

# Technology Technical Note GIS&GPS FL-08

## Planner's Guide for GPS: Geo 7X





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## **Acknowledgements**

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## **Introduction**

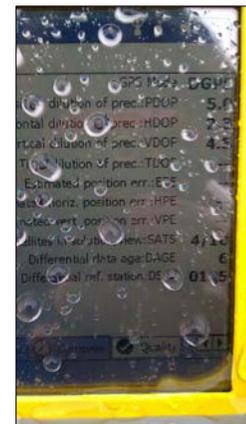
The intent of this document is to provide instructions for utilizing a Trimble Geo7x GPS unit for field data collection. The instructions include:

- An overview of the Trimble Geo7x
- An overview of Windows Mobile 6.5
- An overview of Windows Mobile Device Center 6.1
- Functional steps for using ArcPad
- Data Collection settings and standards
- Data Processing techniques

## **Overview of the Geo7x**

### ***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 Geo7x device and related accessories such as a carrying case, a Lithium Ion battery pack, AC power supply and adapters, USB data cable, a Quick Start Guide brochure, hand strap, screen protector and labels, and extra stylus. Most of those accessories have already been installed for your convenience.

The Geo7x has 256 MB of internal memory and 4 GB disk storage. It is equipped with a slot for an internal SD card. It utilizes Floodlight technology for better reception under canopy. The Geo7x provides real-time differential GPS capability utilizing Space Based Augmentation Services such as the Wide Area Augmentation System (WAAS) for 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 Geo7x 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 Geo7x can last between 7 to 10.5 hours, depending on the number of features being used. The casing of the Geo7x is dust-proof and resistant to heavy driven-wind. Online tutorial for GPS is available:

[http://www.trimble.com/gps\\_tutorial/index.aspx](http://www.trimble.com/gps_tutorial/index.aspx)

### **Software**

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

On the handheld device:

- ArcPad 10.0 R4 or greater
- Microsoft Windows Mobile 6.5 or greater

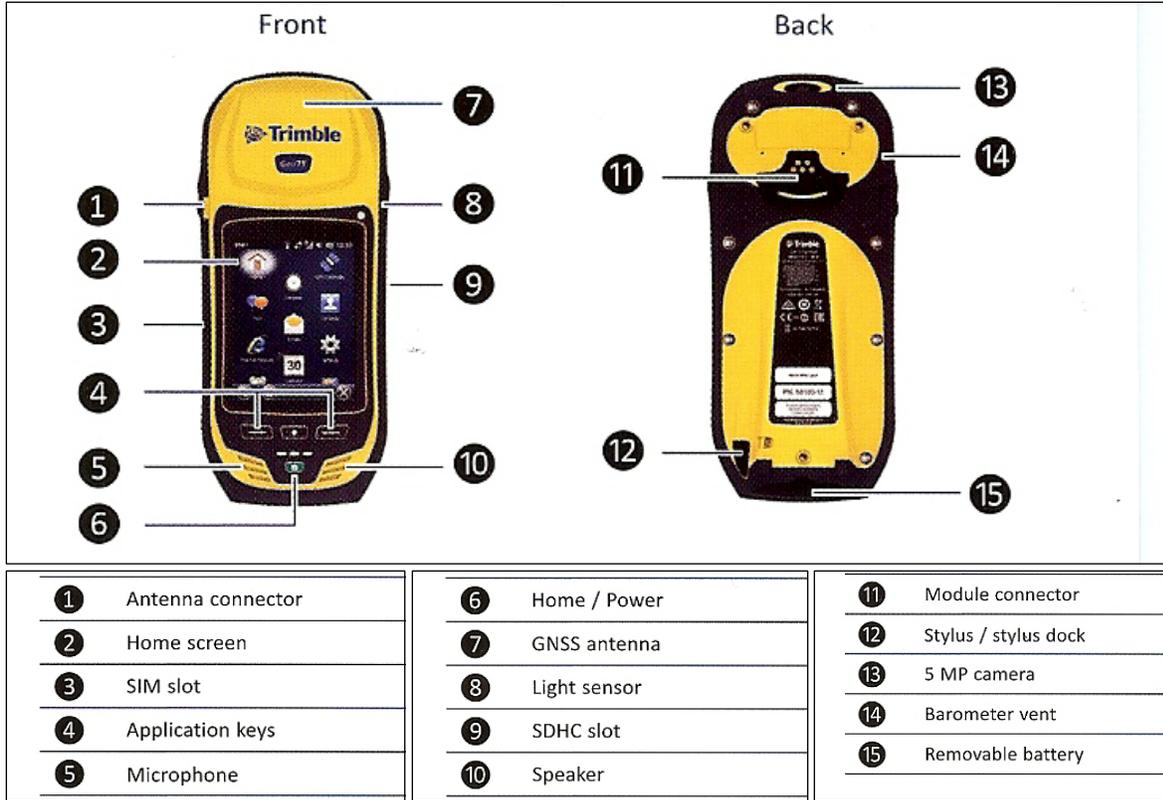
On the computer:

- ArcMap 10.0 or greater
- Windows Mobile Device 6.1 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 Geo7x

This section gives a brief overview of the unit and how to use the basic features.



### 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, tap the Power button on the HOME screen to suspend, soft reset, or shutdown the unit.



*Suspending* puts the device to sleep, and when it is turned back on, the device remembers where it was. Some battery power is used.

*Shutdown* closes all programs and turns off all of the power. No battery power is used.



**Hard reset:** Retains settings and data previously saved. Any unsaved data may be lost. A hard reset should only be done if a soft reset does not resolve problem. To perform a hard reset:

- a. Hold down the Power/Home button on the keypad for at least 10 seconds until the Trimble logo screen appears
- b. Release Power/Home button

**Factory reset:** This procedure should be used if both a soft reset and a hard reset do not resolve problem. **CAUTION:** this procedure erases all data, installed applications and settings stored on the Geo7x, the encryption key for any encrypted file stored on a memory card. To perform a factory reset:

1. Hold down the Power/Home button on the keypad
2. When the Trimble logo appears, immediately press and hold both the left and right application keys



3. Release the Power/Home button. Instructions will appear on the screen
4. Release the application keys
5. Follow the on-screen instructions to continue the factory reset

**Camera/Video:** Press camera button in center of keypad to launch camera or video application. If that button has been programmed for a different task, click on START > Pictures & Videos > Camera. See Appendix A for further instructions on using camera/video features



### ***Safety Measures for the Geo7x unit***

The following precautions should be observed when using the Geo7x unit.

- 1) Use only accessories intended for the Geo7x.
- 2) Do not open the casing of the Geo7x 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 Geo7x. 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 Geo7x 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 Geo7x units is MS-Windows Embedded Handheld version 6.5 Professional. This section provides basic instructions on using this operating system and would therefore be applicable to devices other than the Trimble Geo7x (e.g. ProXYZ, GeoXM, and Juno) that utilize the same 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 double-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 typically used when moving a vertex on a line or polygon feature in ArcPad.

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

## Home Screen

When turning on your unit, you will be presented with a customized Home screen. The “**Home**” screen functions similarly to the Windows desktop on your computer and will look similar to that shown below. The most useful 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.

**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.



**Backlight:** Click on Backlight icon to adjust settings for screen brightness and timing to turn backlight on or off based on user actions or duration of user inactivity.



**File Explorer:** Click on Explorer icon to manage files stored on the handheld disk or a storage card. More details on this topic later.



**GPS Controller:** Click on Controller icon to launch interface and access Skyplot menu to view Horizontal Accuracy or Setup menu to verify/adjust settings

**Settings toolbar:** **TAP** anywhere to access additional icons that indicate the operating conditions of various items on the device. Some examples include:



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



: Clock & Alarms. **TAP** to set volume level or to turn on/off speaker.



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

### 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 Personal (owner’s information; input preferences), System (screen orientation, screen alignment, text size). These are all found on the “System” page of the Settings window.



### Memory and Power Management

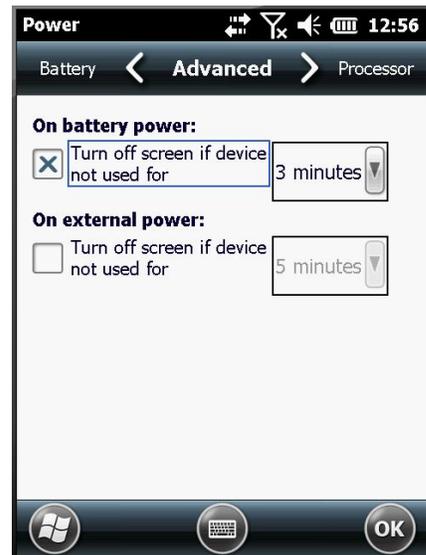
The distribution of memory capacity can be viewed through the **Start > Settings > System > Memory** icon. The *Main* tab shows the amount memory available on the Geo7x unit. The *Storage Card* tab shows available memory on an SD or SDHC card, if present. Recommended memory management practices include:



of

- 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 > 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). 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

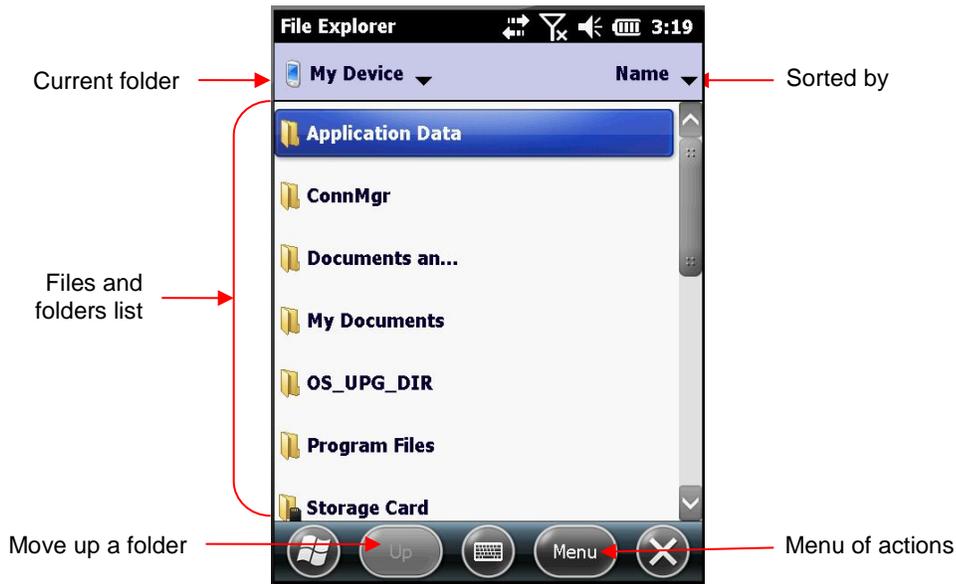
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## File Explorer

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 Windows Explorer application on your desktop computer. This is explained later). To start the File Explorer



application, Click on Explorer icon on the Home screen or **TAP** *Start > File Explorer*. A window similar to that shown below should appear.



**Navigating:** **TAP** a 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).

To Delete, answer yes or no to confirm the prompt.

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

To copy or move a file 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.

**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. You may need to scroll down to see this and other options. Bring up on-screen keyboard



and enter new folder name.

**PRACTICE: Complete Activity #1 in Appendix K**

## **Overview of Windows Mobile Device Center**

In order to communicate (i.e., download and upload) with a desktop computer, Windows Mobile Device Center (WMDC) software (ver. 6.1 or newer) needs to be installed and running on the desktop computer. If WMDC is running, you should see this icon  in the lower right of your screen. If the icon is not there, you will need to start WMDC by selecting *Start > All Programs > Windows Mobile Device Center*.

### ***Establishing a connection***

Using the provided USB cable, plug the “small” end of the cable (USB type Mini-B) into the USB port of the Geo7x. With the computer on and logged into your desktop, plug the “flat” end of the cable (USB type A) 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.

WMDC should recognize you have connected a device. If so, a “Synchronization Setup Wizard” window will appear as shown at right.

Click [“Connect without setting up your device”]. 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 the option to launch Windows Explorer.



Bring cursor on File Management option and click on “Browse the contents of your device to open a Windows Explorer session showing the root directory of the Trimble Geo7x. The option to “Setup your device” , i.e. synchronize the Geo7x with user’s contacts, calendar, email etc. is **not** recommended if more than one person is using the Geo7x in an office.

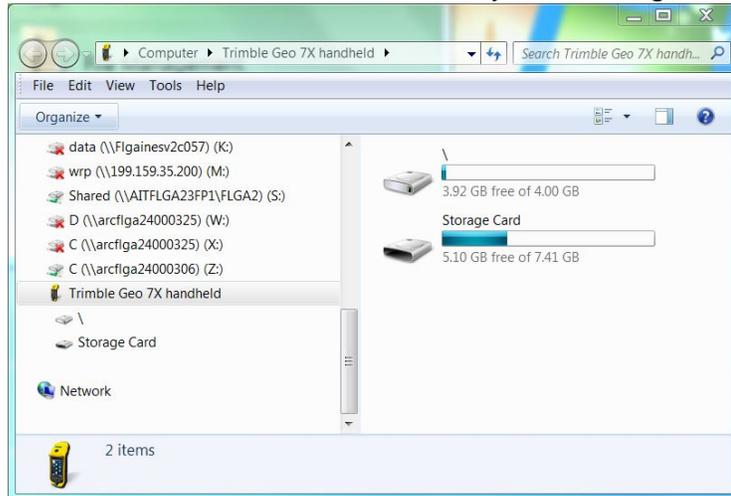


### Transferring files between computer and device

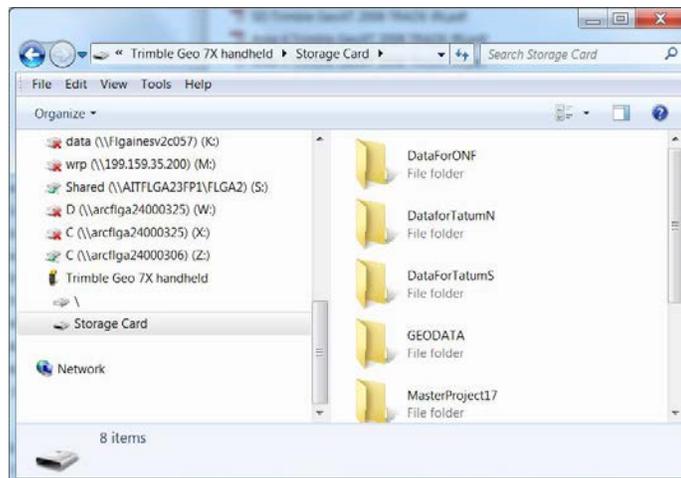
Once Windows Explorer is open, it will normally display the root level directory on the device from where you can access subfolders on the Geo7x’s memory and storage card, if available. Note also that the amount of available memory on the Geo7x and storage card is also shown.

You can now navigate the folders and perform the usual file management actions (i.e., copy, rename, delete, etc.).

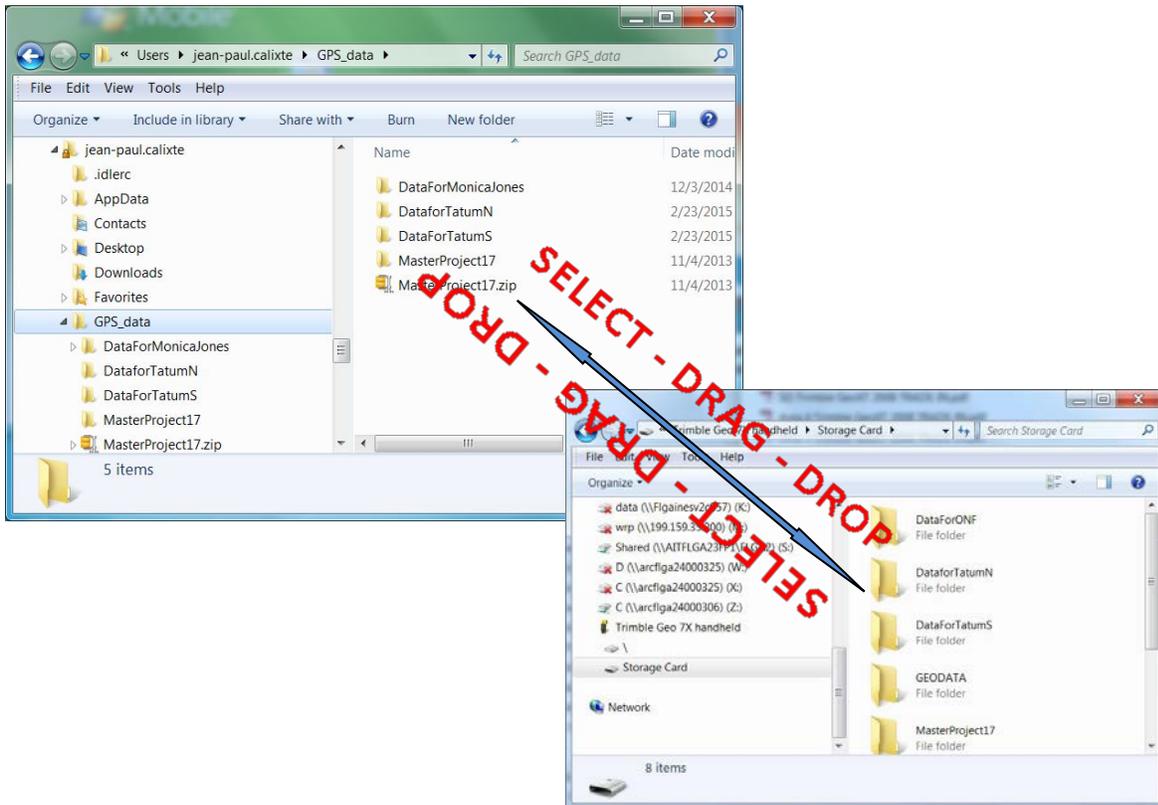
To help in navigating folders, you need to click  on the toolbar to open a folder tree in the left window.



