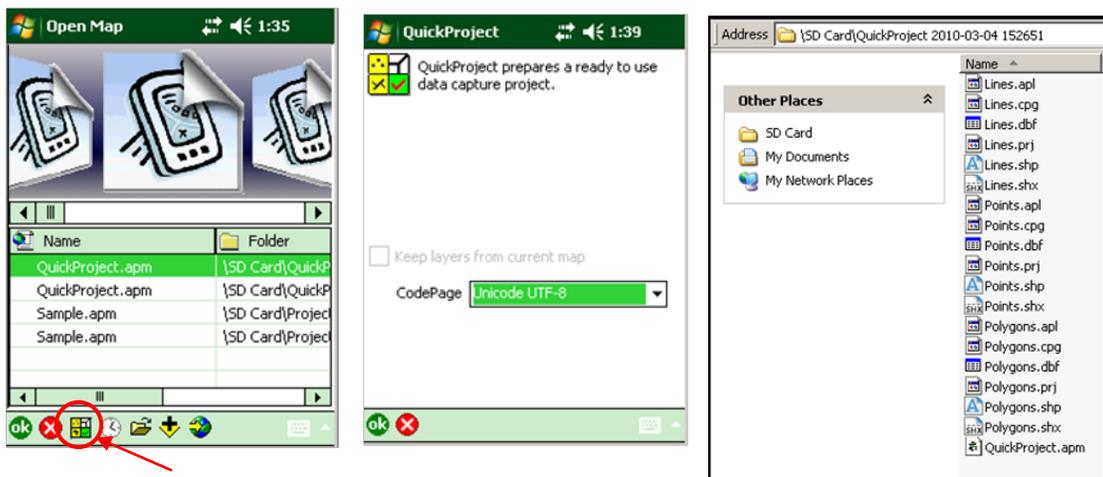
You are now ready to begin adding data to this shapefile.

Use “Quick Project” feature

The first step is to set the default path name to the folder where you wish to store the QuickProject, e.g. DataFor<Customer_Name> or Projects. See notes under “Device Setup” section for details. Otherwise, the new QuickProject folder will be stored under \My Documents, separate from other relevant customer files. To create a “quick project” from the “Open Map” window, **TAP** the “quick project” icon (see left window below). Leave CodePage set at Unicode UTF-8. (middle window below)

TAP OK.

A folder will be created in your default data path. It will be named “QuickProject” followed by a unique date/time stamp. The three pre-defined shapefiles (i.e., Points, Lines, and Polygons) will be created in that folder (see right window below) and opened for editing.



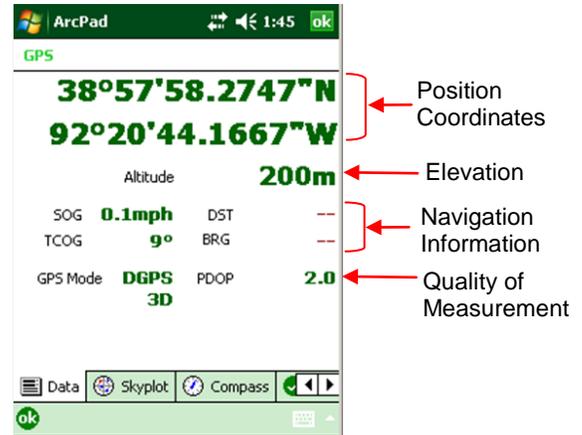
Appendix E – GPS Position Window

A “GPS Position Window” can be displayed by either **TAPPING** the drop-down arrow under the GPS Active icon on the Main toolbar and selecting “GPS Position Window” or by **TAPPING** on the GPS status bar.

The “GPS Position Window” is actually a collection of screens (i.e., tabbed pages): Data, Skyplot, Compass, Quality, and Debug. These are explained below.

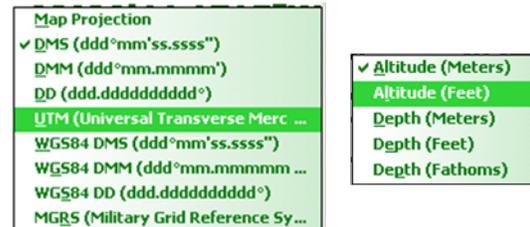
Data tab:

The coordinates of your current position are shown on this screen along with altitude (i.e., elevation), navigation information, GPS mode, and quality of measurement.



The type of coordinates displayed can be changed by **TAPPING** on the coordinates and selecting the desired type from the list as shown at right.

The units shown for elevation can also be changed by **TAPPING** the elevation and selecting from list shown at right.



The navigation values shown are
SOG: speed over ground

TCOG: true north course over ground (can be set to MCOG-magnetic north COG)

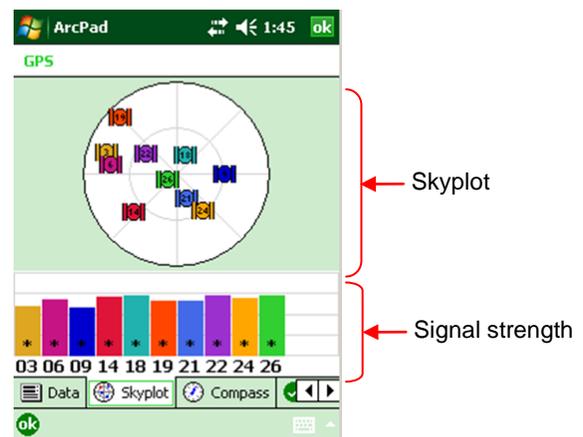
DST: distance from current location to destination

BRG: bearing from current location to destination.

See “Required Accuracy Levels for GPS” section below for specific details about the quality of measurement values.

Skyplot tab:

The skyplot view shows a bird’s-eye view of the position of each satellite according to the satellite almanac. The outer circle represents the horizon (north is up); the inner circle represents 45° above the horizon; and the center point represents what is directly overhead



Each satellite is displayed with its PRN number and a unique color. If the color is

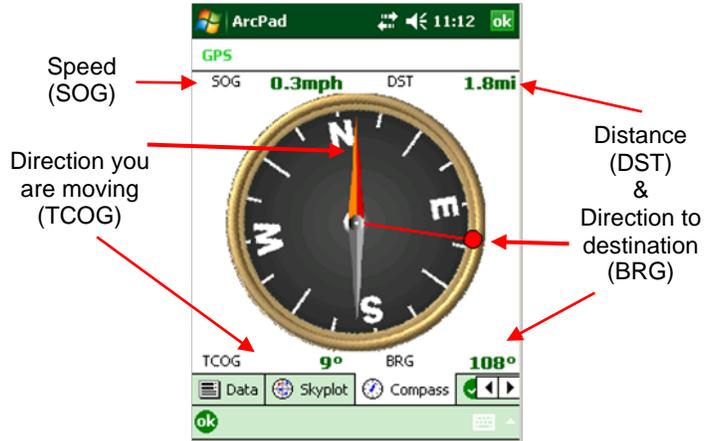
Technology Technical Note GIS & GPS FL-05

outlined in black, it is available and being used for calculating the GPS position. Satellites available but not used are simply colored. Grey satellites are unavailable.

The signal strength bar chart shows the relative signal strength for each satellite. An asterisk in the bar indicates it is being used for calculating the GPS position.

Compass tab:

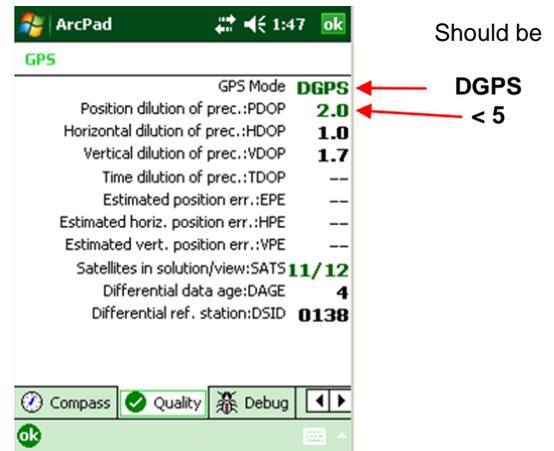
The compass screen shows the same navigation information that was on the Data screen plus a visual compass. The orange compass needle indicates the direction you are moving. The red line indicates the direction to your destination if you have set one.



Quality tab:

This screen displays the values of various parameters that are useful in determining the quality of the GPS location you are receiving.

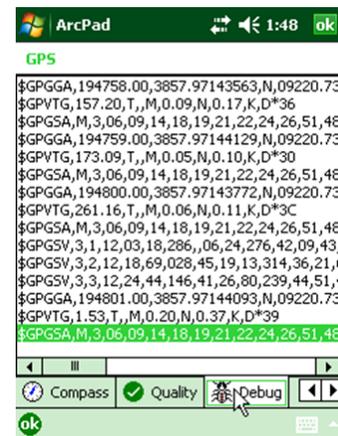
See “Required Accuracy Levels for GPS” section below for specific details about these values.



Debug tab:

This screen simply shows data being received from the GPS receiver. It probably is not a screen you would view too often. It would most likely be used in troubleshooting problems you may be having.

TAP OK to close the GPS Position Window.



Appendix F – Offset & Edit Tools

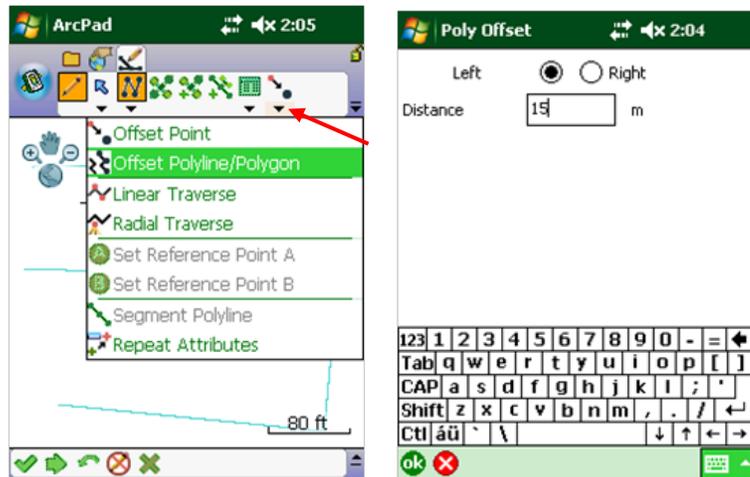
Offset Tools

The offset tools can be used to record a feature that is either in an inaccessible location or a location where you are unable to get a GPS signal. In ArcPad, there are two types of offsets: simple and complex. A simple offset is performed on a polyline or polygon and only uses a constant distance measurement and either left or right of the feature. Complex offsets can be used for point features and vertices of polylines and polygons. Complex offsets use a combination of distance, bearing, and inclination measurements.

Simple Offset

To do a simple offset of a polyline or polygon, first make sure desired layer is in edit mode as described earlier.

TAP drop-down arrow under the “Offset” icon on the Edit toolbar and select “Offset Polyline/Polygon”. Select left or right and enter an offset distance (units will be those of current projection).