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 session and navigate to the desired folder on the computer.



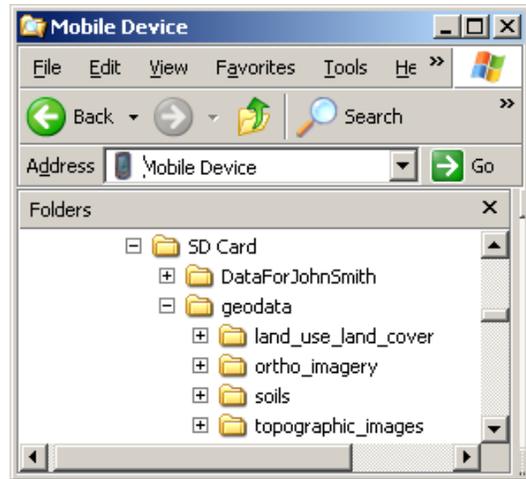
Tip: An easy way to open an explorer windows is to use the  + E shortcut (on your keyboard, hold down the windows key  and then press E). You now have 2 windows that you can drag and drop files and folders from one window to the other to copy them (see below).



## Recommended folder structure for workstation and SD Card

A single directory (**GPS\_data**) should be created under the **C:\Users\*<first name.last name>*\** folder for the purpose of transferring client folders to and from the Geo7x. 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, open the desired parent folder and then select **File > New Folder**.

Florida-NRCS has procured an SDHC card for each Geo7x 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 Geo7x. It is recommended to copy only data categories needed for field work.



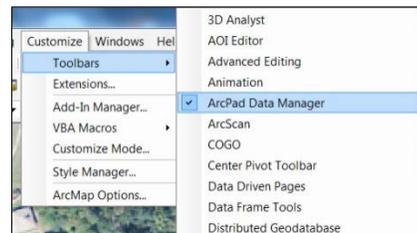
Customer folders should be stored right at the root level of the SD card as shown in the screenshot on the right. Note also the 'geodata' folder and its contents.

## **PRACTICE: Complete Activity #2a in Appendix K**

### Exporting Customer's field boundary with ArcPad Data Manager

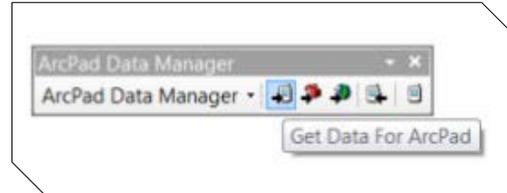
GIS datasets for a customer can be prepared on your workstation in ArcMap and then packaged for transfer onto the Geo7x. In ArcMap, load layer containing field boundaries (e.g. PLU from Toolkit).

The ArcPad Data Manager (ADM) is an application available in ArcGIS 10 to create folders containing layers for transfer onto the Geo7x. To activate ADM in ArcGIS for the first time, click on *Customize > Extensions* and add a checkmark next to ArcPad Data Manager on the list of available extensions.

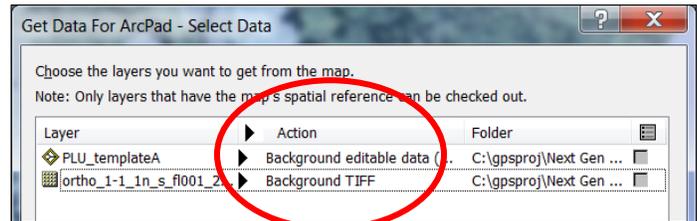


Then click on *Customize > Toolbars > ArcPad Data Manager*. **NOTE: The ADM can be used to export features from ESRI shapefiles and Toolkit's Active PLU, not the Case PLU at this time. Instructions for using the Case PLU are provided in the next section.**

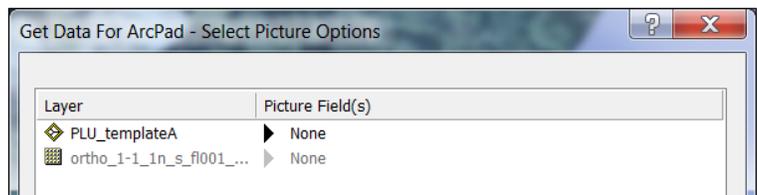
- a. Click on Get Data for ArcPad button



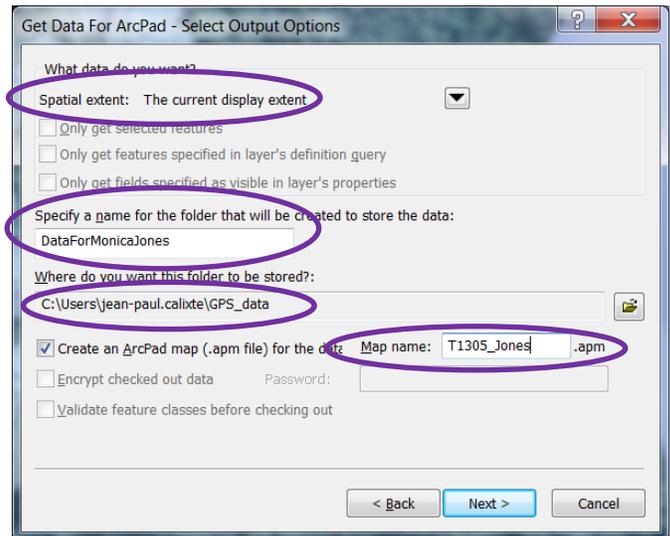
- b. Select appropriate "Action" for each layer



- c. You may skip next screen for Picture Options



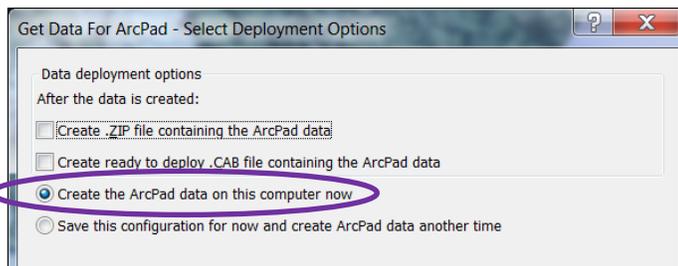
- d. Select Output Options: Spatial Extent, name for customer folder to be created [e.g. DataFor<Customer Name>], directory to store customer folder.



- e. Click the Browse icon to select the path where the customer folder will be saved, i.e. C:\Users\ <user.name>\ GPS\_Data,

- f. Enter name of \*.apm file for quick access on handheld unit.

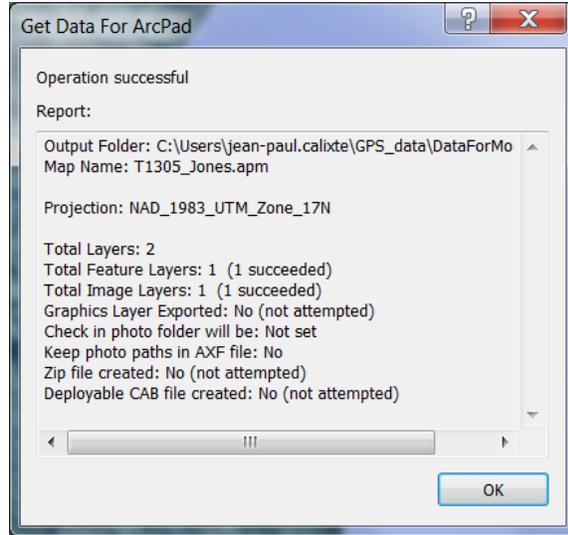
- g. Select Deployment Option: Create ArcPad data on your workstation



- h. A report will be presented when process is complete:

Click [Finish].

A report will display the results of this process. You may want to verify that the layer(s) exported are visible in an ArcMap document. You may also want to set the symbology of the exported layer(s) to remove the default color fill.



Note that exported layers will inherit the projection of the data frame in ArcMap. 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 Geo7x by selecting any of the layers listed in the 'Get Data for ArcPad' dialog box. The spatial extent of layers exported can be specified, if needed. Keep in mind that when an image subset is created, there is a maximum area that can be included in the current display extent. 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:

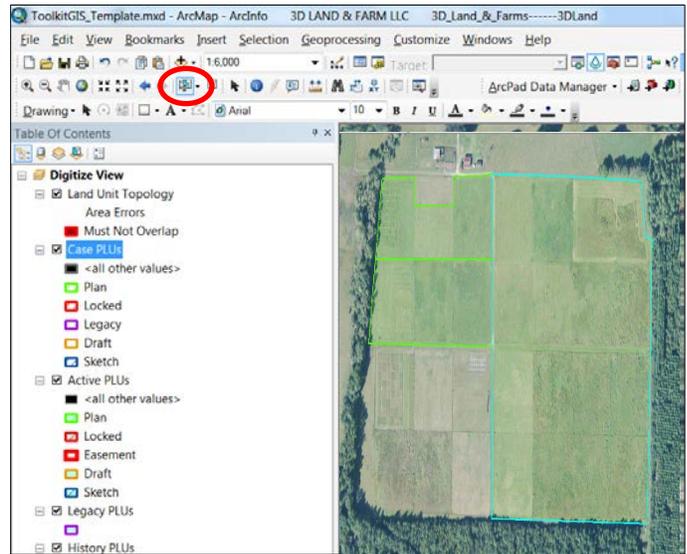
| Image Resolution | Max. Area, acres | Square Dimensions, miles |
|------------------|------------------|--------------------------|
| 1 meter          | 4,000            | 2.5 x 2.5                |
| 2 meter          | 16,000           | 5 x 5                    |
| 2 ft.            | 1,500      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

An alternative for accessing imagery on the Geo7x is to copy countywide orthomosaics on the SDHC card, with the understanding that using very large image files may slow speed of display. This copying process is better done by inserting the SDHC card directly into a workstation due to the size of most county orthoimagery.

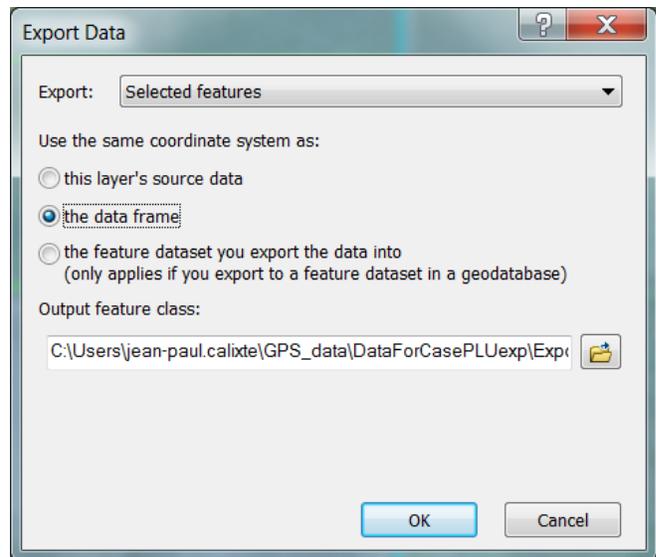
## Exporting Customer's field boundary without ArcPad Data Manager

If you want to export features without using ADM (as is now required for features in the Case PLU, Toolkit v.8), follow these next steps:

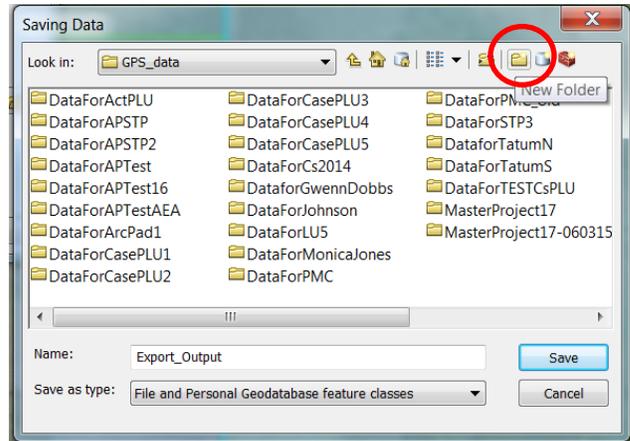
- a) Load dataset in ArcMap
- b) Using the Select Features button in ArcGIS, select fields from desired layer (e.g. Case PLU)
- c) Right-Click on dataset then select Data-> Export Data



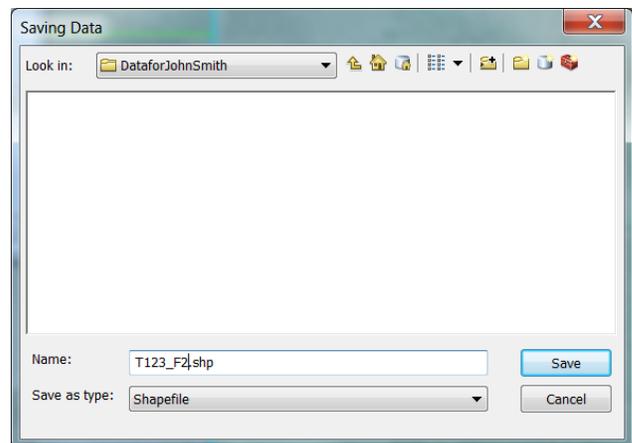
- d) Click the radio button to set coordinate system to be the same as the data frame
- e) Click on the Browse button to navigate to your C:\Users\  
<user.name>\ GPS\_Data folder



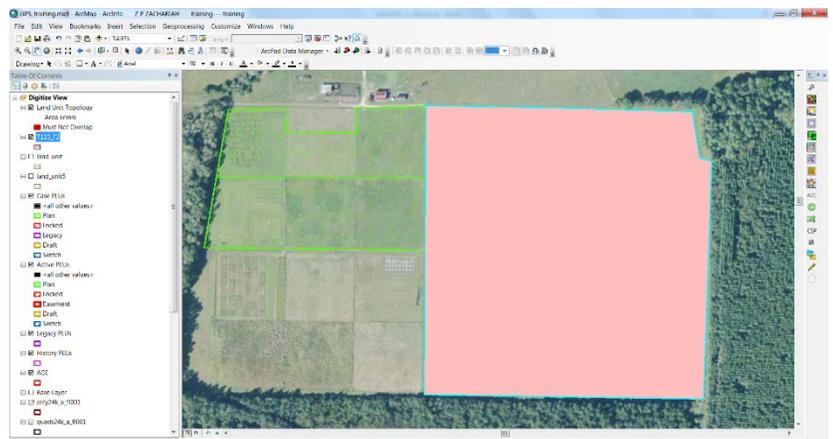
- f) Click on 'New Folder' button to create a new customer folder under GPS\_Data and enter name, e.g. DataforJohnSmith.



- g) In Saving Data dialog box open (double-click) the newly created folder and set file type ('Save as type:') to Shapefile and enter a name that may include the tract and field numbers.



- h) Click the Save button and when the process is completed, add the new shapefile to ArcMap by answering "yes" to the prompt. This will help you verify that the layer(s) exported are visible in an ArcMap document



- i) Close ArcMap session before transferring customer folder to the root level of the SDHC card. Note that an *ArcPad.apm* document is **not** created in the customer folder using this method to export features

**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. 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 **TAP** the ArcPad icon on the HOME screen or select *Start > ArcPad 10.0*. You will then be presented with different options for starting a session.

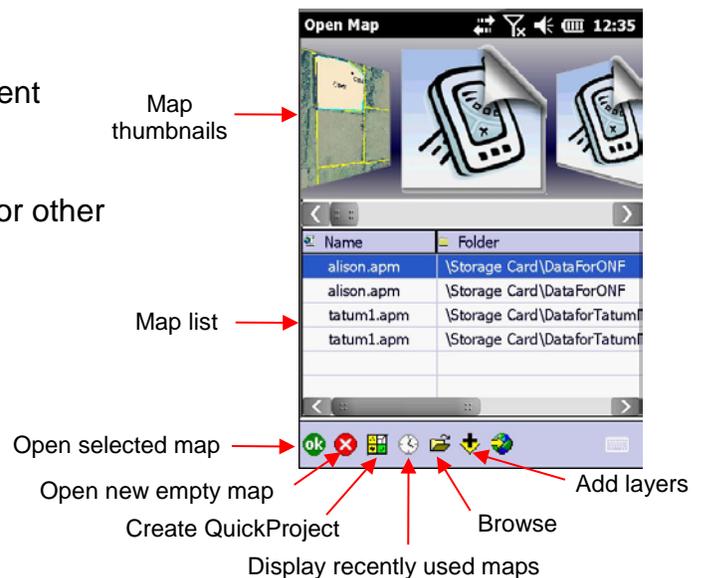
If you have transferred a customer folder on the Geo7x unit, you can select the “*Choose map to open*” to get a list of available ArcPad documents (\*.apm).

The “*Open last map used*” will recall the last \*.apm file used. Otherwise, you can start a new document with the “*New map*” option.