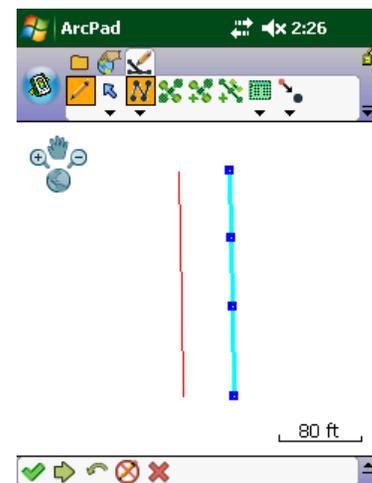


A red box around the “Offset Polyline/Polygon” button indicates that it is active.

You should follow instructions given above for capturing the polyline or polygon. As you are defining it, you will notice a red line which is at the given offset from the feature you are capturing.

Once you are done and **TAP** the right green arrow  on the command bar at the bottom of screen, the red line will become the saved feature.

You will then be asked for the attribute data for that feature.



Complex Offsets

For complex offsets, ArcPad supports 1 point offsets and 2 point offsets. Instructions for performing a 1 point offset, which uses distance and bearing measurements

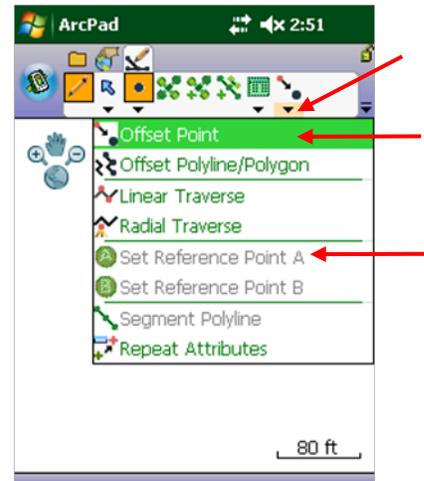
(distance-bearing) to determine the offset, will be given here. For 2 point offset instructions, you should refer to ArcPad's help resources.

To do a 1 point offset of a point, first make sure point layer is in edit mode as described earlier.

TAP drop-down arrow under the "Offset" icon on the Edit toolbar and select "Offset Point".

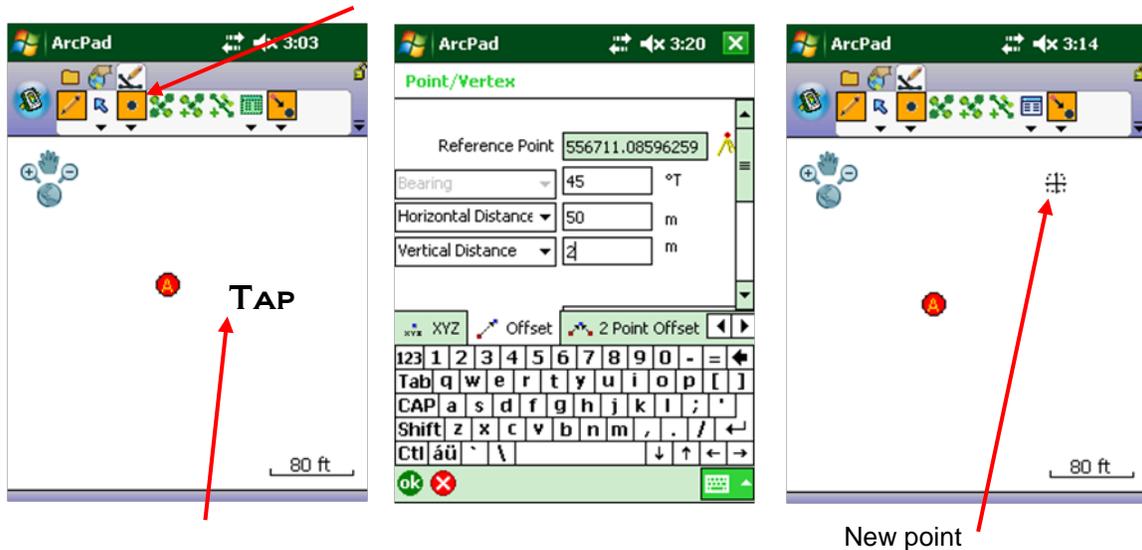
TAP drop-down arrow under the "Offset" icon on the Edit toolbar and select "Set Reference Point A".

A red box around the Offset Point and Set Reference Point A buttons indicates that they are active.



To set point A, move to desired location and **TAP** "GPS Capture Point" icon or **TAP** on the map at desired location. A red circle with an "A" will be placed on the map.

TAP the Point feature icon (see below). **TAP** the screen anywhere in the map area. The Point/Vertex dialog box opens on the Offset page. Enter the appropriate information (e.g., bearing, horizontal distance, vertical distance). **TAP** OK. Enter any attribute data and **TAP** OK. A new point will appear as shown below



Editing Data

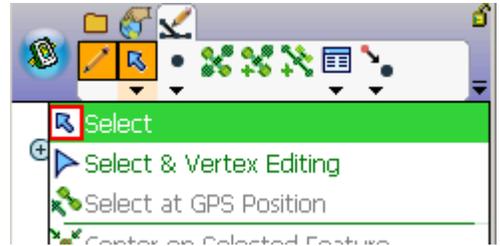
ArcPad provides some basic editing functions that can be performed on your data. As mentioned earlier, this requires that editing be enabled for the desired shapefile. This can be done using either the method given in the **Error! Reference source not found.** section (using Start/Stop Edit on the Edit toolbar) or the method given in the Viewing Data section (using the Table of Contents icon on Main toolbar).

If the feature you need to edit is not in the map view area, you can use the tools on the “Browse” toolbar shown here to move the feature into view or to select it.



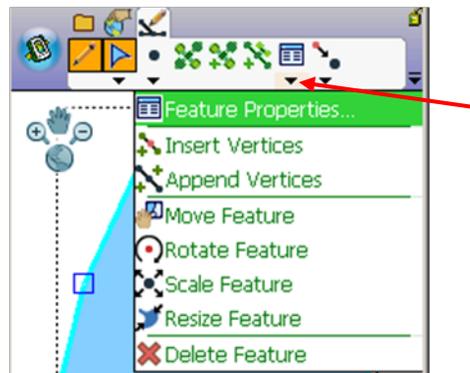
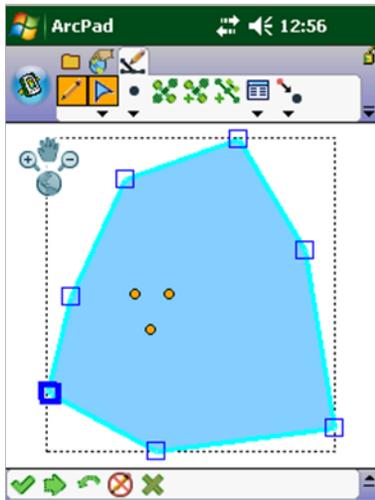
Switch to the Edit toolbar. From the drop-down list of the “Select” icon (second from left), choose the desired select tool.

The “Select” and “Select at GPS Position” tools are used to change a feature’s attributes; insert and append vertices; and move, rotate, scale, resize, and delete features.



The “Select and Vertex Editing” tool is used to move (by pen, GPS, or offsets) and delete a feature’s vertices.

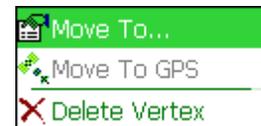
TAP on the desired feature to select it. It will be highlighted with a color and with a dashed box around it. If the “Select and Vertex Editing” tool was chosen, a blue box will be placed around each vertex as shown below. To modify the entire feature or the feature’s attributes, **TAP** the drop-down arrow below the Feature Properties icon and select the desired action. Selecting “Feature Properties” will allow you to edit the attributes as shown below. This can be done on the form page or the “Attributes” page.



To edit a single vertex, you can **TAP AND DRAG** one of the blue boxes to move it or **TAP AND HOLD** one of the blue boxes, which will open the menu shown at right.

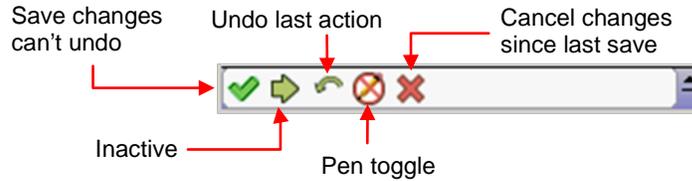
Use “Move To...” to move the vertex to a keyed-in x,y location or to a specified offset.

Use “Move To GPS” to move the vertex to the current GPS position (only available if GPS is active).



“Delete Vertex” will remove that single vertex.

While in edit mode, the Command toolbar is available at the bottom of the screen. The function of each icon is shown below.



Tips: Undo will only undo 1 change. If more are needed, you will need to use the cancel icon to undo everything. If the X cancel icon is green, it indicates there are no changes to undo.

When done editing the feature, simply **TAP** the save changes icon (green checkmark).

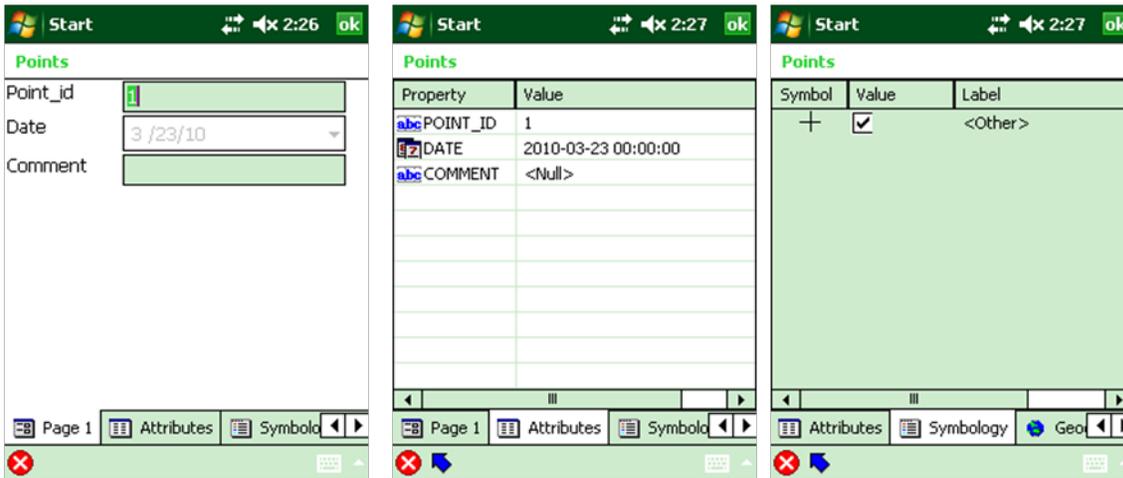
Appendix G – Identify, Navigate, Measure Tools

Identify Tool

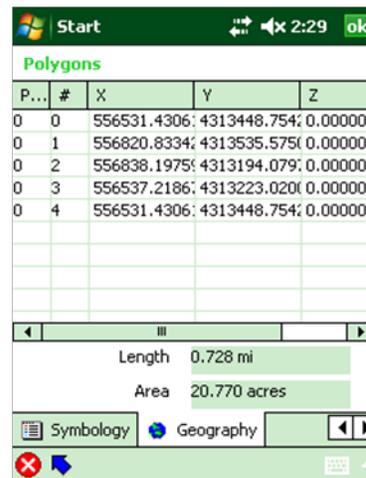
The “Identify” tool can be used to view (not edit) information about a selected feature. To activate this tool, **TAP** on the identify icon on the “Browse” toolbar. Remember to enable the “identify “ tool in the “Layers” tab of Table of contents for the layer containing feature of interest.