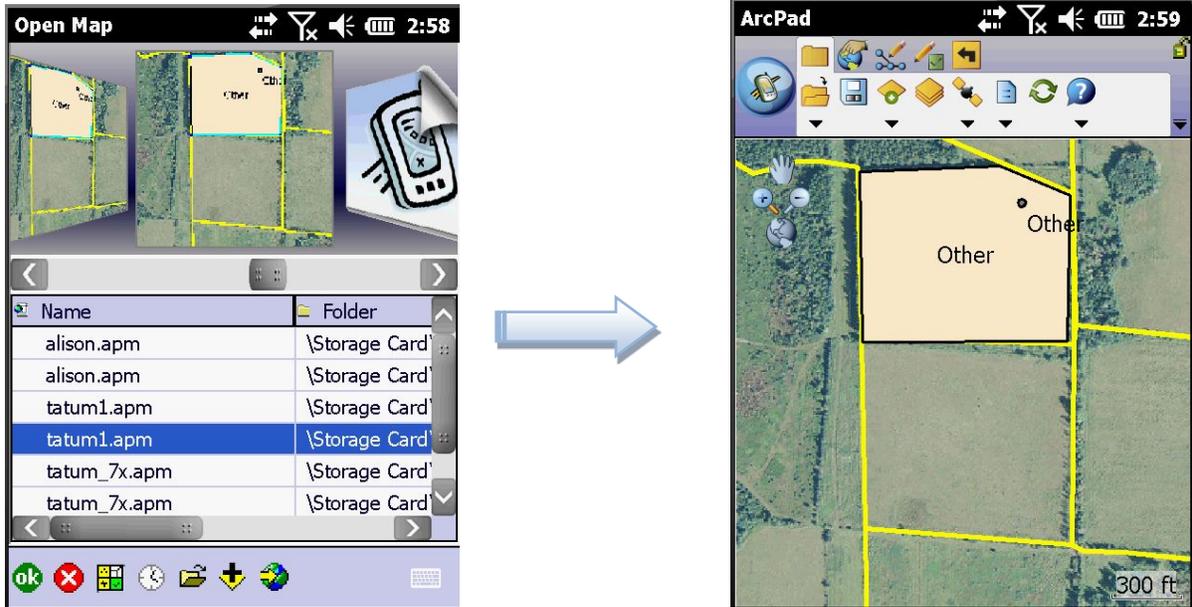


The “Choose map to open” shows the screen below. In this window, you can:

- **Click** on \*.apm file to open the map document for a customer folder transferred
- **TAP** the Browse “folder” icon  to look for other documents not listed on this page



Notice that once an ArcPad document is selected, a snapshot of that document is displayed in the upper area of the dialog box. Click **OK**. The PLU and other layers exported 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.



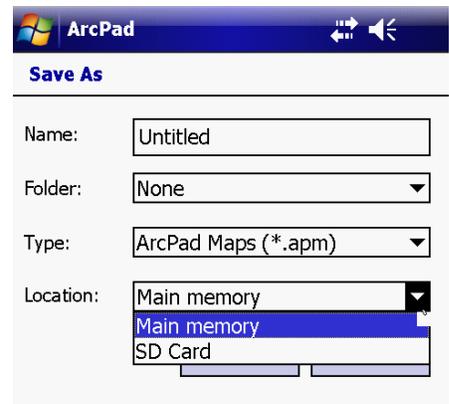
The Edit toolbar has tools to select a layer for capturing GPS coordinates, select features for editing, adding points, lines or polygon features to layers, and manipulate existing features.



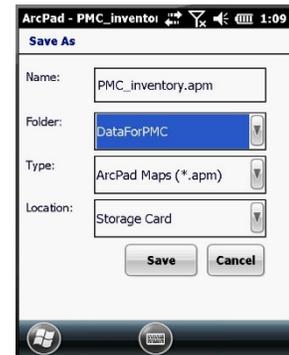
To save an ArcPad Document click on the drop-down arrow of the 'Open Map' icon, then select 'Save Map' or 'Save Map As' options



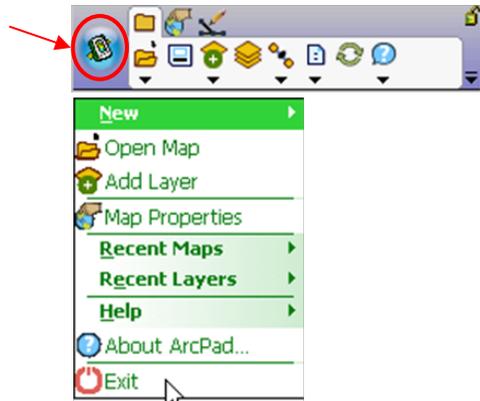
Be aware that the 'Save Map As' option offers the Geo7x's Main Memory as default storage location.



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. For instance, in the image on the right, the "Location" is set to *Storage Card*; "Folder" to *DataforPMC* and "Name" to *PMC\_inventory*. **TAP** Save. It will be saved with an *.apm* extension



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 may have a default solid color fill. That color fill can be changed either in ArcMap on your workstation prior to transferring a customer's folder to the Geo7x or in ArcPad using the following steps:

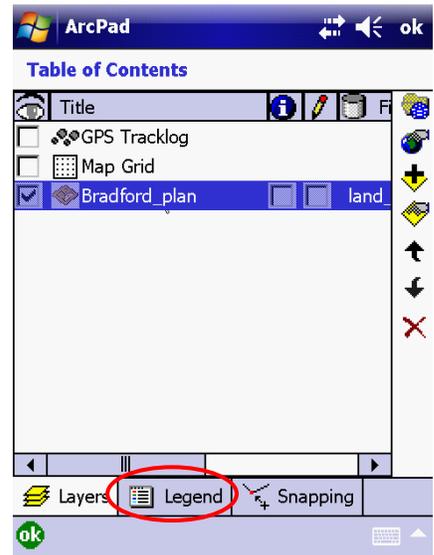
- **Tap** the 'Table of Contents' icon on the Main toolbar



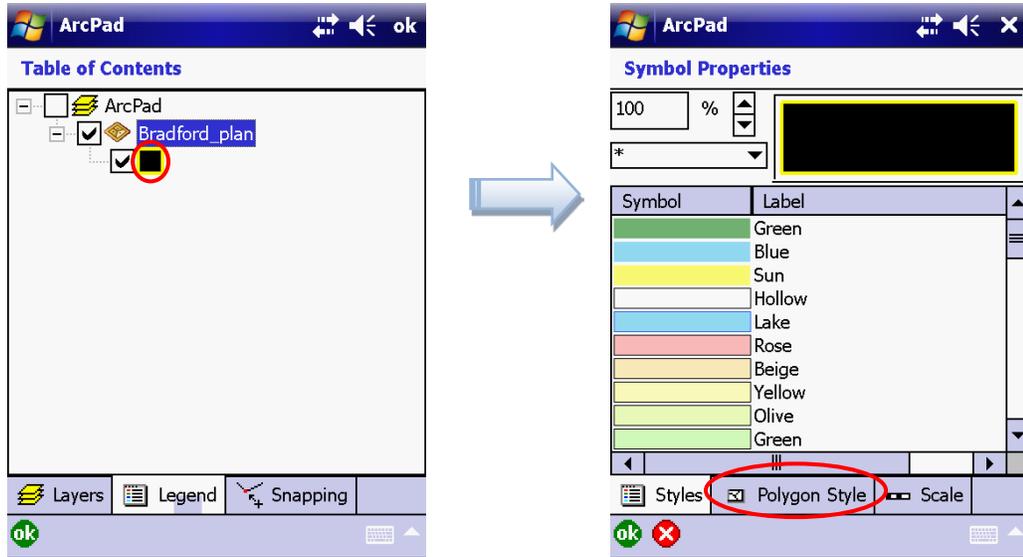
- Please note that the checkbox next to a layer's name in the first column of the Table of Contents allows you to turn on/off a layer in ArcPad's display window



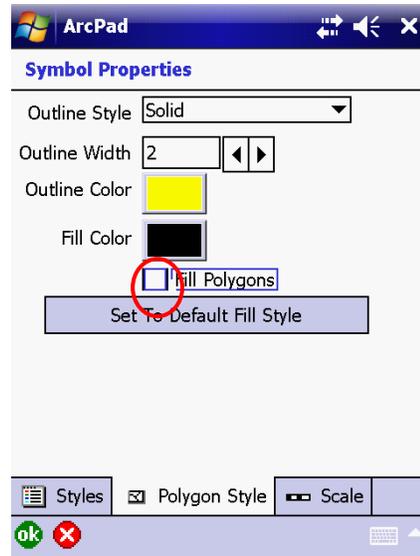
- In ArcPad's Table of Contents, select the PLU then click on Legend tab



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



- If the "Fill Polygons" checkbox is greyed out, click the "Set to Default Fill Style" button
- Uncheck 'Fill Polygons' , set outline to 2
- Click on 'Outline Color' symbol
- Select an outline color, if desired
- Click 'OK' to close 'Symbol Properties' and 'Table of Contents' dialog boxes
- Click 'OK' to exit Table of Contents



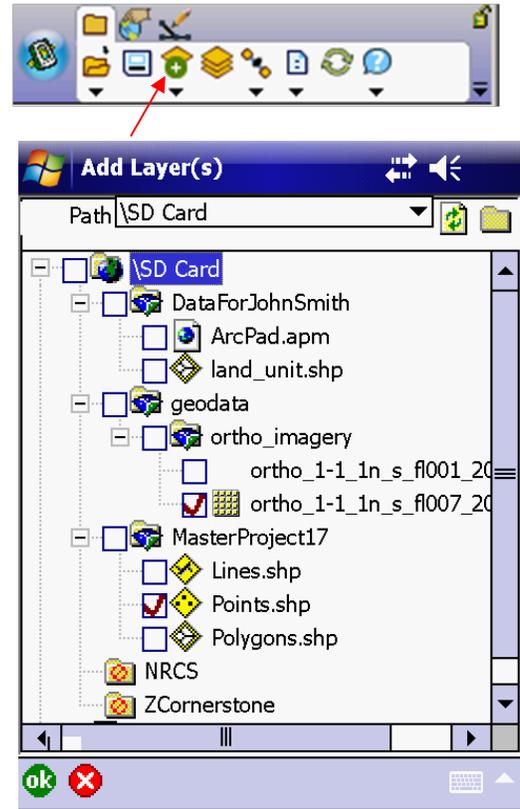
**Adding existing layers to map**

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 

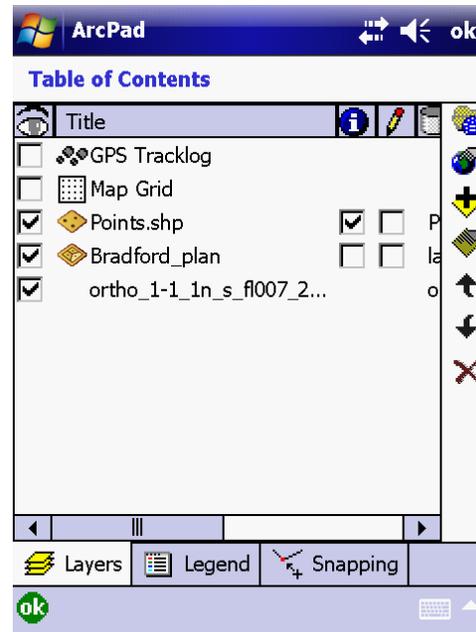
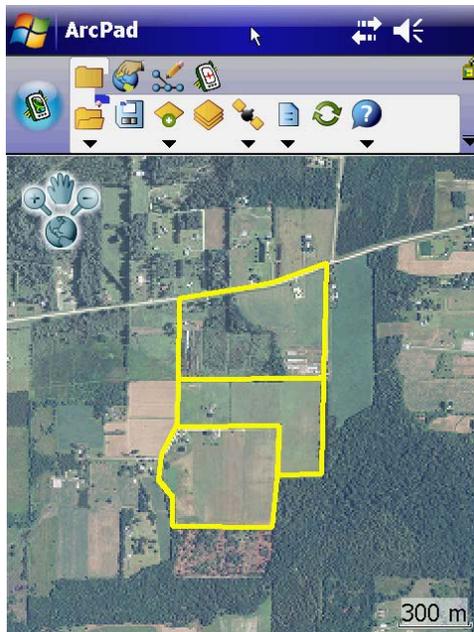
In the “Add Layer(s)” window, find the item or items you wish to add (you will need to **TAP** the “+” next to a folder to expand it). Check the box to the left of the desired item(s). The example at right shows a raster file and a points shapefile as selected.

**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

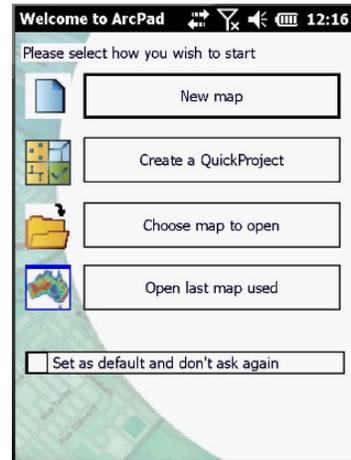


**PRACTICE: Complete Activity #3a in Appendix K**

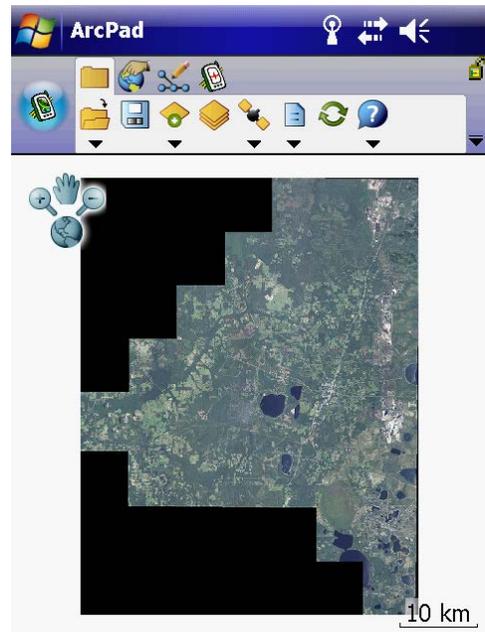
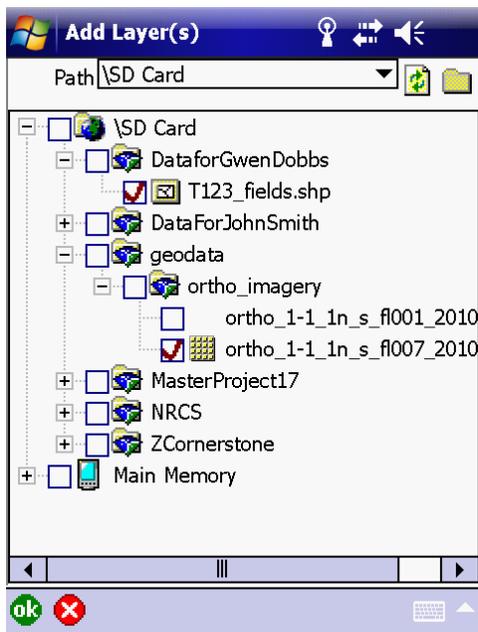
So far, we've started using ArcPad on the Geo7x using a map document (e.g. ArcPad.apm) previously created and stored in the customer folder. We've used tools on the Main toolbar to add layers, view the table of Contents and manipulate symbology.

Next, we'll consider the case where a customer folder has been created without using the ArcPad Data Manager, and therefore a default \*.apm file is not available.

Once that customer folder is transferred 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. Then choose "New Map". Additional features of ArcPad will be discussed.



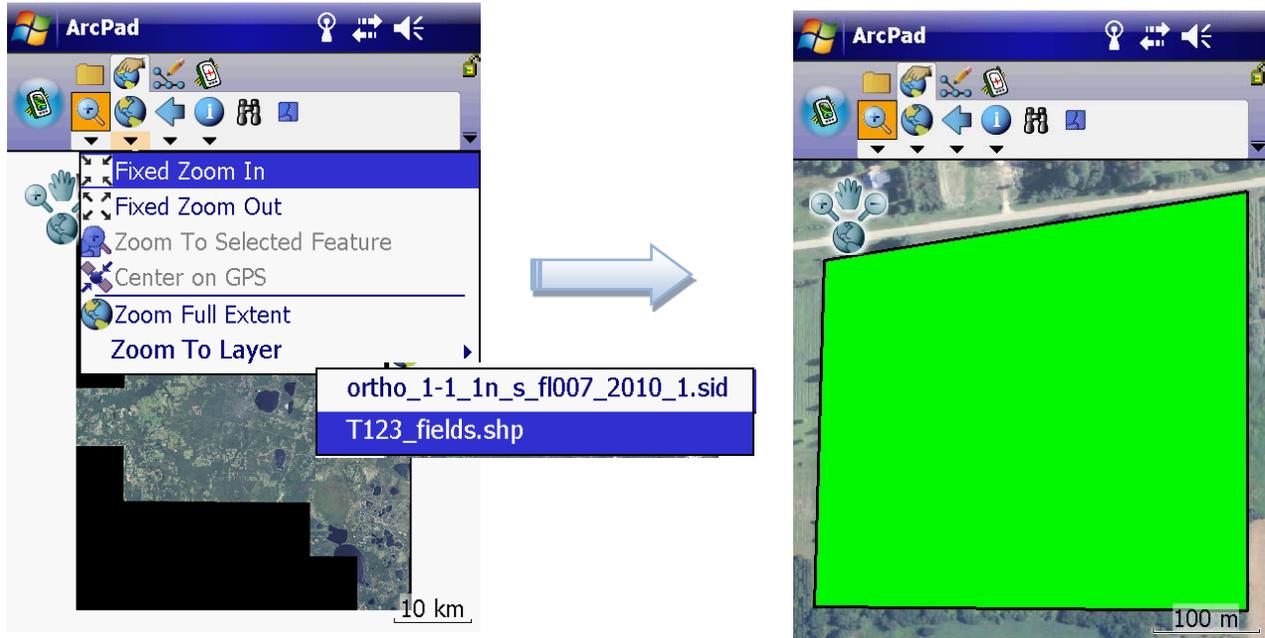
This will open a new ArcPad document into which the customer boundary shapefile and other layers can be added, as shown below. Click OK.



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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.



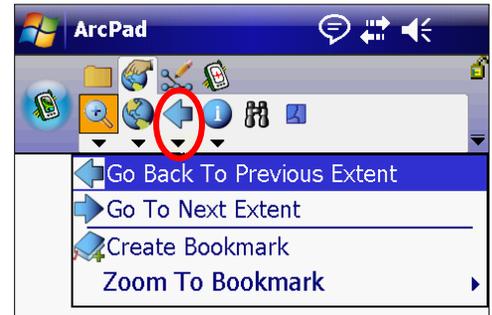
Manual Zoom options can be accessed from the Browse toolbar or the Map Navigator:



Manual Zoom Options on Browse  
Toolbar



Map Navigator



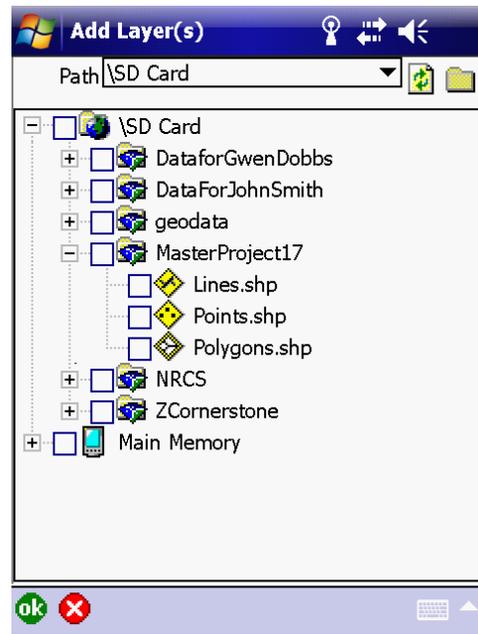
Previous Extent button has options  
to set or change geographic  
windows

**PRACTICE: Complete Activity #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.

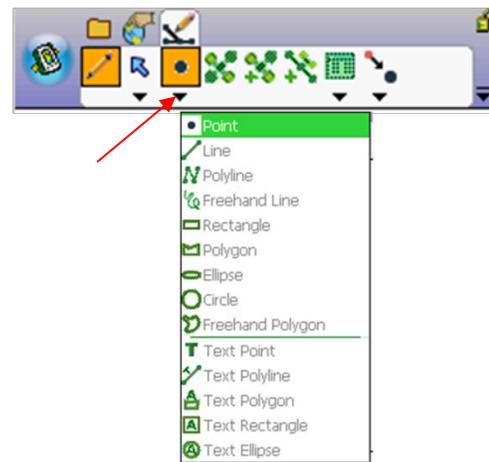
To do this, select the “Edit” toolbar. **TAP** the “Start/stop edit” pencil icon. **TAP** the desired layer to start or stop editing. A red box around the icon indicates it is in edit mode.



### ***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.

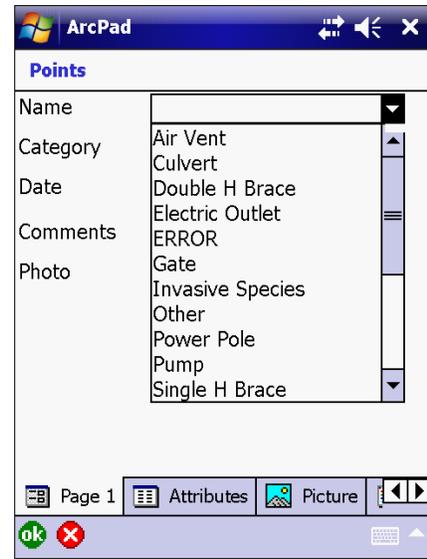
The icon should then change to the selected feature in an orange square.



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.).

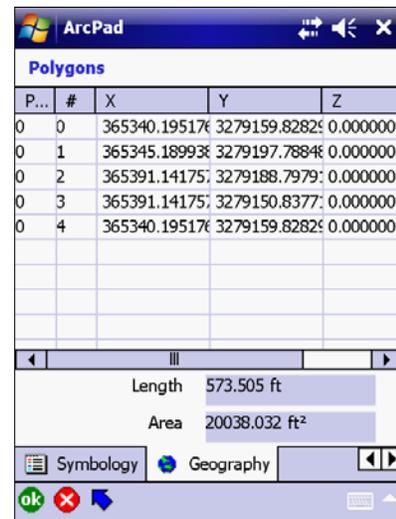
For a point, it will then bring up the form for you to enter related data (i.e. Name, Comments etc. - see example at right). Note that if the name of the feature collected is not in the customized list, users can select 'Other' for "Name" and enter proper description in the "Comments" entry.



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.

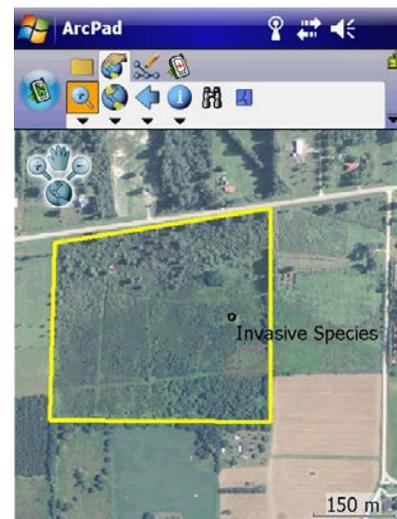
For line or polygon features, you can switch to the "Geography" page in the attribute form to view their length and/or area values.

**TAP** OK when finished entering data.



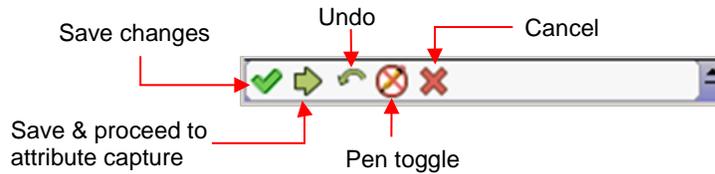
Note that after a feature is added to a shapefile from the MasterProject folder, it is shown on the screen along with a label based on the 'Name' attribute entered.

**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 at 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.

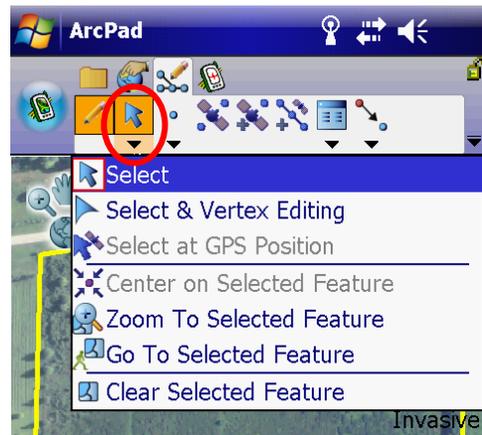
For a multi-vertex feature (e.g., polyline, polygon, etc.), select appropriate sketch tool from the Edit toolbar, **TAP** on the desired location on your map to start digitizing, continue adding vertices until you are done with that feature. To end the capture of that feature, **TAP** the big right arrow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

**Deleting features**

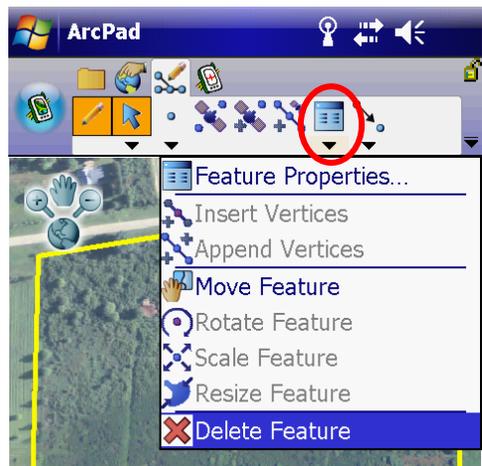
If you want to remove a feature, the shapefile that contains the feature to be deleted must be in the Edit mode.

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.



**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 ArcPad preferences. 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 Geo7x 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 Geo7x is turned on
2. Click GPS Controller on shortcut bar
3. Click SkyPlot -> Setup
4. Click on *GNSS Settings*
5. Set GPS Receiver Port-> COM3
6. IF AVAILABLE, Set Productivity/Precision scale bar to 50% (5<sup>th</sup> tic mark from left)
7. IF AVAILABLE, add checkmark to "Use Smart Settings" checkbox
8. Scroll down and set NMEA output -> ON
9. Click on wrench icon next to NMEA
10. Set Output interval -> 1s
11. Checkmark sentences: GGA, GSA, GSV, RMC
12. Click DONE to exit NMEA SETTINGS
13. Click DONE ( to exit GNSS settings)
14. Click Real Time Setting

15. Set CHOICE 1-> Integrated SBAS (Space Based Augmentation Service, e.g. WAAS)
16. Set CHOICE 2-> Use Uncorrected GNSS
17. Set Real Time Age limit -> 2 minutes
18. Click on wrench icon
19. Set tracking mode to auto
20. Click DONE
21. Click DONE to exit Real-time Settings
22. Click Setup -> Exit

## ArcPad Preferences

ArcPad can be used to set user preferences for GIS functions. If ArcPad is not already open, you can start the software as follows: select *Start > ArcPad 10.0* or tap the

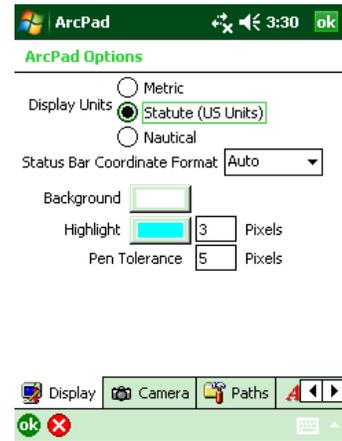
ArcPad icon  on the Home screen. Click on 'New Map' option.

To set up or check ArcPad options, tap the Options icon on the Main toolbar.



There are a few option screens that really need to be checked, including "Display", "Camera", and "Paths".

The "Display" screen comes up first. Recommended settings are shown on the image on the right, "Display Units" should be set to **Statute (US Units)**

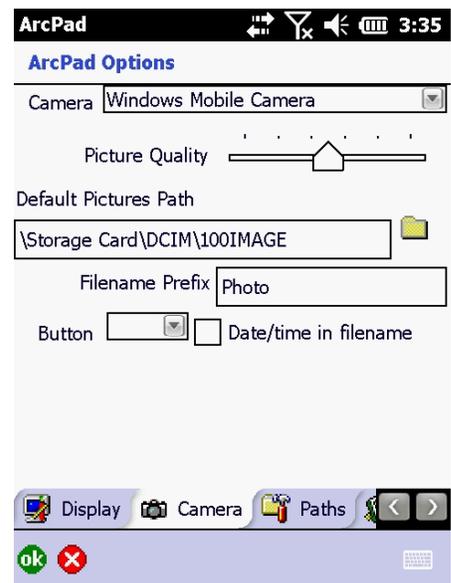


To switch to "Camera" screen, tap on "Camera" tab near the bottom of screen.

The "Camera" Application should be set to **Windows Mobile Camera**.

The "Default Pictures Path" should be set to **\Storage Card\DCIM\100IMAGE**. Note that you may have to type in this path if the DCIM directory is not available through the Browse folder listing.

The filename prefix is set to **Photo** by default. This means that photos will be saved with a name starting with that prefix followed by a number, e.g. *Photo\_0001.jpg*. In practice, it is more useful to replace the default prefix with a customer tag (e.g. customer's initials/last name or similar combination) to more easily identify the customer folder(s) on the workstation where such photos need to be transferred later on.

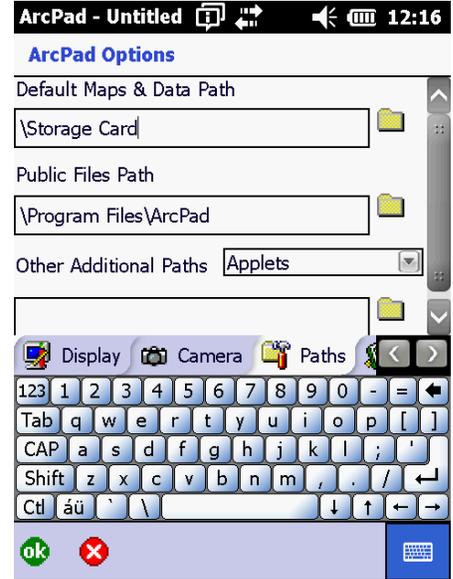


To switch to “Paths” screen, tap on “Paths” tab near the bottom of screen.

The “Default Maps & Data Path” should be set to **\Storage 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 **\Storage Card**.

The other values should be left as shown.

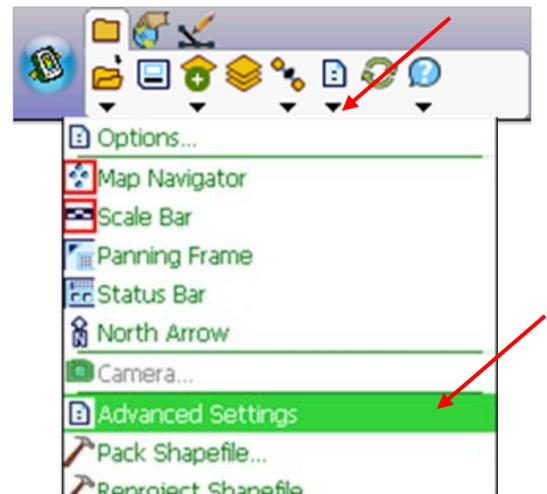
Tap the ok icon  in lower left of screen.

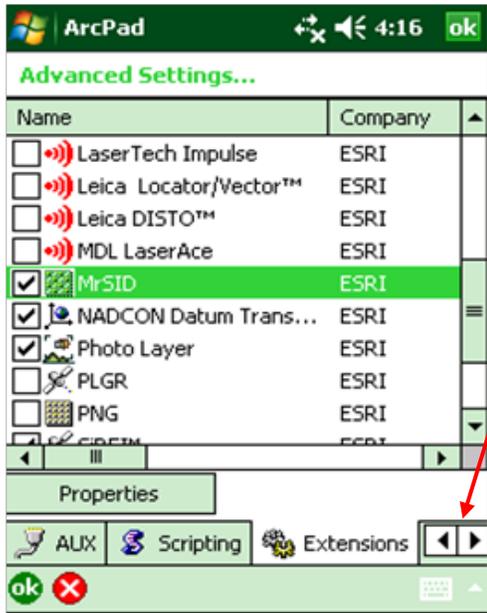


### ArcPad Extensions

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.

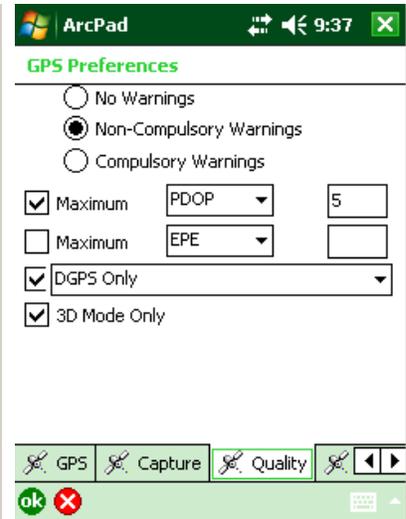
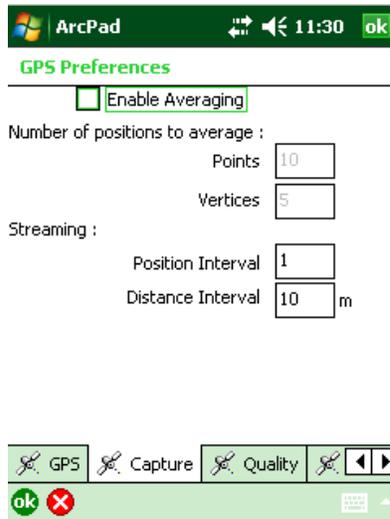
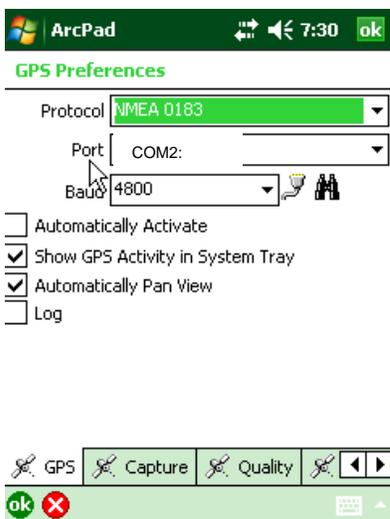
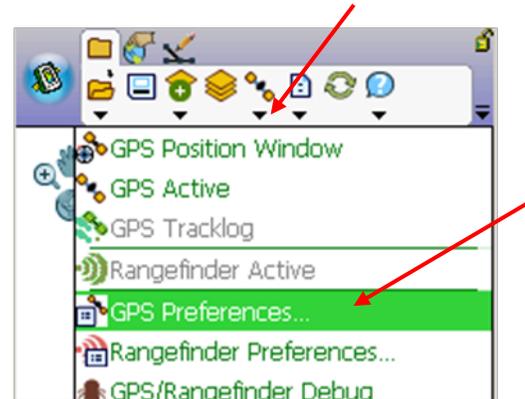
Tap the ok icon  in lower left of screen.