You can now select a feature by **TAPPING** on the desired feature. A screen should then be displayed with one or more pages of information depending on how the shapefile and quickform were created. The possible pages are Page #, Attributes, Picture, Symbology, and Geography (coordinates, length, and area). Samples of these (except Picture) are shown below.

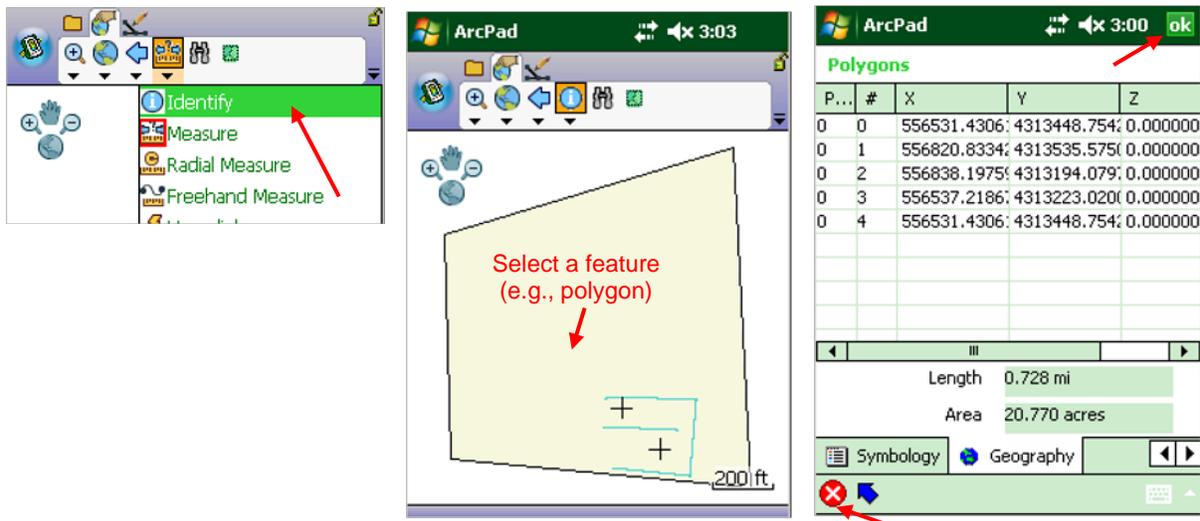


Points



Polygons
(similar for polylines)

The “Identify” tool can be used to display the length of existing line features and the perimeter and area of existing polygon features. To do this, switch to the Browse toolbar and **TAP** the drop-down arrow for the “Identify” menu (fourth icon) and select Identify (see below). The icon on the toolbar will switch to the “identify” icon . **TAP** on the desired feature (line or polygon). The properties window opens for that feature. Use the right arrow near the bottom to move to the Geography tab and select it. The lower half of that window will display the appropriate length (perimeter) and area values. NOTE: If only one vertex is shown for a line or polygon and the area is not shown for a polygon, try restarting ArcPad (i.e., exit and then start ArcPad again). When you check again, the vertices and area should appear. Tap ok or  to close the window.

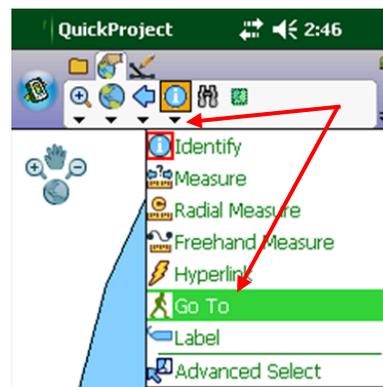


Setting a Destination

ArcPad along with the GPS can be used to navigate to a desired location. There are multiple ways to set your destination.

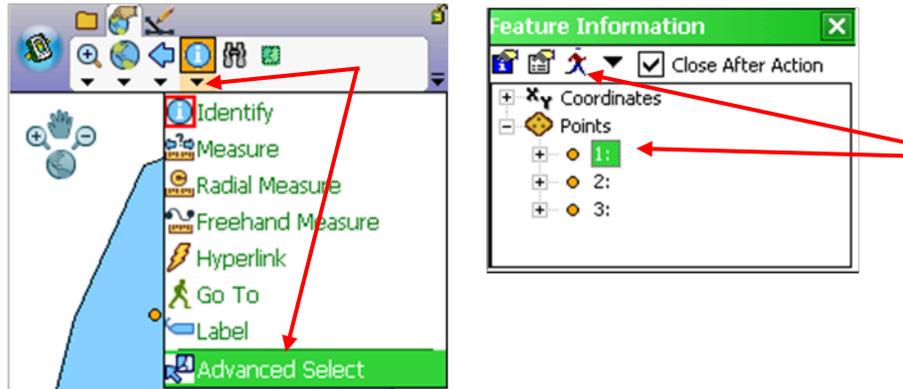
Tapping on Map

On the Browse toolbar, **TAP** the drop-down arrow under the Identify icon and select “Go To”. You can then **TAP** anywhere on your map to set the destination.



Using Advanced Select

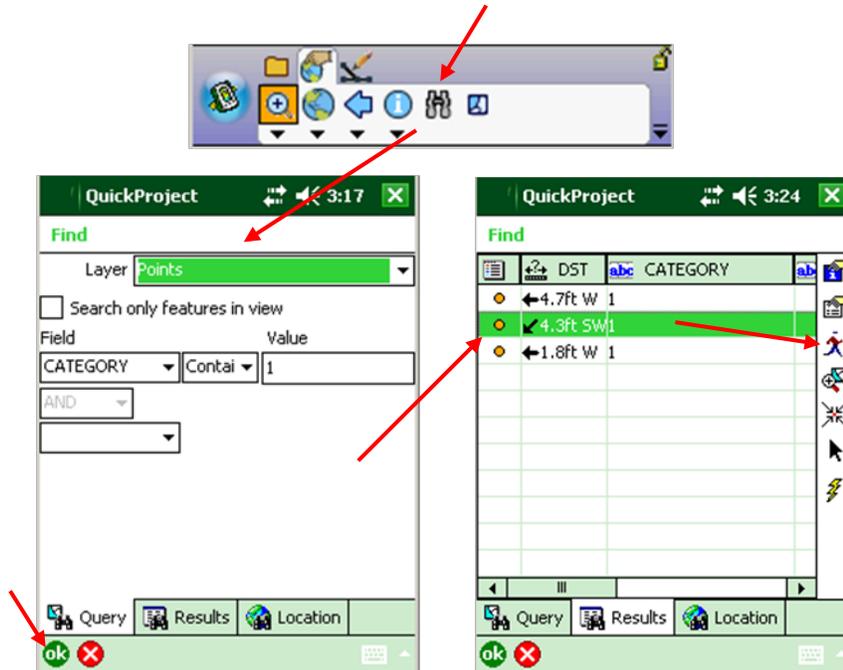
On the Browse toolbar, **TAP** the drop-down arrow under the Identify icon and select “Advanced Select”. You can then select a single feature by **TAPPING** it or multiple features by dragging a window around them. Highlight the desired feature in the “Feature Information” window and **TAP** the Go To icon .



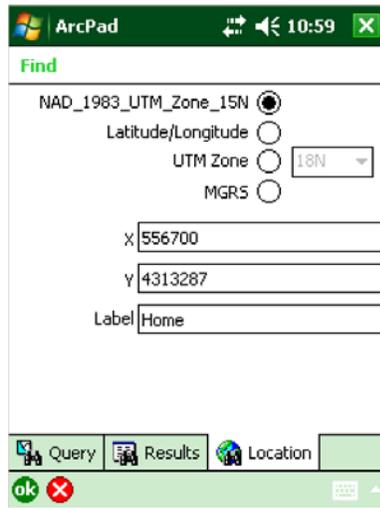
Using Find (binoculars)

On the Browse toolbar, **TAP** the Find (binoculars) icon. You can then find a feature based on a query of attributes (see step 1 below) or find a location by entering known coordinates (step 2 below).

1. On the “Query” tab, specify desired search criteria. **TAP** OK. Highlight feature in “Results” screen. **TAP** Go To icon .

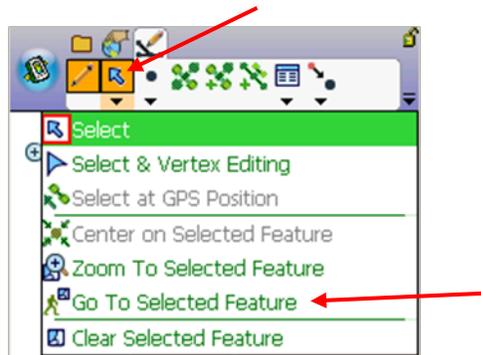


2. On the “Location” tab, select coordinate system and then specify the desired coordinates. **TAP** OK.



Using Select then Go To from Edit toolbar

Use the Select tool on the Edit toolbar to select the desired feature on the map. Once selected, **TAP** the drop-down arrow under the Select icon and choose “Go To Selected Feature”



Labeled Destination

Once the destination has been determined, a point labeled either “Mark” or with the field the feature was searched on with the Find tool is placed on the map similar to that shown at right.

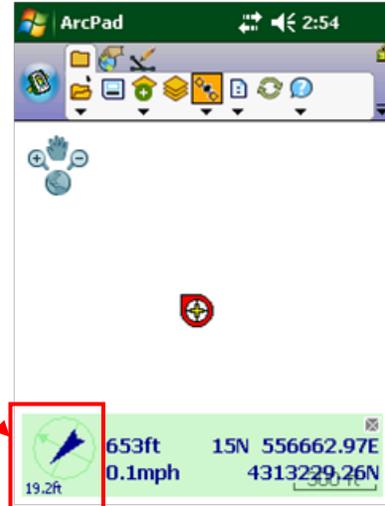
For lines and polygons, this point will be the centroid of the selected feature.



Getting to the Destination

If GPS is not activated, you need to do that using the GPS icon  on the Main toolbar. You then need to wait until you get a good GPS fix.

To assist in navigating to your destination, you can then use the left side of the GPS Status bar (shown at right)

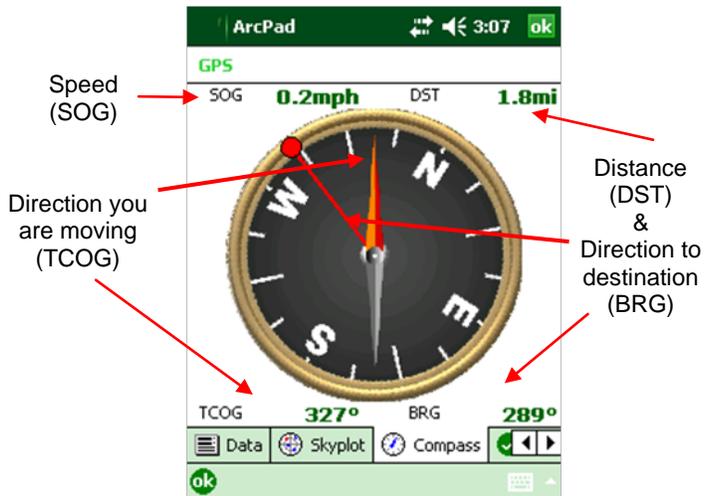


or

the Data or Compass tabs on the GPS Position window. The useful information is highlighted on the screen images at right.



If you are traveling in the correct direction, the TCOG and BRG values should be the same and the red direction line on the compass will be pointing to the top of the screen in line with the orange compass needle.



When done navigating, you can clear the destination point by tapping the "clear selected features" icon on the Browse toolbar.

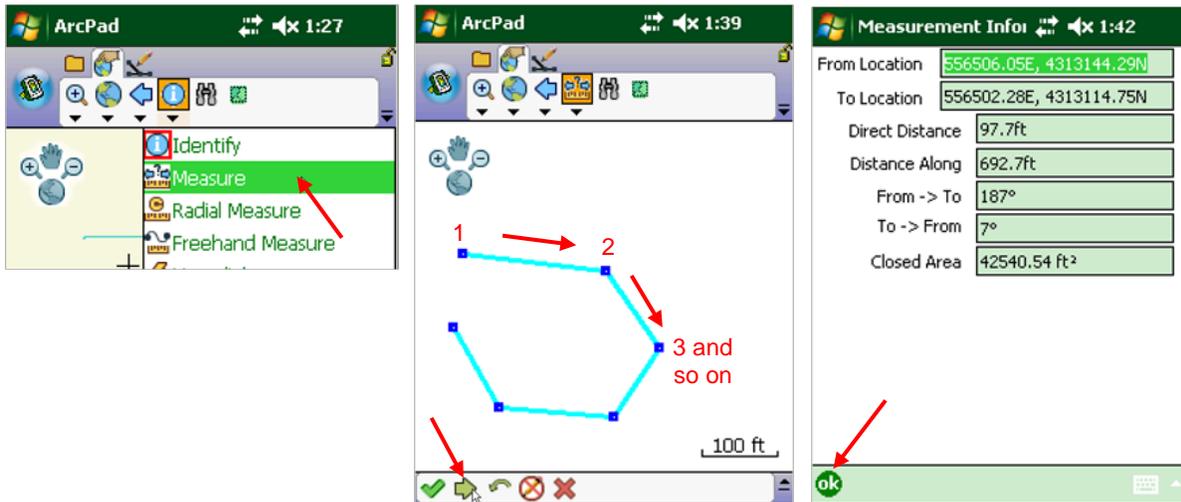


Measuring

If you have a need to measure distances or areas, you have four different methods to choose from: Measure, Radial Measure, Freehand Measure, and the Identify tool.

Measure tool

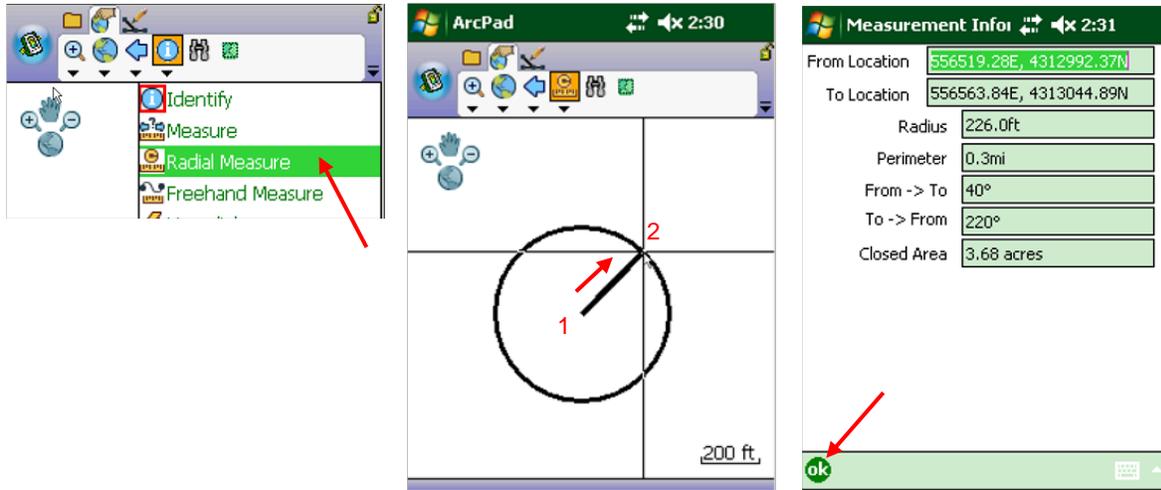
To use the measure tool, switch to the Browse toolbar and **TAP** the drop-down arrow for the “Identify” menu (fourth icon) and select Measure (see below). The icon on the toolbar will switch to the “measure” icon . **TAP** the first point where you wish to begin measuring from. Continue **TAPPING** points along the line or around the area you are measuring. When done, **TAP** the “proceed” icon in the command toolbar at the bottom. A measurement screen should appear with the appropriate information. The From and To Locations are the coordinates of the first and last points (i.e., taps). Direct Distance, From -> To angle, and To -> From angle are compass azimuth front and back bearings for the straight line direct distance between the first and the last point. Distance Along is the total length of the drawn line. Closed Area assumes a line drawn



from the first to last point to close the figure. **TAP** OK to close window.

Radial Measure tool

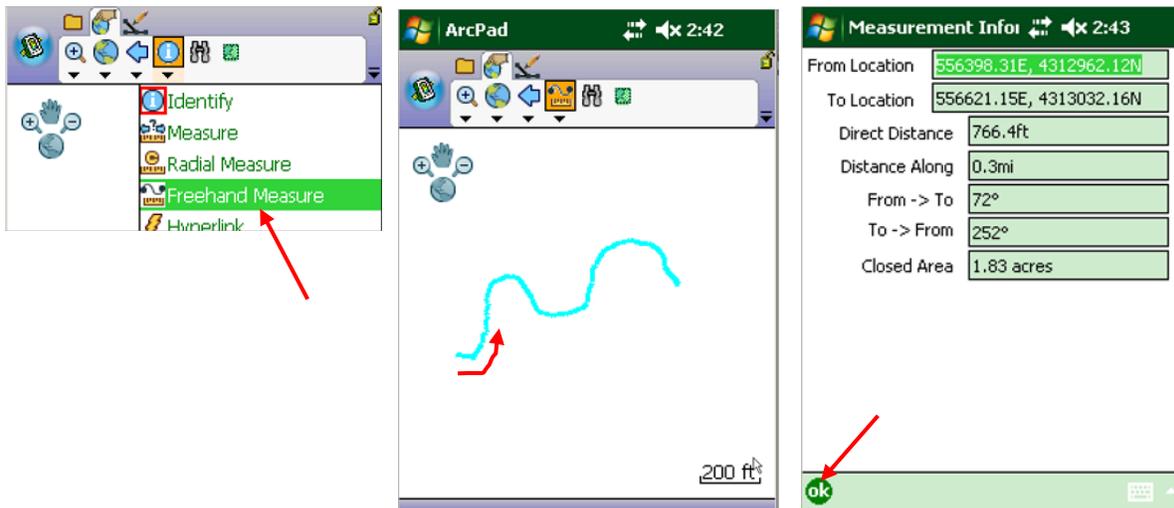
To use the radial measure tool, switch to the Browse toolbar and **TAP** the drop-down arrow for the “Identify” menu (fourth icon) and select Radial Measure (see below). The icon on the toolbar will switch to the “radial measure” icon . **TAP AND DRAG** from the first point to the second point. When you lift the stylus, a measurement screen should appear with the appropriate information. The From and To Locations are the coordinates of the first and second points. Radius, From -> To angle, and To -> From angle are from the first to the second point. Perimeter is the perimeter distance for the circle of given radius. Closed Area is the area for a circle of given radius. **TAP** OK to close window.



Freehand Measure tool

To use the freehand measure tool, switch to the Browse toolbar and **TAP** the drop-down arrow for the “Identify” menu (fourth icon) and select Freehand Measure (see below).

The icon on the toolbar will switch to the “freehand measure” icon . **TAP AND DRAG** the stylus on the map as you draw a “freehand” line. Upon lifting the stylus, a measurement screen should appear with the appropriate information. The From and To Locations are the coordinates of the first and last points. Direct Distance, From -> To angle, and To -> From angle are from the first to the last point. Distance Along is the total length of the drawn line. Closed Area assumes a line drawn from the first to last point to close the figure. **TAP OK** to close window.

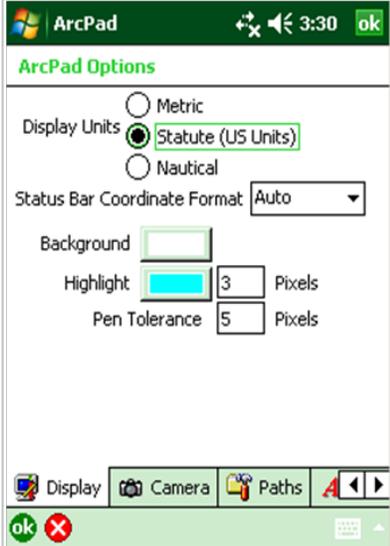


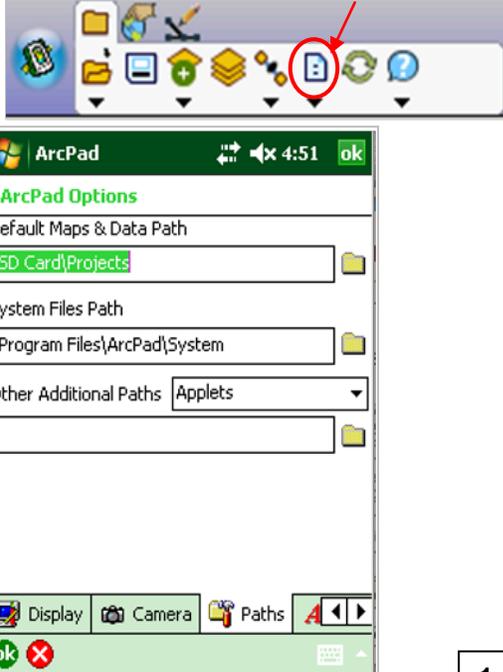
Appendix H– Field Guides

The “Field Guides” below are simply instruction “cards” that can be printed (single-sided), cut out, folded (where indicated), and laminated to carry along with the GeoXT GPS unit in the field.