### 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:

**Geo7x : GPS** – Protocol: NMEA 0183 ; Port: COM2: ; Baud: 4800

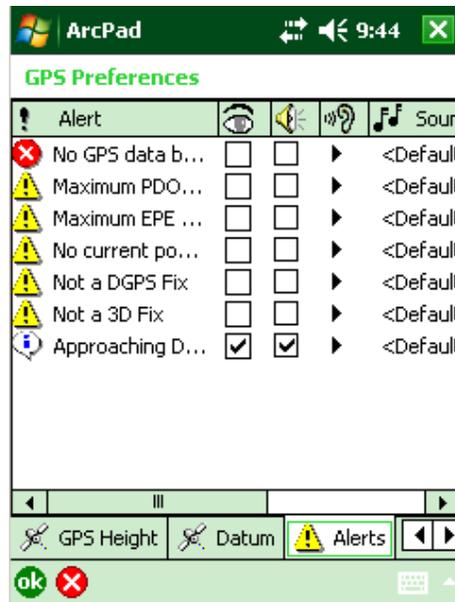
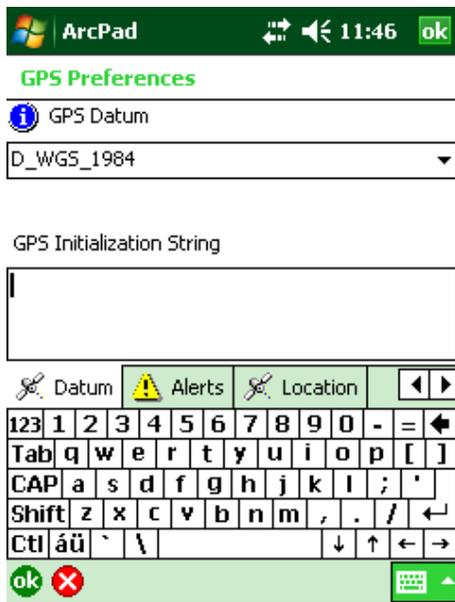
The **recommended** settings of items shown above are as follows:

- 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.

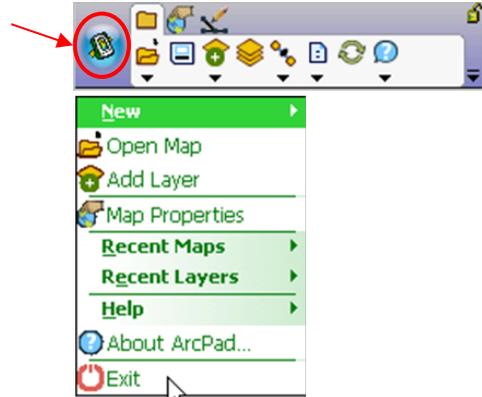


**Datum** – GPS Datum should be set to D\_WGS\_1984.

**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

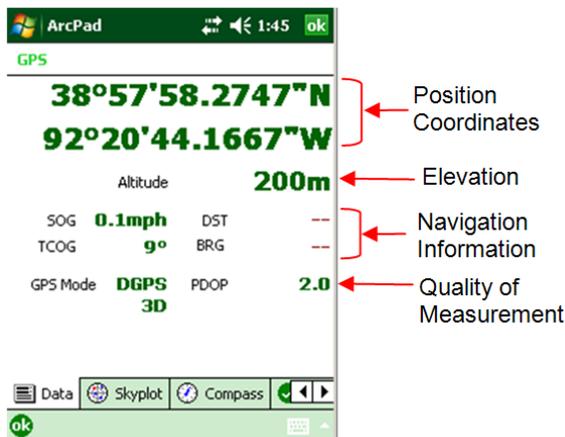
GPS collection standards are needed to ensure consistency in the method of collection, data quality, and the accuracy and repeatability of measurements.

### **Position Quality Indicators**

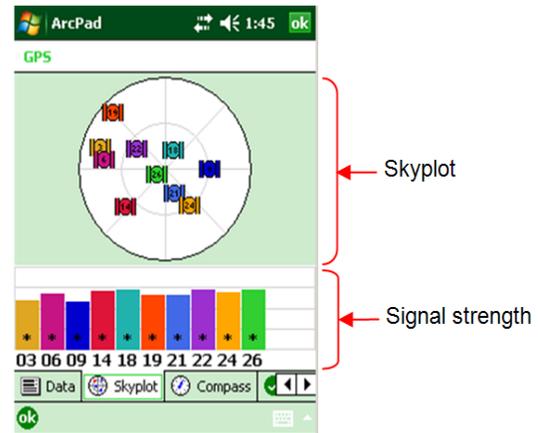
Several parameters are used to gauge the quality of position (QOP) provided by the Trimble Geo7x. These parameters include:

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 of 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

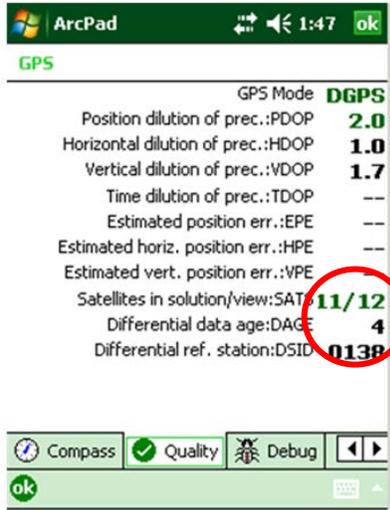


**Data Tab: Parameters 1 - 3**



**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.



Quality Tab: Parameters 5 - 6



GPS Controller-Skyplot: Parameter 7

### Positioning Standards

Guidelines for Positioning Requirements and Standards are listed in the following documents: GM 170 Part 400 Subpart D (35). 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 Geo7x, 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)

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. If a management practice is applied to an area easily identified on an orthophotograph (e.g. prescribed burning in a wooded lot clearly visible on an orthomosaic image), then the extent of that practice does not need to be delineated with GPS.

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

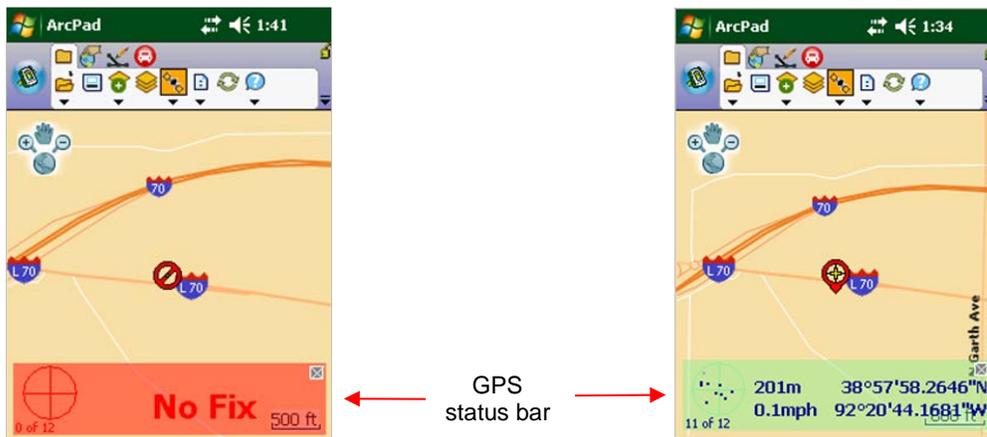
If needed, launch ArcPad on the Geo7x either using an existing map document (\*.apm) in the customer folder, or opening a new document and centering the view on the area of interest (e.g. PLU). For better screen refresh rates, you may want to turn off the imagery, especially when using countywide orthoimagery.

### ***Initiating GPS data collection***

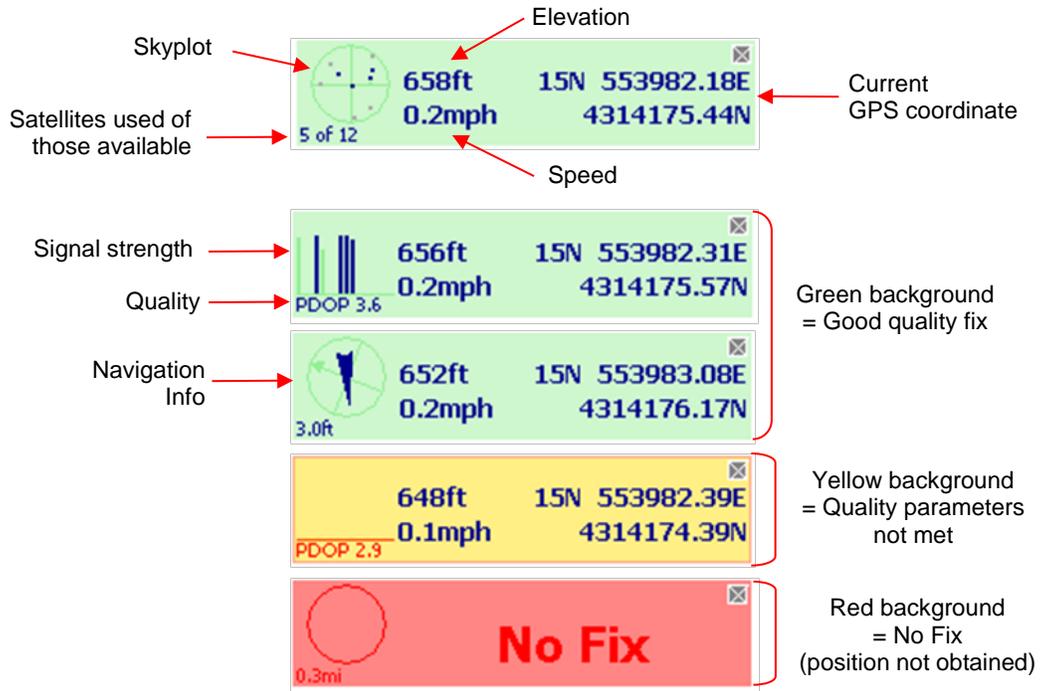
In order to record a feature at your current GPS location, you first need to activate GPS. Do this by **TAPPING** the “GPS Active” icon on the Main toolbar.



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

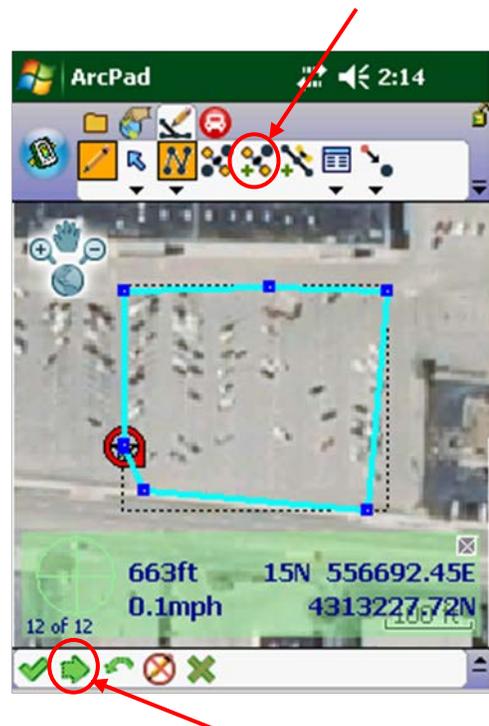
To capture a polyline, your screen might look similar to that shown at right. You are in polyline edit mode (pencil and polyline icons highlighted), you are at desired location, and GPS status bar is green with good quality info shown.

**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 in section “Device Settings for using GPS”.

The “Position Interval” setting is the number of readings received from the GPS receiver. Since the Geo7x 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 before GPS unit will capture the next vertex.

To start continuous positioning capture, **TAP** the icon and move. When you arrive at the last point of the feature (polyline) or next to the starting point (polygon), **TAP** the icon again to stop continuous mode.

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 or polygon.

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

Note that while in continuous mode, you can temporarily 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”. You can also move off the trail to capture nearby point feature(s) with the “GPS Capture Point” icon. To resume data collection in continuous mode, just **TAP** the appropriate icon when at the next position along trail.

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.

**PRACTICE: Complete Activity #7 in Appendix K**

### ***Using embedded camera***

The Geo7x comes equipped with a 5MP camera. There are two applications available for taking pictures: one is included in Windows Mobile and the other in ArcPad. However, this manual will focus on using the Windows Mobile application because it offers more flexibility to users, and is also be available through ArcPad. Let's jump to Appendix A for an in-depth look at recommended procedures.

**PRACTICE: Complete Activity #8a in Appendix K**

### ***Preparing for Practice Certification***

Make sure the Geo7x unit is fully charged before leaving the office. If a vehicle charger is available, use it to recharge the battery between sites.

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 '***Exporting Customer's field boundary with ArcPad Data Manager***' section above.

**PRACTICE: Complete Activity #8b 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 Windows Mobile Device Center software. The details of connecting your device and copying files were given earlier in the section “Overview of Windows Mobile Device Center”. You should refer to that section for detailed steps. A 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. Windows Mobile Device Center will activate. Click [“Connect without setting up your device”]. The device will connect as a “guest”.
5. On the WMDC window, select “File Management” on the menu. A Windows Explorer session will launch. Navigate to the root level of the SD card
6. Open another Explorer Window on your workstation and copy the MasterProject<utm\_zone> folder from SDCard to your workstation’s **C:\Users\<first name.last name>\GPS\_data** folder. If you have made any changes to the PLU delineation on the Geo7x, you need to also copy the customer’s folder back to the same target directory on your workstation
7. If you have captured any photos or videos documenting certified practices, use Windows Explorer to navigate to the SD Card folder where such files are stored: **\Trimble Geo 7X handheld\Storage Card\DCIM\100IMAGE**. Copy and paste those files to the customer folder where images will be transferred. Such folders are located either in **C:\Users\<first name.last name>\GPS\_DATA** folder (if Toolkit is not available) or under **C:\Users\<first name.last name>\My Customer Files Toolkit**. See Appendix A for more details.

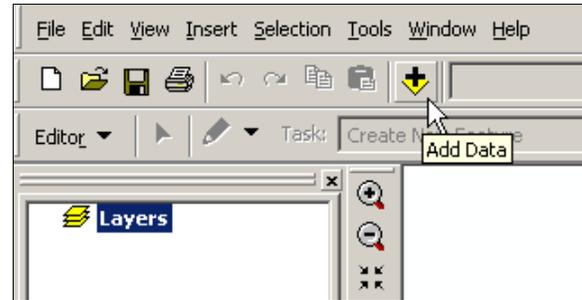
### ***Using the Data***

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 instructions on importing GPS data. 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 their respective Help resources.

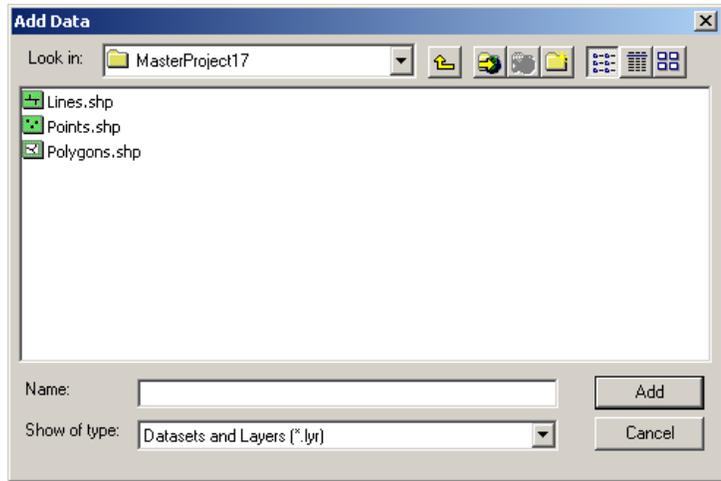
**Incorporating features from Geo7x into ArcGIS**

Open an ArcMap document, then if the property boundary is not already in view, load that shapefile from the customer folder (i.e. Datafor<customer\_name>):

1. Click the “Add Data” icon on the toolbar to select the property boundary layer.
2. Use Zoom options to bring that layer into the center of the Data View,



If Toolkit is available, open any ArcMap document in the customer folder and the data frame will be centered on the Case PLU. 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):



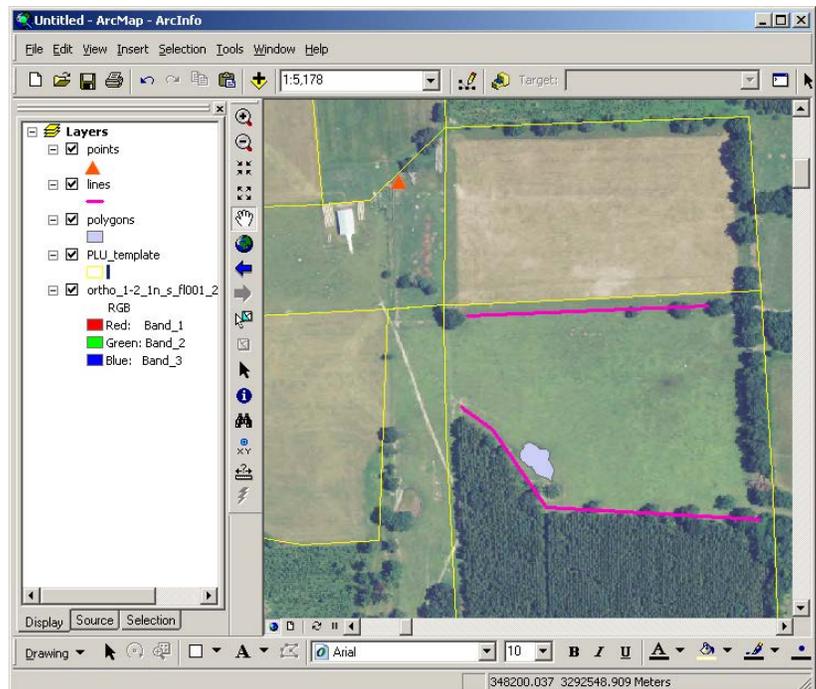
On the ArcGIS button bar, click ‘Add Data’. Navigate to the MasterProject<utm\_zone> folder.

Select appropriate shapefile(s) and click [Add ].

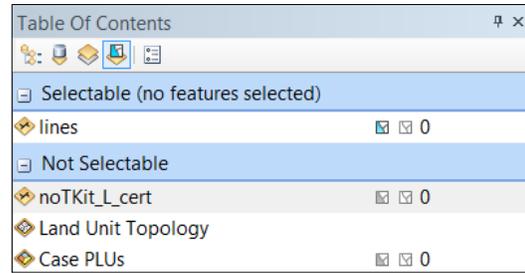
The shapefile(s) will be added to your table of contents and be available to use in whatever way you desire.