Table of Contents & ArcPad Options

ArcPad Options Recommended Settings





1

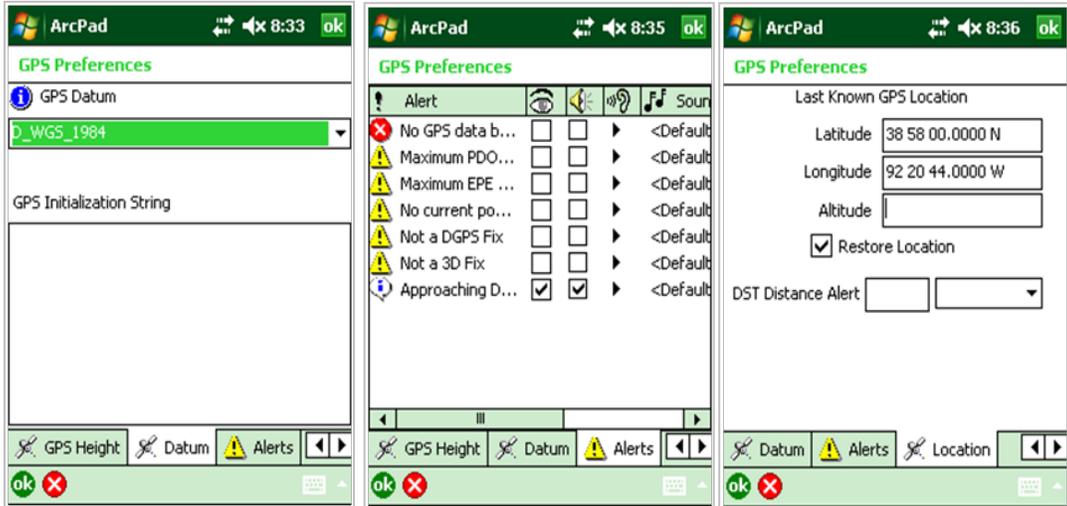
Fold

ArcPad Field Guides - Table of Contents

	Page
ArcPad Options/Recommended Settings	1
GPS Preferences	2-3
Create New Quick Project	4
Create New Shapefile	5
New shapefile (Add Fields)	6
New shapefile (QuickForm)	7
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Viewing Data	10-11
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Setting a destination	13
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GPS Preferences

GPS Preferences (page 2)

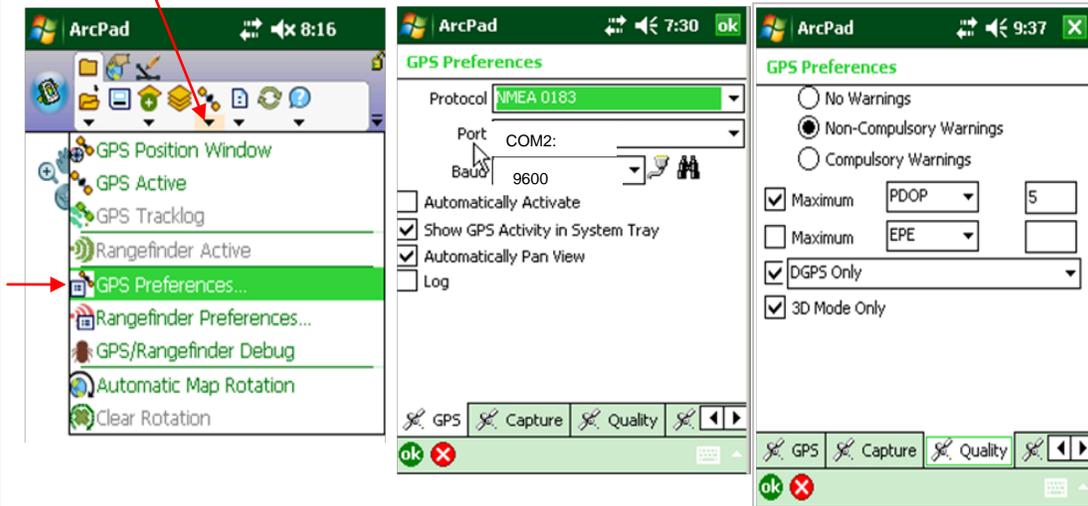


If unit has trouble finding satellites, enter coordinates of current location on location tab (these do not have to be exact).

3

Fold

GPS Preferences (page 1)

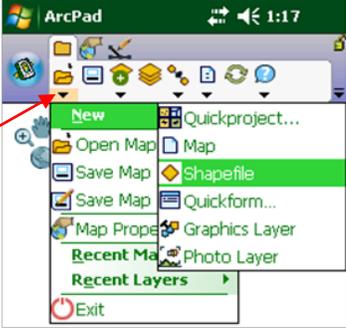


NOTE: Protocol, Port, and Baud must be set as shown above.

2

Create New Quick Project / New Shapefile

Create New Shapefile



Define fields
(See "Add Fields" card)



Define QuickForm
(See "QuickForm" card)

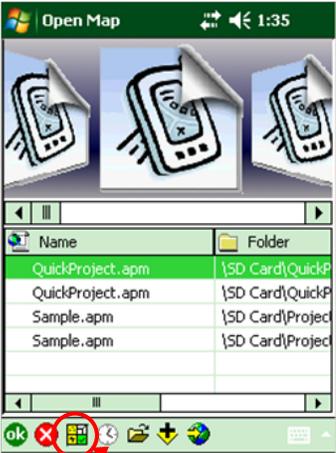
On Main toolbar, Select **New** -> **Shapefile** from Open Map menu.

Enter name and desired storage location.
TAP Save.

5

Fold

Create New Quick Project



TAP quick project icon in Open Map window



TAP OK

3 shapefiles will be created:
Points
Lines
Polygons

in a Quick Project folder.

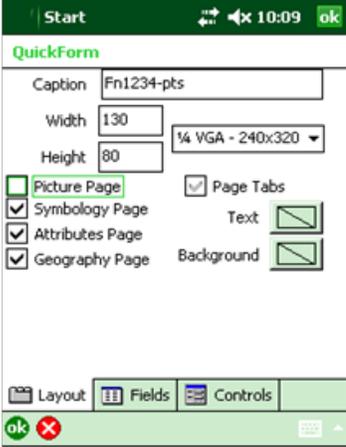
Note: if you want to control where the QuickProject folder is stored, you need to set that parameter in the default Maps & Data Path under ArcPad Options prior to creating a new QuickProject.

4

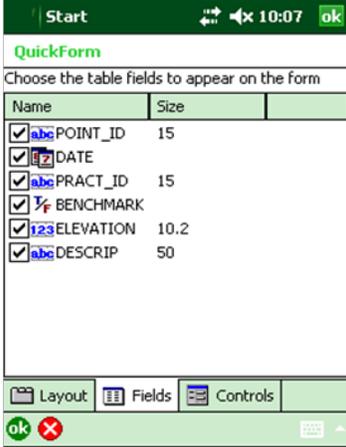
New Shapefile Setup

New shapefile (QuickForm)

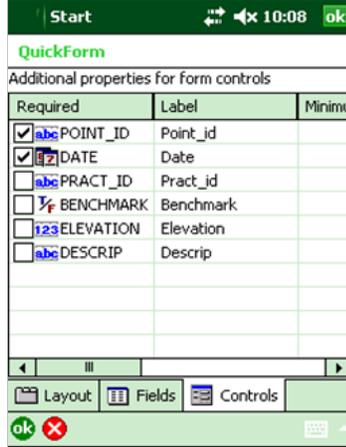
TAP OK to save & exit.



Enter form layout info.



Choose fields.

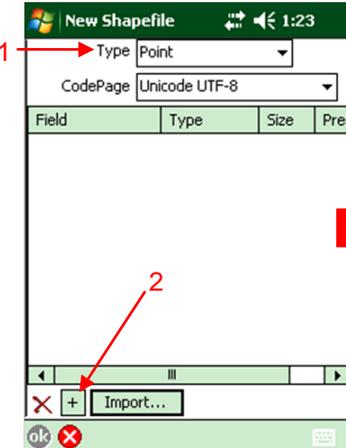


Set additional properties:
required, min, max,
list values, tooltip

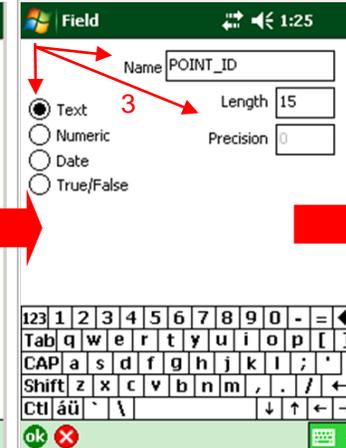
7

Fold

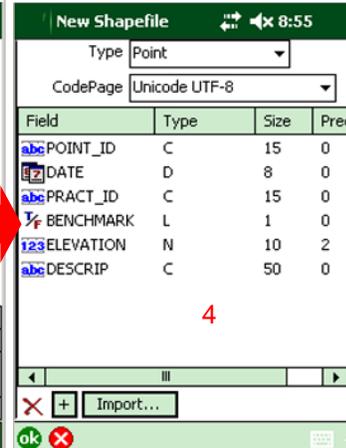
New shapefile (Add Fields)



1) Select type.
2) Tap +.
or use [Import...]



3) Enter field info.
Tap OK.



4) Repeat steps 2 and 3
for each field.
5) Tap OK.

6

Collecting Data

Collecting Data (page 2)

Continuous



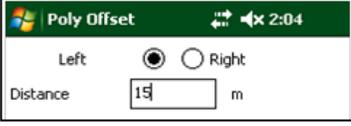
Set "Streaming" settings in GPS Preferences -> Capture



Put in polyline or polygon mode.
TAP GPS Continuous Capture icon.
 Travel desired path. **TAP** icon to turn off.
TAP "Proceed" icon to end capture.



Offset

Select "Offset Polyline/Polygon".
 Select side and enter distance.
 Capture polyline or polygon as described on other card.

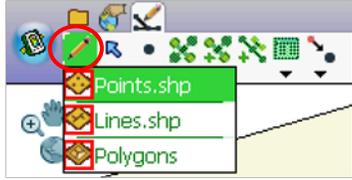


When finished with line or polygon, tap "Proceed" icon on command toolbar.

Complete attribute data.
TAP OK and repeat for next feature.

9

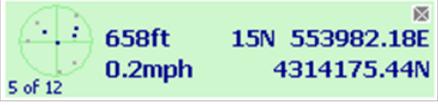
Collecting Data (page 1)



Turn on edit of desired feature(s).



Activate GPS.



Occupy point
 Wait for quality GPS signal:
 green status - DGPS 3D, PDOP<5

Point

Put in point mode.
TAP GPS Capture Point icon.

Polyline Polygon

Put in polyline or polygon mode.
TAP GPS Capture Vertex icon.
 Repeat for each vertex.



When finished with line or polygon, tap "Proceed" icon on command toolbar.

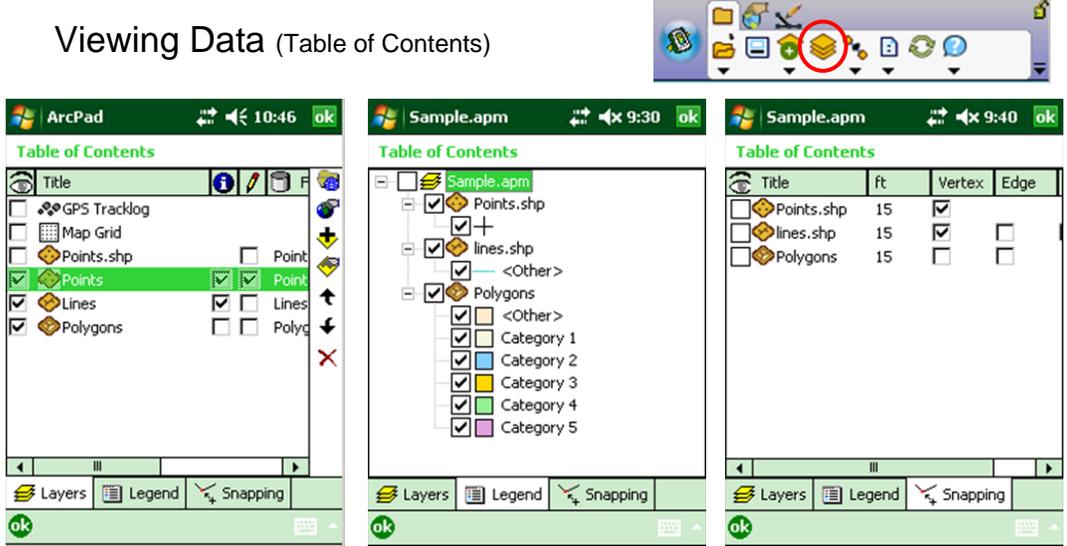
Complete attribute data.
TAP OK and repeat for next feature.

8

Fold

Viewing Data

Viewing Data (Table of Contents)



Set visibility, edit and identify modes and other properties.

Change symbology. Can also be done via Layer Properties.

Set snapping criteria.

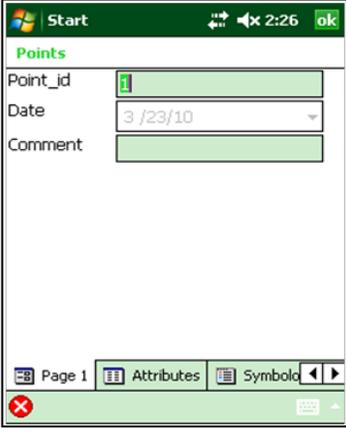
11

Fold

Viewing Data (Identify)



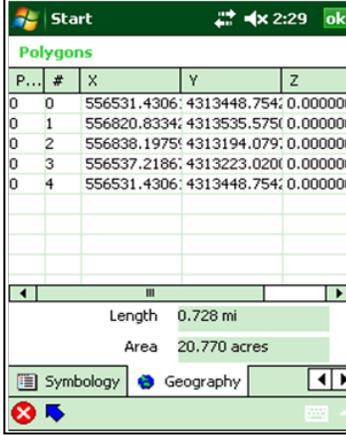
Then select a feature



View: attributes



point coordinates



vertex coordinates and length and areas for polygons & polylines

10

Editing Data / Destinations

Setting a destination

Tap on Map:
Browse toolbar > Identify drop-down > Go To tap on map

Advanced Select:
Browse toolbar > Identify drop-down > Advanced Select > select feature(s) > highlight feature > tap Go To icon .

Find:
Browse toolbar > binoculars icon > specify criteria > highlight feature in Results window > tap Go To icon or
Enter known coordinates (location).

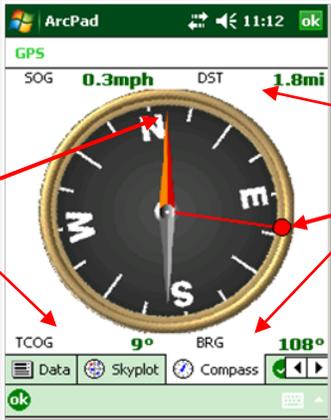
Edit Select:
Edit toolbar > Select icon > select feature > Select drop-down > Go To Selected Feature.

Getting to the destination



Activate GPS.

Use compass on GPS Position window to navigate to destination.



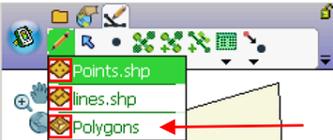
Distance (DST) & Direction to destination

Direction you are moving (TCOG)

13

Fold

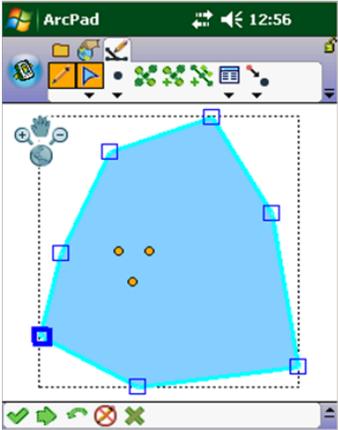
Editing Data



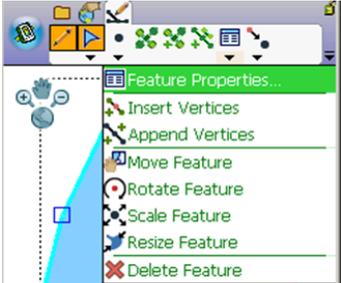
Ensure feature is in "edit" mode.



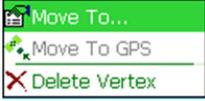
Choose appropriate
Select tool on Edit toolbar.



Select feature or
TAP AND DRAG
a vertex.



Select desired
edit feature action
or
TAP AND HOLD
on a vertex and select
vertex edit action



Command
Toolbar



Save changes can't undo

Undo last action

Cancel changes since last save

Does nothing

Pen toggle

12

Measuring

Measuring (page 2)

Freehand Measure



TAP AND DRAG
to draw freehand line.
Lift stylus.

Measurement Info

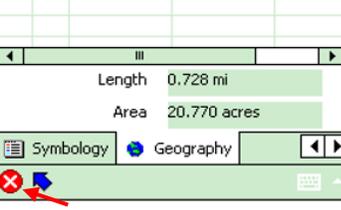
From Location	556396.31E, 4312962.12N
To Location	556621.15E, 4313032.16N
Direct Distance	766.4ft
Distance Along	0.3mi
From -> To	72°
To -> From	252°
Closed Area	1.83 acres

Measurements info is displayed.
TAP OK to exit.

Identify Tool



TAP feature.

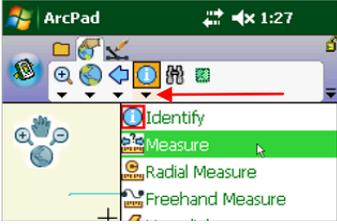


Length and area given on
"Geography" page.
TAP cancel icon to exit.

15

Fold

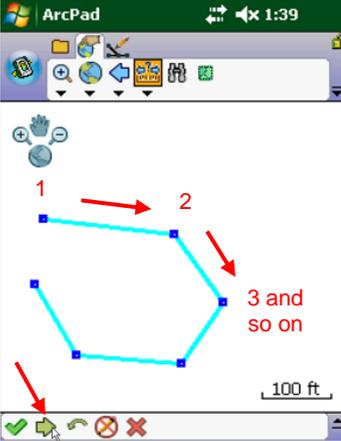
Measuring (page 1)



Select drop-down for Identify menu on "Browse" toolbar

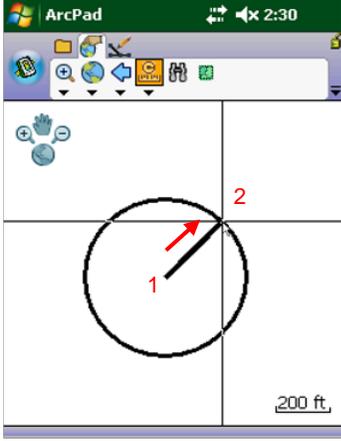
Select: Measure, Radial Measure, or Freehand Measure.

Measure



TAP points along line or around area.
TAP "proceed" icon.

Radial Measure



TAP AND DRAG from first point to second point.
Lift stylus.

14

Troubleshooting



Fold

Troubleshooting

Unit Not Responding

Is device locked? If so, unlock it (“Unlock” at bottom or lock icon in ArcPad), or Reset device - hold down Power button, select “Reset”, or Remove battery. Reinsert battery.



GPS very slow at obtaining fix

Wait longer, or try entering approx. location on “Location” page of GPS Preferences

GPS Off

Check settings in GPS Preferences (see other field guide).

Zoom Extents / nothing displays

Either there is nothing to display, or features are extremely far apart. Try “Zoom to Layer” or use Find tools to look for features.

GPS location is incorrect or not stable

Check surroundings for possible obstructions. Reset (i.e., reboot) device. Hold down Power button, select “Reset”.

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Appendix I – Troubleshooting

Unit is not responding (locked up)

The first thing to check is if the device got “locked”.

If in ArcPad, check the small lock symbol  in upper right corner. If it is locked, **TAP** it and select Yes to unlock. If it is unlocked, something else is wrong.

If not in ArcPad, check the bottom of the Today screen. If it says “Unlock”, **TAP** the word and then **TAP** again on “Unlock” near the middle right of the screen.

If the above actions don’t work, hold down the power button until a menu appears. **TAP** on “Reset”. This should cause the device to do a reboot.

If this doesn’t work, it may be necessary to remove the battery temporarily and then reinsert the battery. You should then be able to power it up.

GPS very slow at obtaining a fix

If the unit had last been used at a location far from where you are now or this is the first time you have had it out at your current location, it may take awhile for the GPS to “find itself”. To speed this up, one thing you can try is to manually enter your location. You can do this by going to “GPS Preferences” in ArcPad and entering the lat-long coordinates of your present position in the “Location” page. This does not have to be real accurate, but just in the general vicinity.

GPS Off

This message indicates that ArcPad is not receiving any information from the GPS receiver. Most likely the reason is that the settings on the “GPS” page under “GPS Preferences” in ArcPad are incorrect. Check the **Error! Reference source not found.** section in the main body of this document for correct settings.

I do a Zoom Full Extent and nothing seems to be there

You may have features that are extremely far apart. One thing you might try is to use the “Zoom to Layer” tool under the “Browse” menu. You also can utilize find and select tools to diagnose if this is the case. If you find an errant feature, you could then delete it using the edit instructions given above.

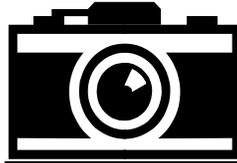
GPS location is incorrect or is not stable (i.e., constantly changing by a large amount) even though PDOP shows a good value.

The first thing to check is that you are not near some object (e.g., chain link fence, metal sign, another electronic device, etc.) that may be affecting the GPS signals.

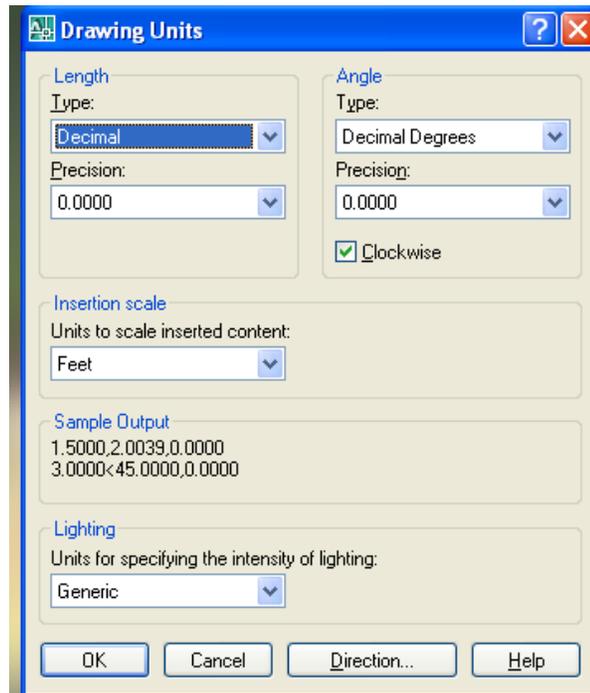
If that is not the case, you should then reset the device. Hold down power button until menu appears. **TAP** Reset. The unit should reboot and the problem should (hopefully) be resolved.