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, make sure each source layer (i.e., points.shp, lines.shp, or polygons.shp) is the only selectable layer in Table of Contents by clicking the

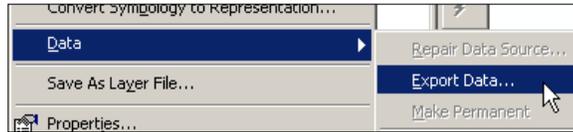


'Selection' tab and ensuring that the source layer is the only one listed in the 'Selectable' category.

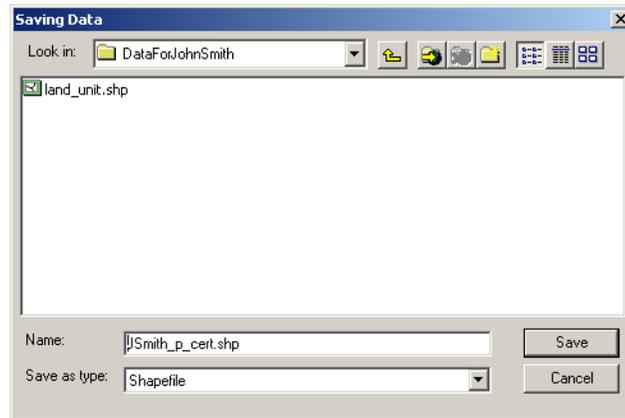
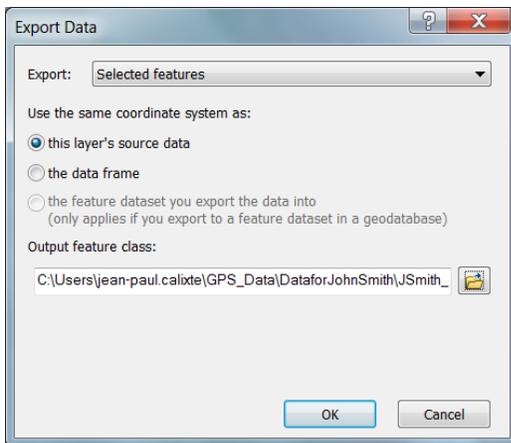


Select the desired features using standard selection tools and techniques (e.g., using the 'Select Feature(s)' tool, click on individual features or draw a window around a group of features; using Query tools, select feature(s) based on attributes, etc.).

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



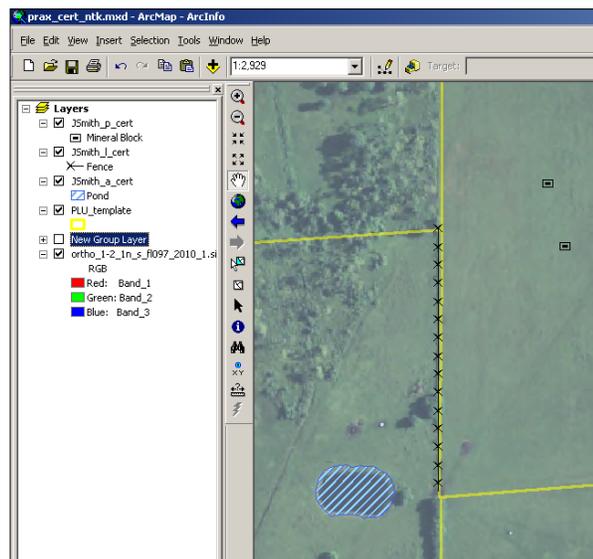
Choose "Selected features" for Export. Select coordinate system to match the layers' source data and specify the customer folder (either in **C:\Users\<<first name.last name>\GPS\_DATA\Datafor<customer\_name>** folder (if Toolkit is not available) or under **C:\Users\<<first name.last name>\My Customer Files Toolkit\<customer\_folder>\Resource\_Maps**) 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.

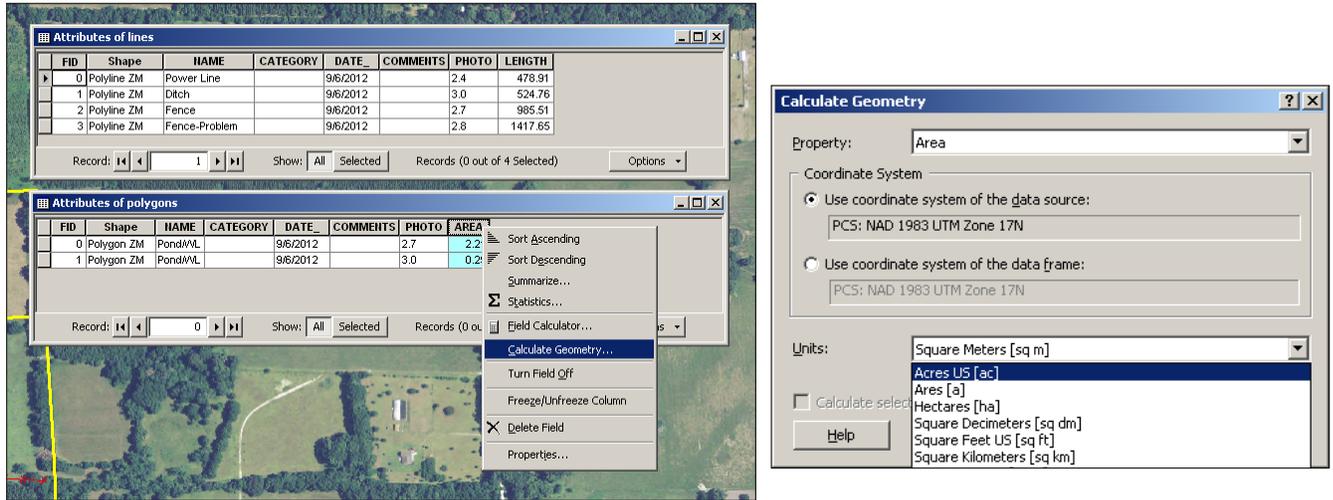
Example of ArcGIS shapefiles with GPS data



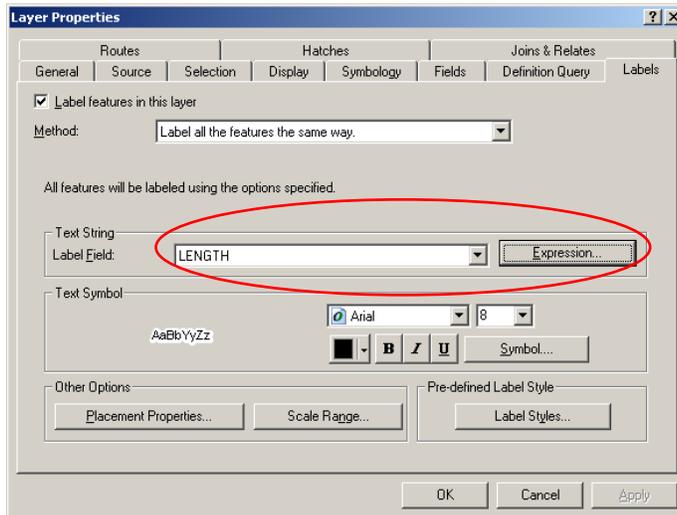
**PRACTICE: Complete Activity #9a in Appendix K**

## Updating Attributes and Labels

Next, you will need to calculate length and area of certified practices features in those line and polygon shapefiles you've just exported. 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 Geo7x data and can be used as map labels.



Right click on 'Area' or 'Length' field and select 'Calculate Geometry'. Then, set **Property** and **Units** to be calculated

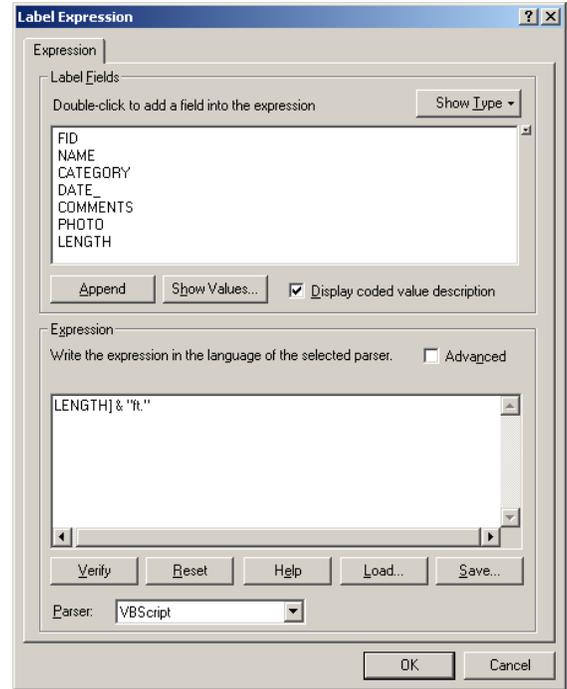


To create map labels from those measurements, open the 'Layer Properties' dialog box of a shapefile (double click on layer name in Table of Contents), click on the 'Labels' tab and select the field to use as label and other formatting parameters. Make sure the 'Label features in this layer' checkbox has a check mark.

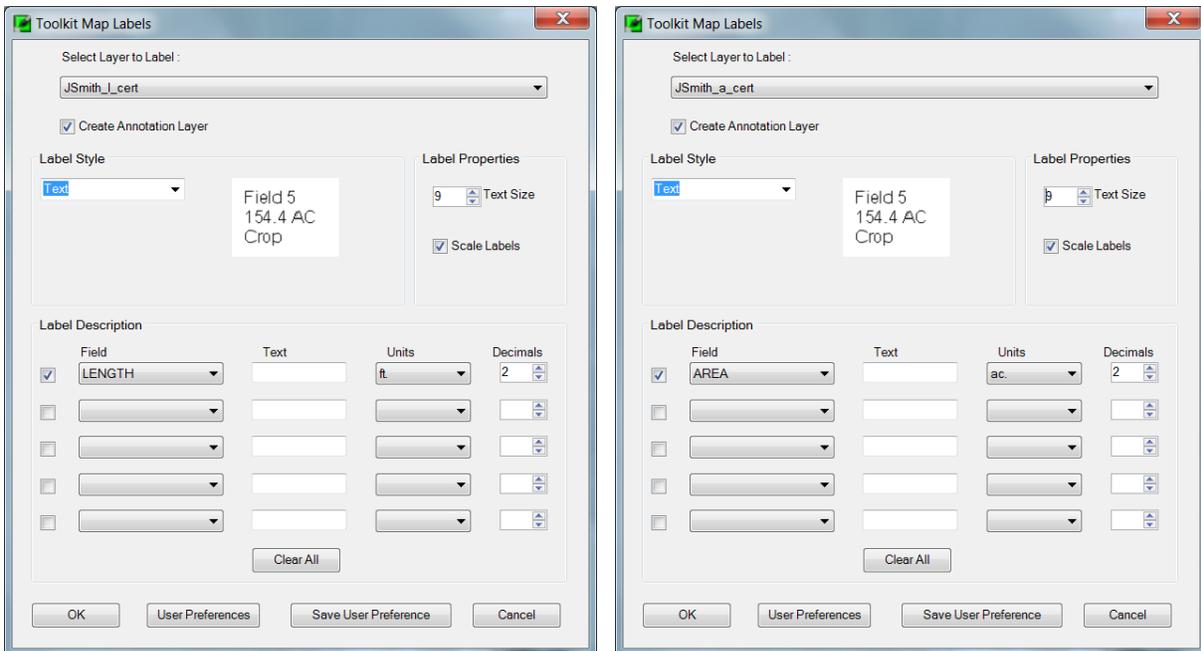
You should also add the units of measurements as part of the label. This can be done by clicking on the “Expression” button next to the Label field and appending the appropriate units of measurement within double quotes preceded by an ampersand (e.g.: & “ft.”).

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

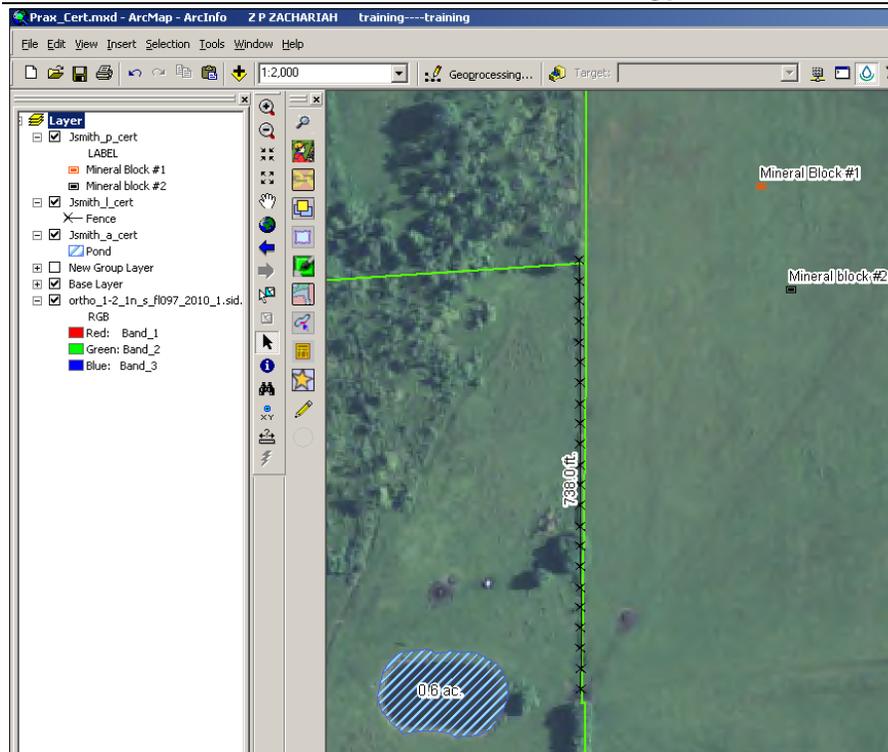
Click on *Apply* in the Layer Properties dialog box to check your labels. You may further edit your map labels as needed and click on *OK* when done to close the Layer Properties dialog box.



If Toolkit is available, the *Map Labels* tool can be used to create labels on the screen display along with units of measurements.



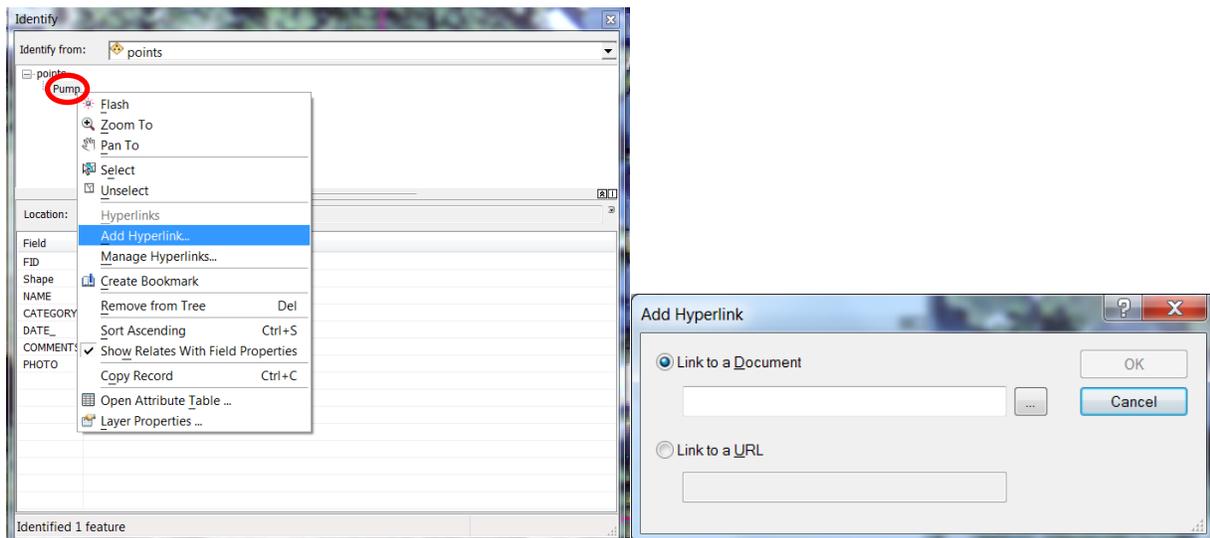
Such labels can be further edited using the *Properties* dialog box of selected elements in ArcGIS.



Example of map labels for practice certification map

### Adding a Hyperlink for Pictures

Once pictures are copied into a customer folder, you can create a hyperlink to display those pictures in ArcMap. The first step is to display layer(s) with features that have been photographed in the data frame. Then, use the Identify button to click on the feature to be linked with a photo. In the Identify dialog box, right click on the attribute listed for that feature and select 'Add Hyperlink'. Navigate to the location where the pictures are stored to select hyperlink target. Then the Hyperlink tool  on the Tools toolbar can be used to view hyperlinked photo(s) by clicking on a desired feature.



**PRACTICE: Complete Activity #9b in Appendix K**

## Developing a Practice Certification Map

After exporting the GPS data into individual shapefiles, choosing appropriate cartographic symbols to represent features, and developing map labels, you need to create 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).

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 name of the person who completed practice certification and date must be listed on the map. If you're using Toolkit, the 'Map Products' button is an excellent tool to produce such a map. Otherwise, the layout view of ArcGIS offers several tools to create and arrange different cartographic elements.

The initial values of QOP indicators recorded in the field should be included in a text box. In Toolkit, the 'legal description' box in the 'Map Products' dialog box can be used to enter initial values of QOP indicators.

Once the layout is created on the display, remember to **remove** the "Legal Description" expression from the QOP text box before printing your map

Consider using the National NRCS Conservation Practice Symbol stylesheet to represent certified practices to the extent possible. 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.

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

**PRACTICE: Complete Activity #10 in Appendix K**



## Appendix A – Using Camera/Video Application

This appendix contains two sections that describe how to capture photos with Windows Mobile outside of GIS, and within ArcPad where photos are associated with a geospatial footprint.

### ***Using the Camera Application with Windows Mobile***

Press camera button in center of keypad to launch camera or video application. If that button has been programmed for a different task, click on START > Pictures & Videos > Camera.

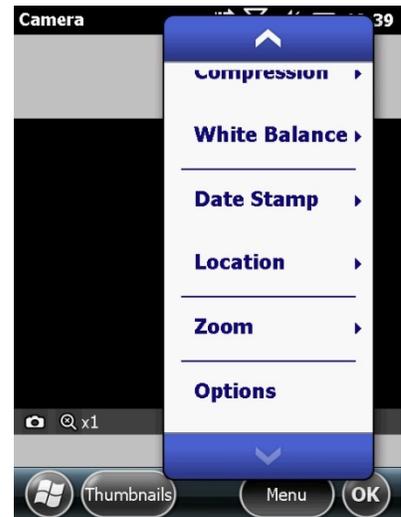
When the camera application is started, it is by default in 'Still' (photo) mode.



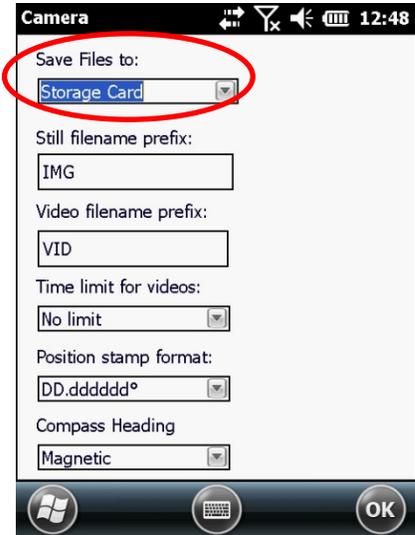
### **Adjusting the camera settings:**

The following steps typically need to be done once. To access the camera settings:

1. Start the camera application and then tap Menu.  
The available camera settings are displayed in a list.  
**NOTE:** The list of available settings varies depending on whether you are in Video mode or Still mode. You will tap the required setting to change the current value as indicated in the next steps.
2. Set **Date Stamp** to 'ON', and **Location** to 'WaterMark'.
3. You may want to set the **Resolution** to a setting lower than 5MP (e.g. 2MP or 3.2MP) if there's a concern about size of images.



4. Click on **'Options'**, you will be presented with a set of additional options for storage location, file naming, location format etc.
5. Set the 'Save files to' option to Storage Card. Your pictures and videos will be stored in the following directory: **\Trimble Geo 7X handheld\Storage Card\DCIM\100IMAGE**. This setting will facilitate transfer of images and videos from the storage card to specific customer folders on your workstation, as explained at the end of this appendix
6. Other options can also be set according to user preferences (e.g. position stamp format, filename prefix etc.)
7. Click OK to exit 'Options' menu



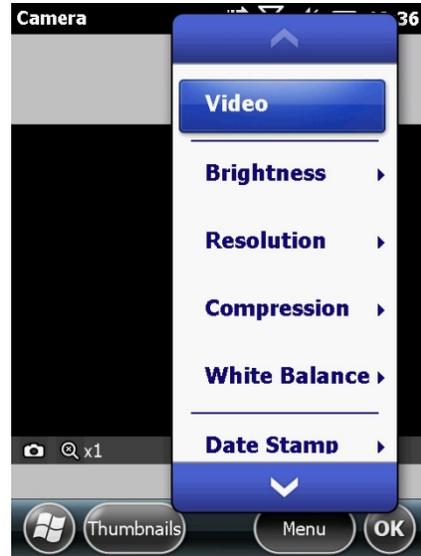
**To capture a photo:**

1. Press the Camera button on the keypad
2. Hold the handheld steady. Use the preview window to frame the subject in the center of the frame.
3. To focus, tap the preview window. A white box appears, which then turns green. If you do not tap the preview window, the camera assumes that the distant focus (that is, targets > 1m or so away) is OK, and it does not autofocus.
4. To capture the photo, press and release the Camera button. If you have set the camera to add a location stamp to your pictures, you need to wait until the lat/long values are displayed in the bottom right corner of the preview screen before capturing photo.



**To capture a video:**

1. Tap the Menu button and then select Video.
2. Use the preview window to frame the start of the video
3. To start recording, press and release the Camera button. Move the handheld to record the video.
4. To pause recording, tap Pause.
5. To stop recording, tap Stop or press the Camera button.



When the camera application displays, it is storing the photo or video file. Removing the battery or the memory card while recording may affect photos / videos or damage the memory card.

To switch to 'Still' mode from Video mode, tap Menu and then select 'Still'.

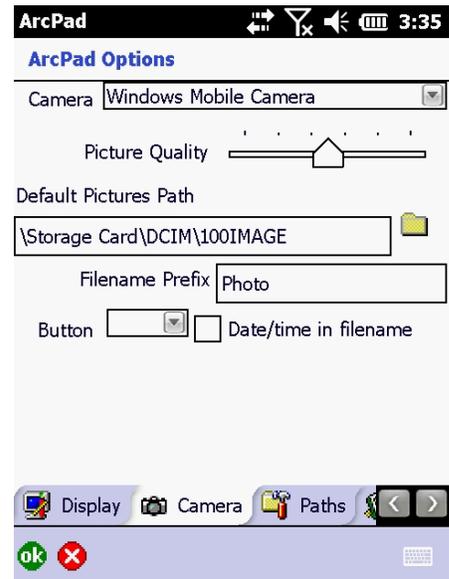
**Using the Camera Application with ArcPad**

ArcPad allows users to take pictures as standalone photos or as photos linked to geographic features. In order to maintain consistency in the storage and management of picture files, this section will focus on the process of capturing standalone photos with the QuickCapture toolbar. This process creates a photo layer in ArcPad (on the Geo7x) with points indicating location of photos on the landscape. When transferred to a workstation, those same photos can be hyperlinked to features included in resource inventory or practice certification datasets in ArcGIS.

**Adjusting the camera settings:**

Camera settings in ArcPad should be set according to instructions presented in the **Device Settings for using GPS** section. The image on the right shows the basic settings as a reminder.

Remember that the filename prefix is set to **Photo** by default. This means that photos will be stored on the SD Card with a name starting with that prefix followed by a number, e.g. *Photo\_0001.jpg*. In practice, it is more useful to replace the default prefix with a customer tag (e.g. customer's initials/last name or similar combination) to more easily identify the customer folder(s) on the workstation where such photos need to be transferred later on.



**To capture a standalone photo:**

1. Launch ArcPad and open a new or existing map
2. Click on the QuickCapture toolbar
3. If you want to capture a photo at current GPS location, click on the dropdown arrow and select the Camera tool.

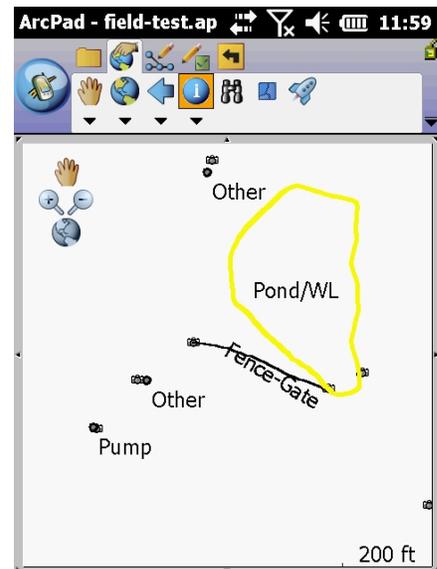


4. Once target comes into view follow instructions in the **Using the Camera Application with Windows Mobile** to take a photo.

5. ArcPad will place a camera symbol  on the screen indicating location of picture. That symbol can be used to view information about the photo with the 'Identify' tool 

or to view the actual photo by selecting the 'Hyperlink' tool (available on the drop-down menu for the 'Identify' tool)  and clicking on a camera symbol

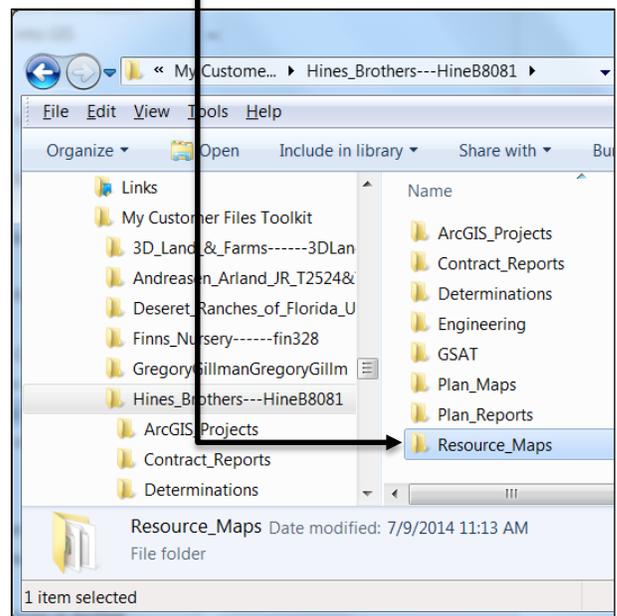
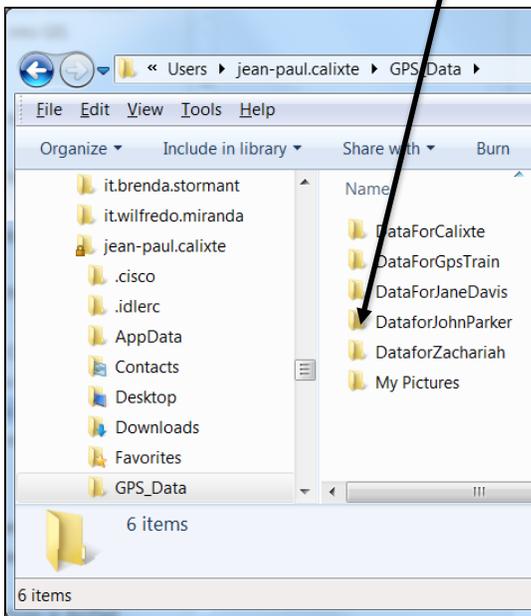
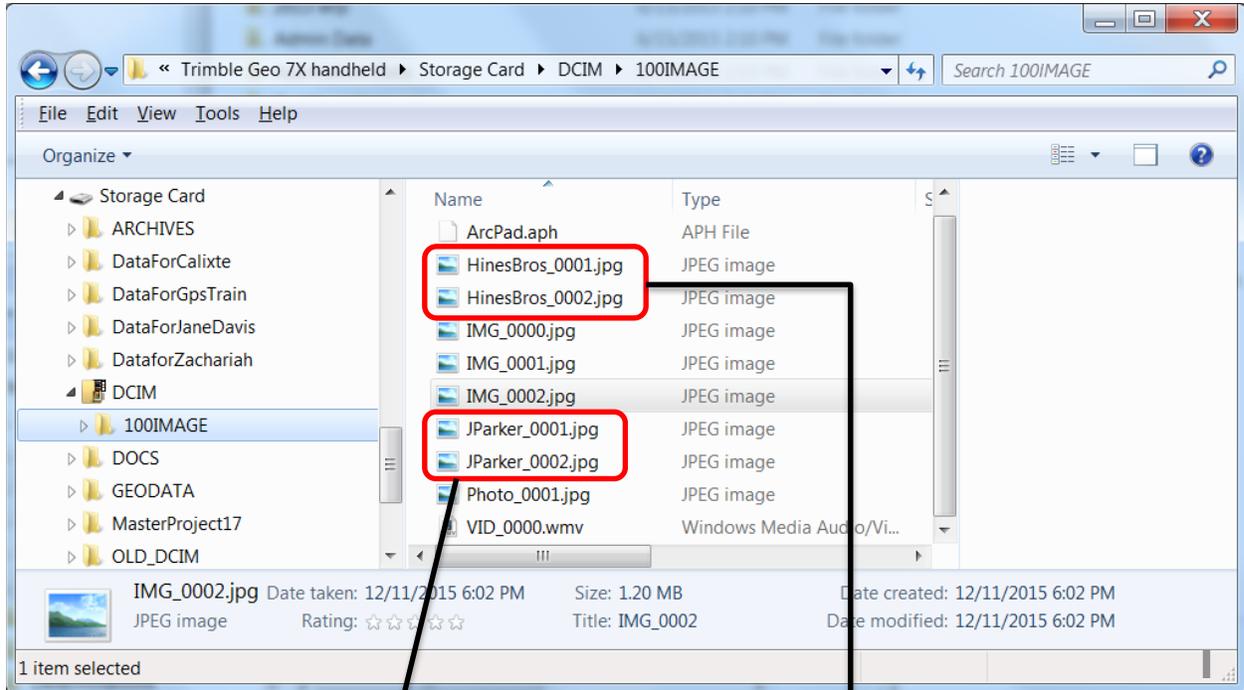
6. The 'Photo Point' option allows users to tap the map location representing the photo on the Geo7x screen and launch the camera tool. This option may be useful for resource inventory activities when GPS signals are not available or access to a location is restricted and an orthomosaic allows planners to identify the location of a feature on screen.



**To transfer pictures and videos:**

1. Connect the Geo7x to your workstation
2. Open a Windows Explorer session on your workstation and navigate to the storage location of pictures and videos on your handheld device.
3. Open another Windows Explorer session and navigate to the customer folder where images will be transferred. Such folders are located either in C:\Users\<<first name.last name>\GPS\_DATA folder (if Toolkit is not available) or under C:\Users\<<first name.last name>\My Customer Files Toolkit. The Resource\_Maps subdirectory in Toolkit can be used for that purpose. See diagram on the following page.

4. A Photo viewer or Media Player application may also be used to view/verify content of images before transfer to workstation.
5. Copy and Paste selected photos from the handheld to your workstation.
6. Be sure to delete photos that are no longer necessary to maintain on either device.



## 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.



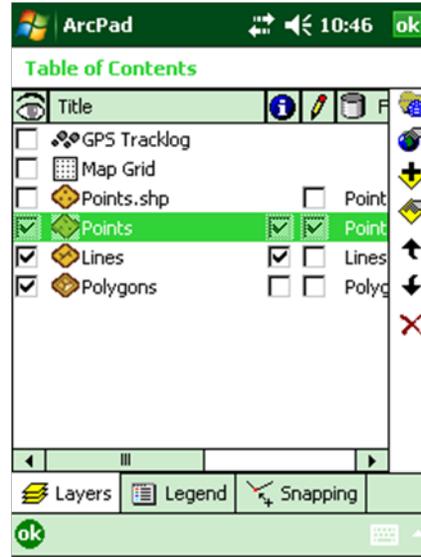
### Layers

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 feature type for editing.



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

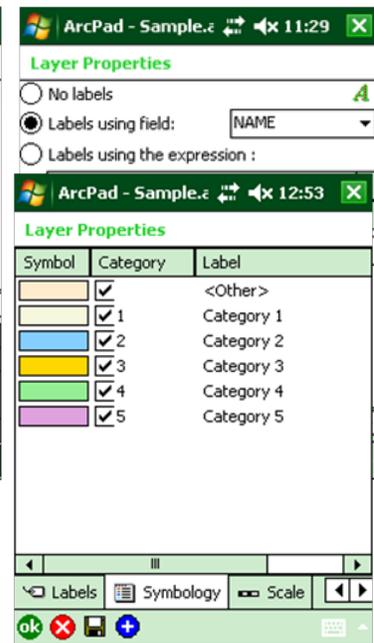
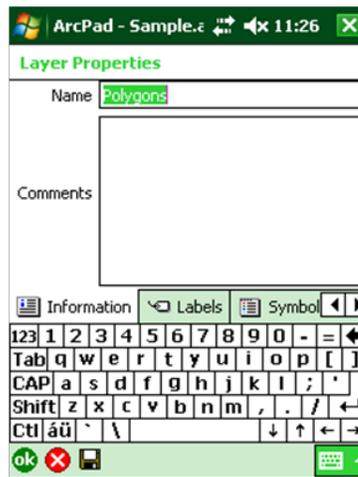
The functions of the side toolbar are shown at right. The bottom four icons are layer specific and require you to select a layer before the icon is active.

### 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.

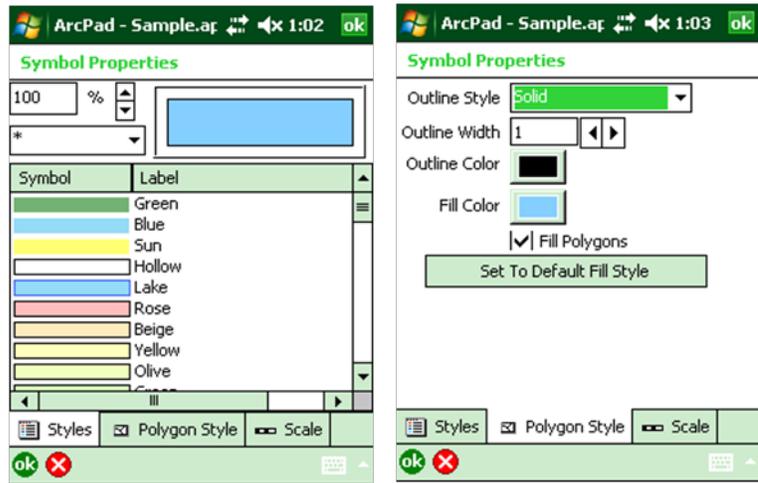
A screen with three different pages will then display.

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.