Appendix J – Importing Shapefiles into AutoCAD

Method I

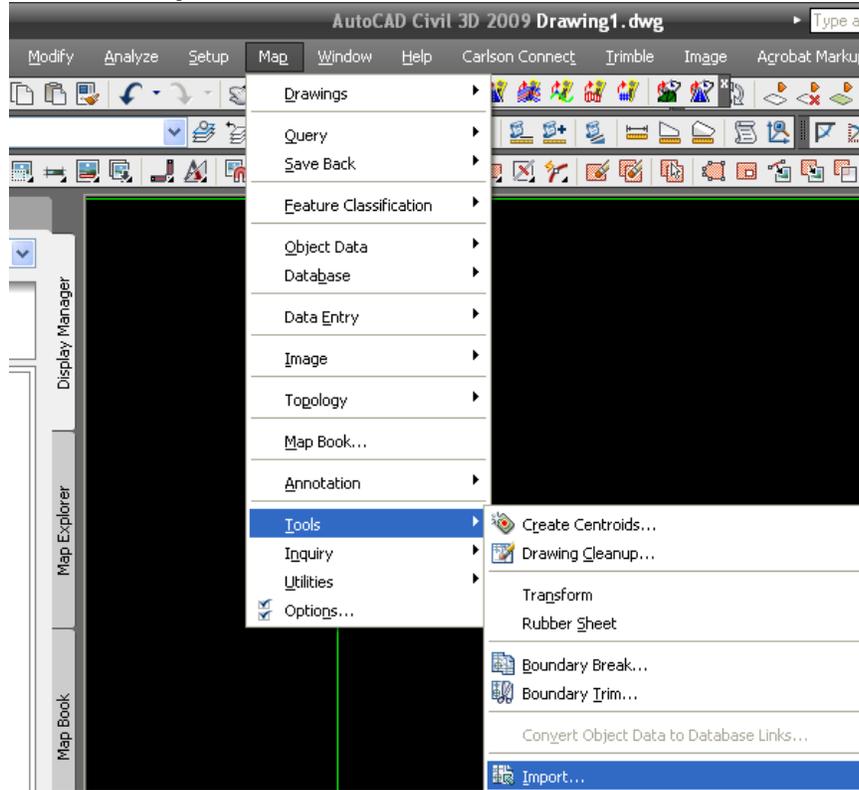


1. Open up a new drawing in “**Civil 3D as AutoCAD 2009**”
2. To make sure you have the right units, type in “**UNITS**” on the command line.
 - a. Once the *Drawing Units* dialog box comes up- Follow the values in the picture.

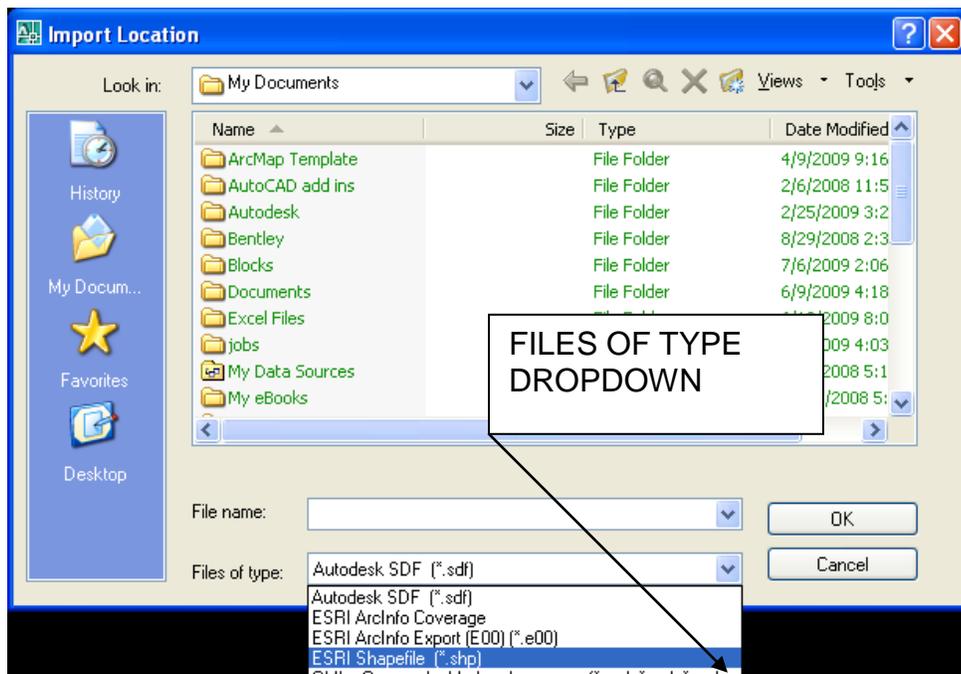


- b. Hit “**OK**”
3. In the menu bar go to > “**MAP**” – (*If you don’t have the “Map” menu refer to getting customizing the menus*)

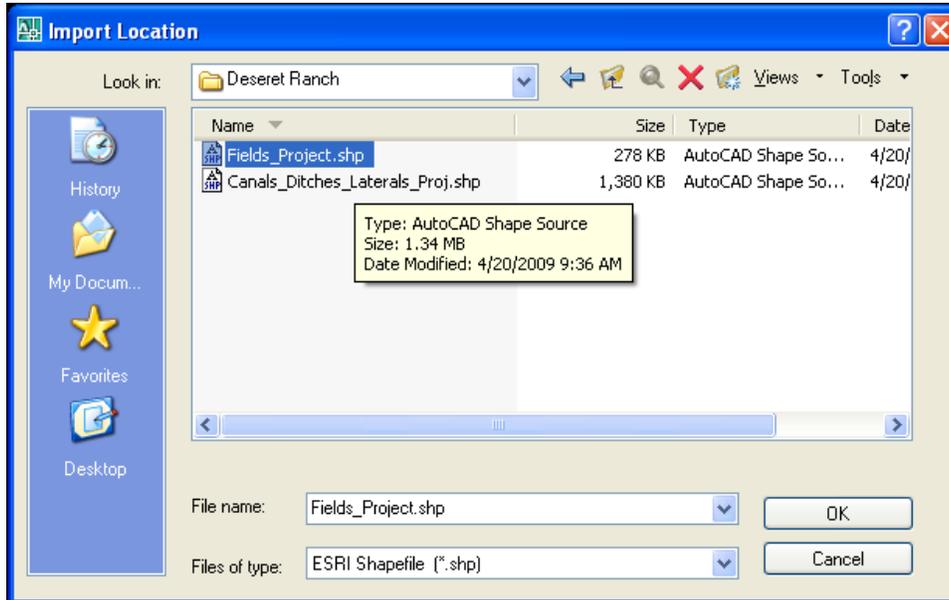
4. Go to> “Tools” > “Import...”



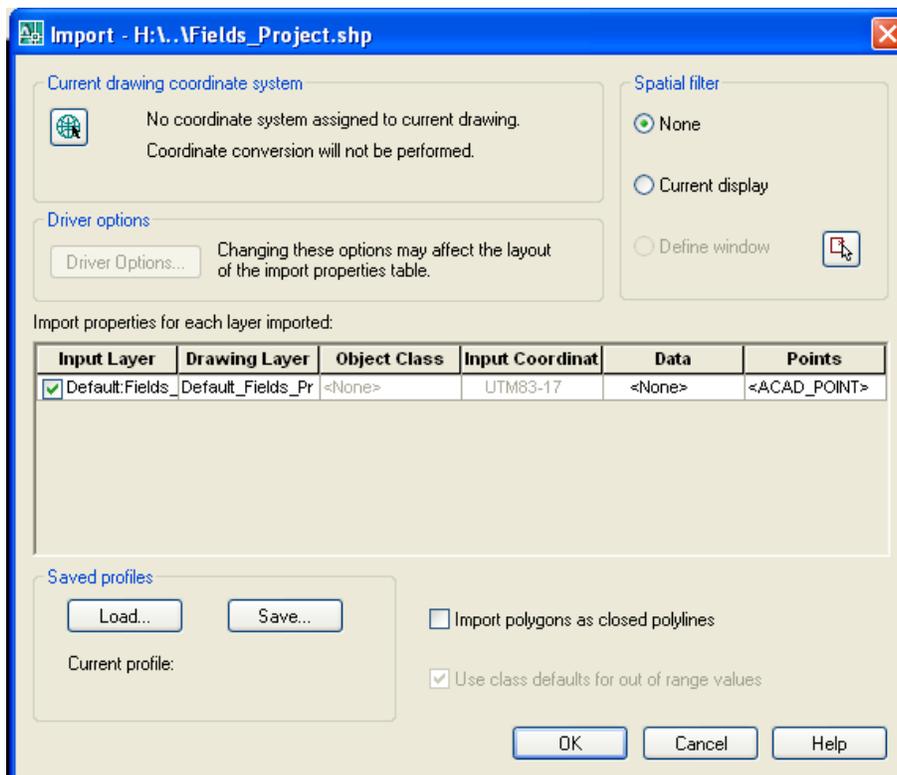
5. Once the “Import Location” dialog box is open, change the files of type to “ESRI Shapefile (*.shp)” since that is the type of file you wish to import



6. Browse to the Shapefile you wish to import- Select it and hit “OK”

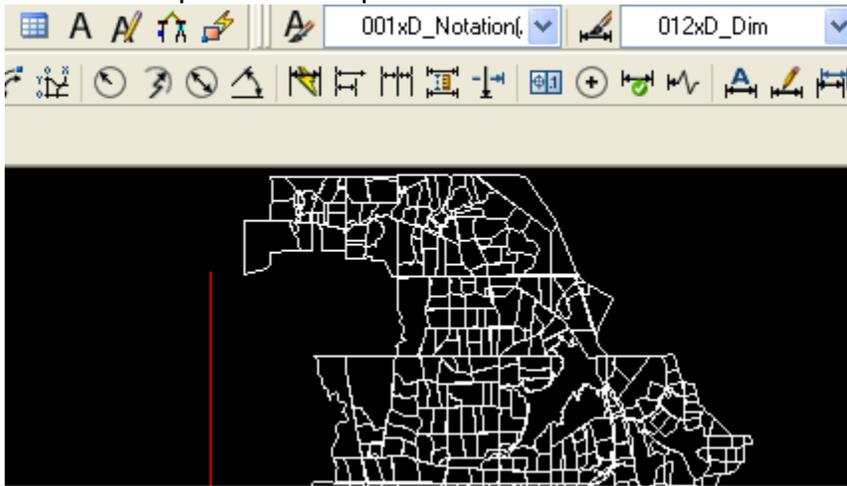


7. You should see the Import <File path>Shapefile screen- Hit **“OK”**



8. Zoom Extents and you'll see your image.
 a. "Z" enter "E" enter - or double click your scroll wheel.

9. If the Shapefile is completely filled with a solid, type in “**Fill**” and select <**OFF**> you have now imported a Shapefile



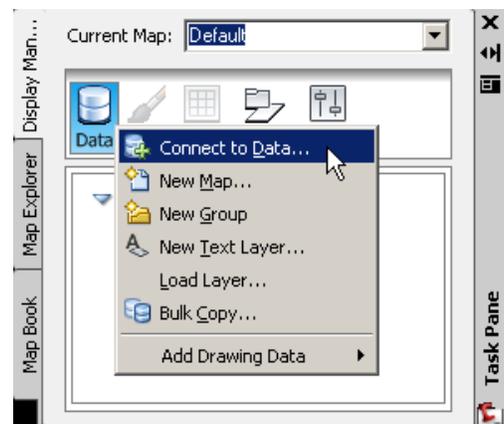
Method II

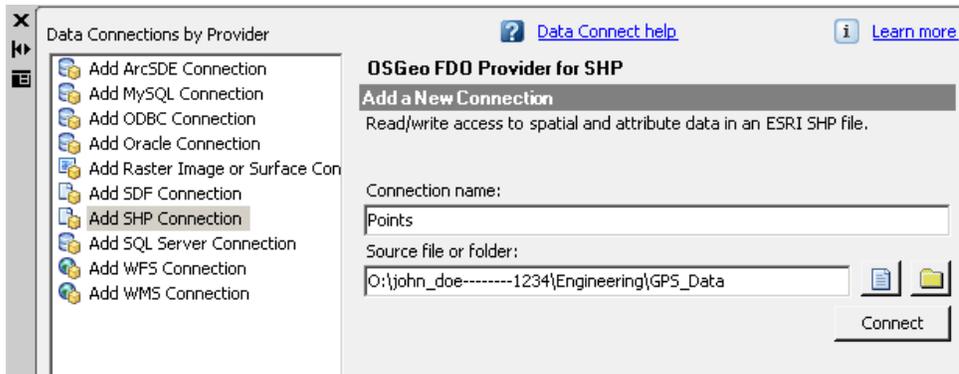
The previous method imports shapefiles in a way that each of the points, lines, or polygons becomes a drawing object. If any changes are made, the objects would have to be exported back out to a shapefile (i.e., the original shapefile is left untouched).

The other way is to create a “data connect” to the shapefile. The features are not imported to drawing objects, but rather a connection is made where you can edit the shapefile directly.

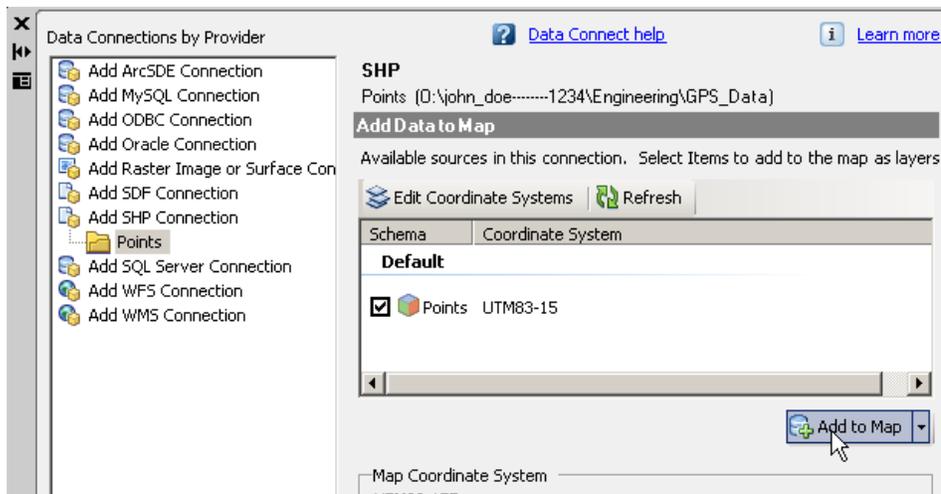
Open the “Task Pane” palette and select the “Display Manager” tab.
Click on the “Data” icon in top toolbar.
Select *Connect to Data...*

In the Data Connection window (below), select “Add SHP Connection” in left window. Enter a connection name.
Click yellow folder and navigate to the folder where shapefile was saved and click [OK]
Click [Connect].





A list of shapefiles in the selected folder will be listed (see screen below).



If the coordinate system is not set for the desired shapefile, click the “Edit Coordinate Systems” tab.

Check the box to the left of the desired shapefile.

Click [Add to Map].

You can then close the Data Connect window.

The shapefile is now listed in the Task Pane’s Display Manager window.

To learn more about how to use the data, refer to AutoCAD’s help.

Appendix K – Training Exercises

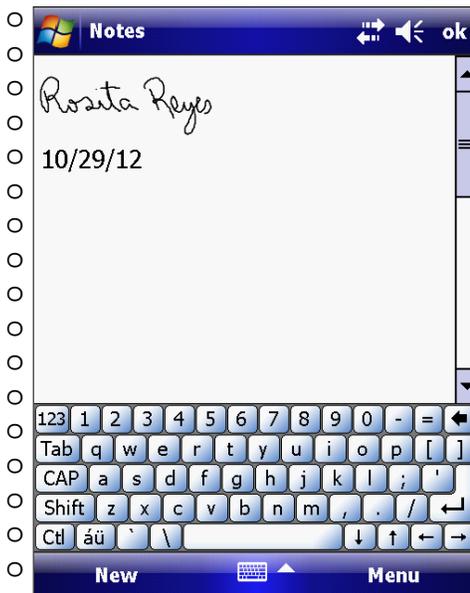
Activity #1

- Name two ways to find amount of memory available on device and SD card

- Using the GeoXT, open File Explorer and navigate to SD Storage Card
 - Open folder named '**docs**'
 - Rename file **oldname.txt** to **activity1.txt** (if those files are not visible, click on Menu, make sure the option to 'Show all Files' is checked)
 - Create a subfolder named '**temp**' under **docs**
 - Copy '**original.txt**' to temp folder
- Using NOTES file :
 - Click *START > NOTES* or *START > PROGRAM > NOTES*
 - Verify that the default folder name (upper left corner) is set to 'All Folders' as shown below



- Click *New* or press *Left Application* button
- Use stylus to "hand" write your name
- Use keyboard to type today's date.



- **FYI:** *The Notes file created will be named with the first alphanumeric characters entered with the keyboard. If you did not use the keyboard, the operating system assigns a default name (e.g. Note1) to the new file created.*
- Click *OK* to close Notes file
- Click  button to exit Notes interface

- Using the GeoXT, open File Explorer and navigate to '**My Documents**'
 - Move (Cut & Paste) Notes file created in previous step to the *docs\temp* subfolder on the SD Storage Card
 - Rename Notes file created in previous step to **Smith_QOP**

- Name two ways to do a soft reset on the GeoXT

- Perform a soft reset on the GeoXT

End of Activity #1

Activity #2a

- Create a '**GPS_Data**' folder on your workstation [C:\Documents and Settings\- Connect your GeoXT and workstation using a 'Guest' connection
- Open new Explore session for GeoXT from **Active Sync** window on workstation
- Open the SD Storage Card directory
- Use Drag & Drop to copy folder named *DataForGpsTrain* from the SD Storage Card to the *GPS_Data* folder previously created on your workstation

End of Activity #2a

Activity #2b

- Open ArcMap Editor:
 - o If Toolkit is available, open Toolkit Training Customer, launch Toolkit_Template.mxd
 - o If Toolkit is **not** available, launch ArcMap (click  > All Programs > ArcGIS > ArcMap)
- Add the following layers located in *DataForGpsTrain* folder:
 - o PLU_template.shp
 - o ortho_1-2_1n_s_fl<FIPS>_2010_1.sid.sid
- Zoom to PLU_template.shp
- If Toolkit is available:
 - o Create a new Toolkit plan (**MP_T1804**)
 - o Copy feature(s) of PLU_template into the new plan
 - Make sure target layer (MP_T1804) is in edit mode
 - Make the source layer (PLU_template.shp) the only selectable layer in Table of Contents by clicking the 'Selection' tab and ensuring that the source layer is the only one with a checked box
 - On ArcGIS toolbar, use 'Select Features' button to select features to be transferred, then hit the 'Copy' button and "Paste button to complete the process
 - Save your edits in target layer
- If Toolkit is **not** available, rename PLU_template to **MP_T1804** in the table of Contents, using two single clicks on the layer name.
- Using ArcPad Manager, export MP_T1804 to a new customer folder (Datafor<your_last_name>), under GPS_Data
- Transfer customer folder from GPS_data to the GeoXT SD Card

End of Activity #2b

Activity #3a

- Using GeoXT, launch ArcPad document from customer folder DataFor<your_last_name> on SD Card
- Edit symbology of *MP_T1804*
- Load county ortho imagery under the geodata folder on SD card
- Save ArcPad document as *prax_cert.apm*
- Close ArcPad

End of Activity #3a

Activity #3b

- On workstation, create a new folder under *GPS_Data* '**DataforJaneDavis**'
- Copy shapefile *partner_plu* from *DataForGpsTrain* to *DataforJaneDavis*
- What is the projection of *partner_plu* ?
- Transfer new customer folder (*DataforJaneDavis*) from *GPS_data* to the GeoXT SD Card
- Launch new ArcPad document to view *partner_plu*
- Load county ortho imagery under the geodata folder on SD card
- Save ArcPad document as *partner.apm* under *DataforJaneDavis*
- Close ArcPad

End of Activity #3b

Activity #4a

- Using GeoXT, launch *partner.apm* under *DataforJaneDavis*
- Load points.shp from MasterProject{16 or 17}
- Add a point within PLU boundary and enter attribute
 - Key Steps:**
 - Put shapefile in edit mode
 - Select sketch tool
 - Digitize features
- Save ArcPad document

End of Activity #4a

Activity #4b

- Load lines and polygons shapefiles from MasterProject{16 or 17}
- Add a fence and an area for nutrient management in each respective shapefile
- Delete point feature from Activity 4a
- Close ArcPad

End of Activity #4b

Activity #5

- Check GPS Controller settings on GeoXT
- Check ArcPad Preferences settings on GeoXT

End of Activity #5

Activity #6

- Fill in the blanks

QUALITY OF POSITION INDICATORS	RESOURCE INVENTORY	PRACTICE CERTIFICATION
GPS STATUS		
POSITIONING MODE		
POSITION DILUTION OF PRECISION		
SIGNAL STRENGTH OF EACH SATELLITE		
NUMBER OF SATELLITES IN SOLUTION		
DIFFERENTIAL DATA AGE (Maximum)		
HORIZONTAL ACCURACY		

End of Activity #6

Activity #7a

- Using GeoXT, launch *partner.apm* file from folder *DataforJaneDavis*
- Check collection QOP for compliance with Resource Inventory standards
- Record length of a feature using *Continuous* method
- Record length of same feature using *GPS Capture Vertex* method
- Is there a difference between length measurements obtained from those two methods? Why?

- Record location of point, surface area of features in practice area

End of Activity #7a

Activity #7b

- Using GeoXT, launch *prax_cert.apm* file from folder *Datafor<your_last_name>*
- Check collection QOP for compliance with Practice Certification standards
- Record location, length of designated features
- Record surface area of designated feature(s)

End of Activity #7b

Activity #8

- Copy MasterProject<*utm_zone*> from GeoXT to GPS_Data folder on workstation
- If Toolkit is available, open ArcMap document and import practice certification features into Resource Inventory layer. Use attribute tool to assign practice name to features.
- If Toolkit is **not** available, export certified features to shapefiles under folder *Datafor<your_last_name>*
- Create layout for Practice certification features
- Export layout to PDF or JPG file with your name as part of the filename. Store file in assigned directory.

End of Activity #8