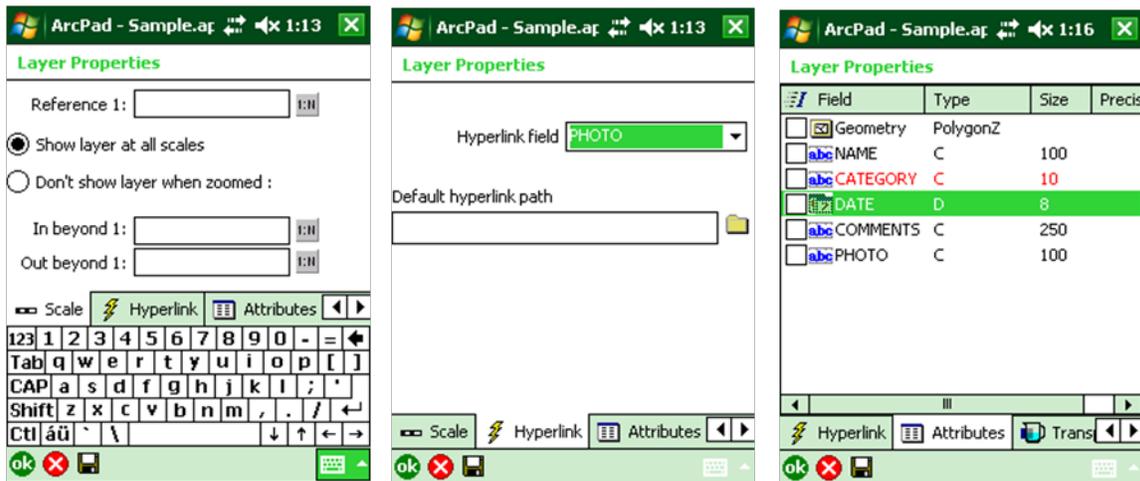
If the options are grayed-out, you will need to **TAP** on the “Set to Default Style” button and then you should be able to change the settings.

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

**TAP** OK when done with your changes.



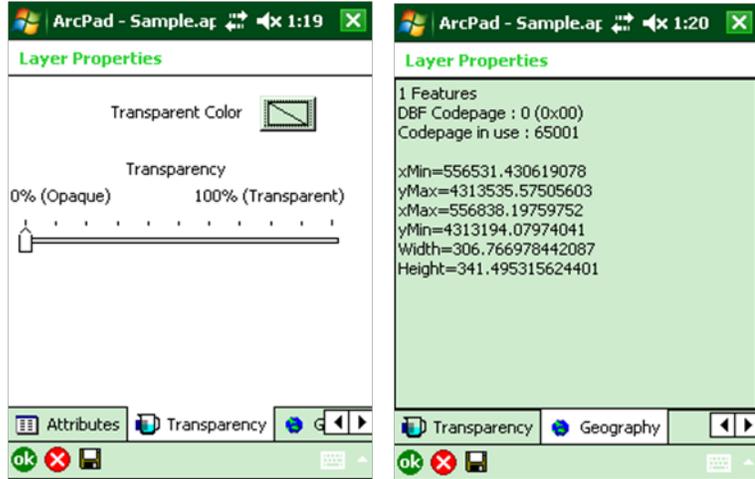
Use the “Scale” page to set visibilities at different scales. The “Hyperlink” page is used to specify a field to be a hyperlink field. The “Attribute” page is basically for viewing the attributes of the layer and to manage indexes.



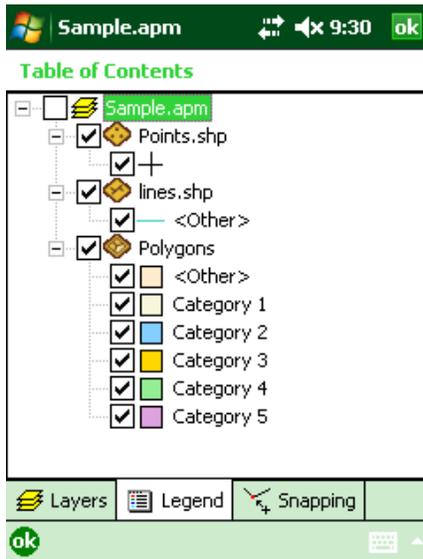
The “Transparency” page can be used to specify a particular color as being transparent.

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.



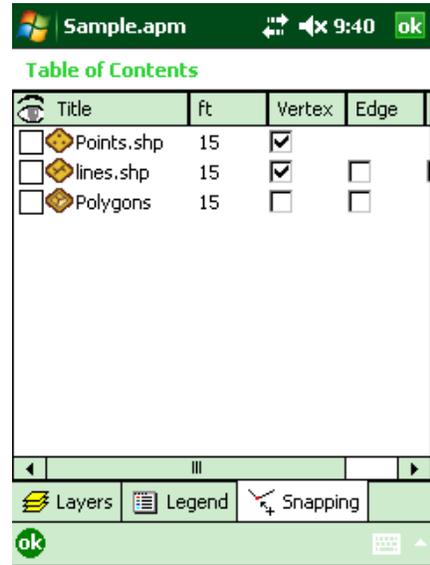
### Legend and Snapping



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.

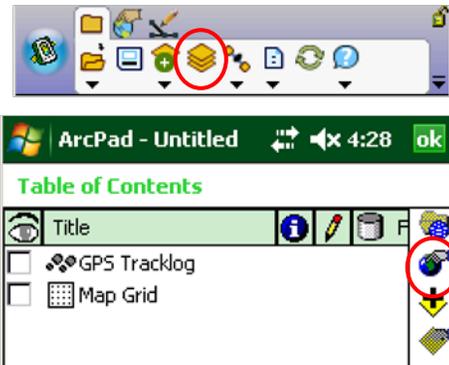


## Appendix C – Projections in ArcPad

### *Projections*

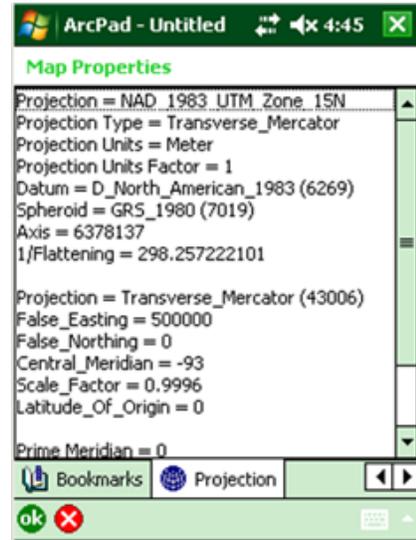
The first thing you need to be aware of when starting a new map is the projection you wish to work in (e.g. UTM NAD 83-Zone 16N-meters or UTM NAD 83-Zone 17N-meters). ArcPad, unlike ArcMap, can only use one projection for a map. This means that any layer you create or add needs to be in the same projection 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.

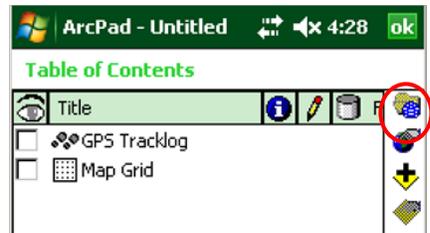


- Use the right arrow button near the lower right corner of screen to scroll to the right and select the “Projection” tab. This will show the information for the current projection selected.

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

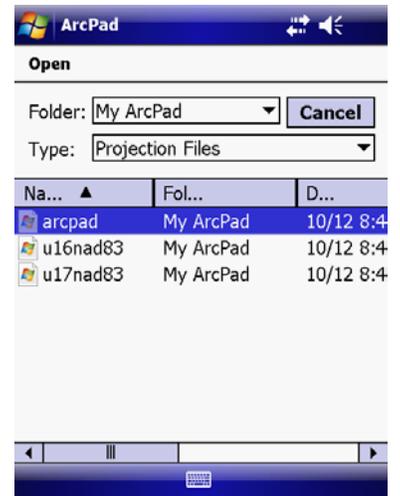


- Trimble Geo7x units in Florida have been updated with projection files (arcpad.prj) set to the appropriate UTM Zone where Service Centers are located. If you need to change the projection, **TAP** the top icon (“Select Projection”) on the toolbar at right side of screen.



- 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.



- 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)

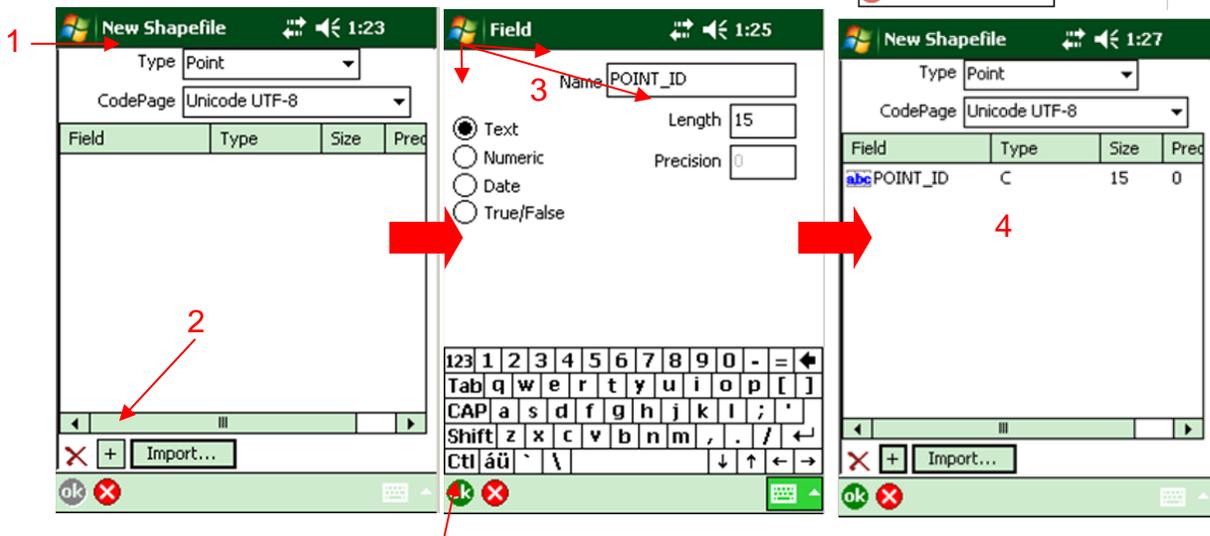
Some of these, but not all, are discussed in this document.

### **Create a new shapefile on the device**

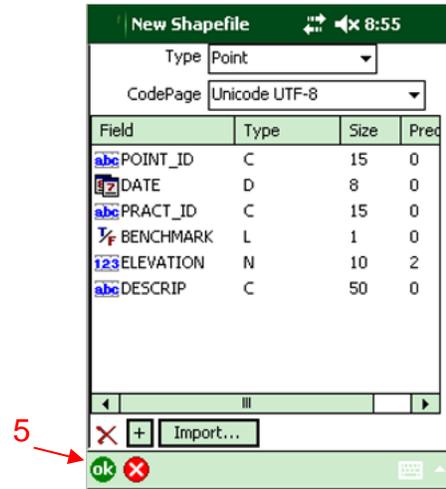
To create a new shapefile, **TAP** the drop-down arrow below the open folder icon on the Main toolbar.

Select *New > Shapefile*

The new shapefile window will appear (see below).

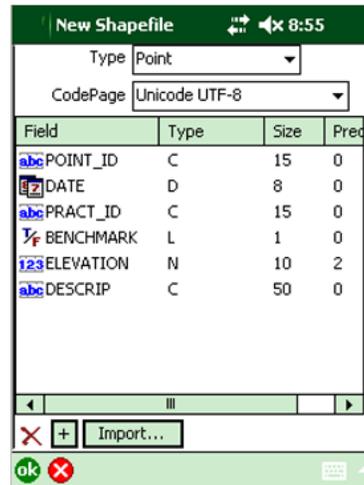


1. Select the type of shapefile you are defining from the “Type” drop-down list. Note: All types store x,y coordinates. Types with an M on the end (e.g., PointM) will also store an “m-measure-value” (sort of a time stamp) and types with a Z on the end (e.g. PointZ) will store a z-value (elevation) and 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**.

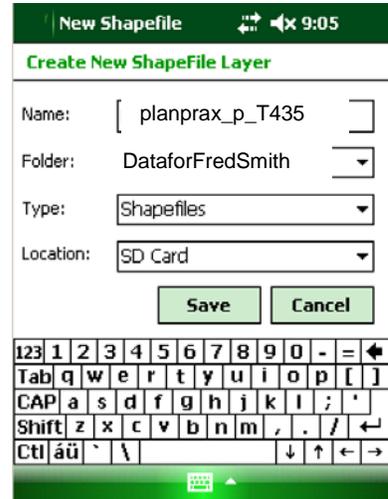
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Enter a name for the shapefile. Try to be as descriptive as possible. Use existing naming convention, i.e. <theme>\_<feature type>\_<location>. The location could be a tract or field number instead of the typical state and county FIPS codes.

Select a Location and then select a Folder, e.g. DataFor<Customer\_Name>.

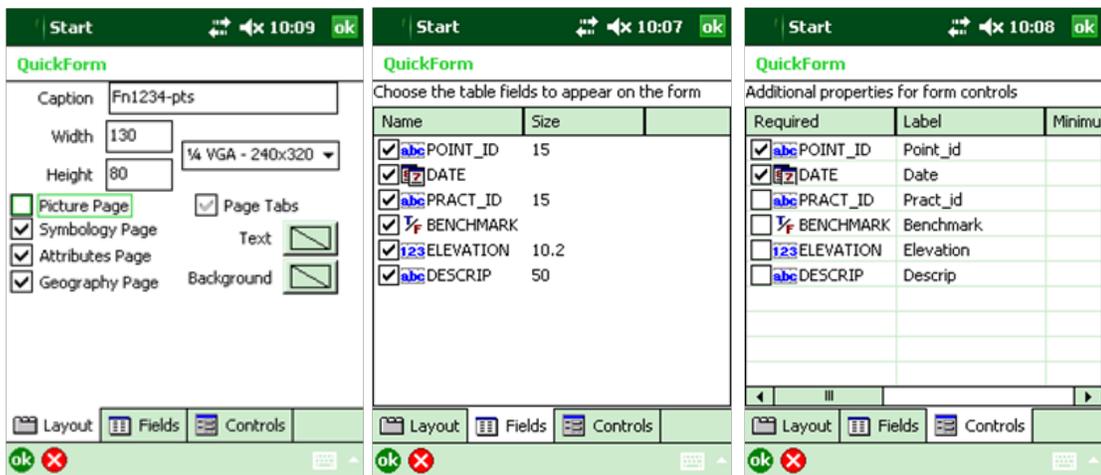
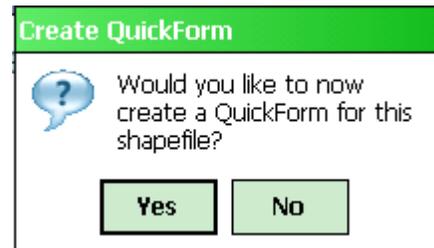
Type should be Shapefiles.

**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.



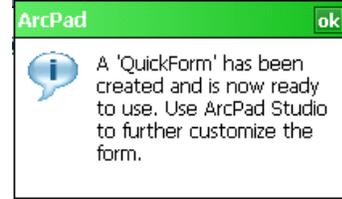
Use “Layout” tab to define form properties: caption, size, pages (if any), text and background. You might find the symbology, attribute, and geography pages useful when viewing feature properties.

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.



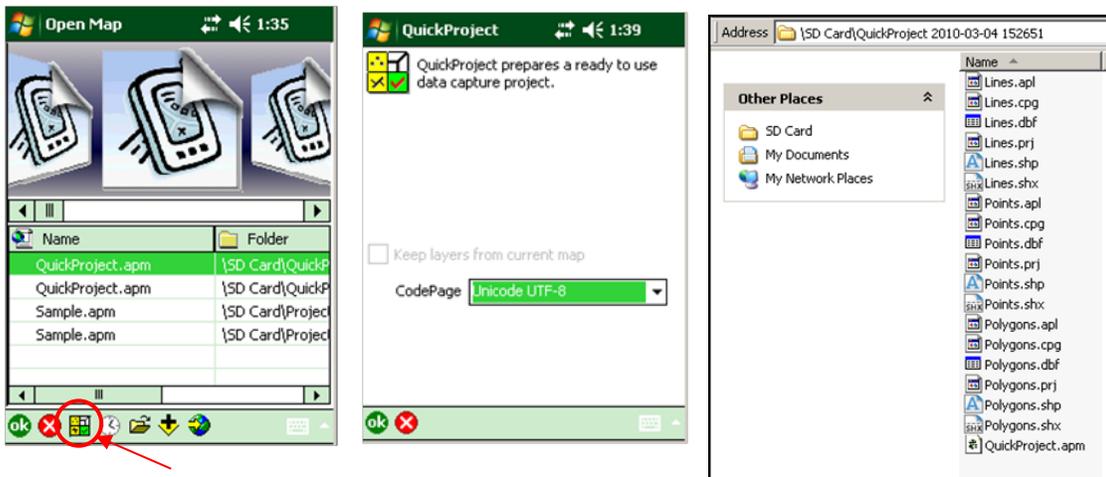
You are now ready to begin adding data to this shapefile.

**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 “ArcPad Preferences” 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.



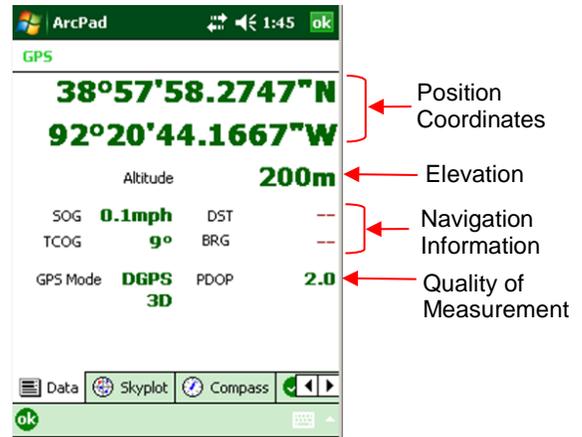
## Appendix E – GPS Position Window

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.

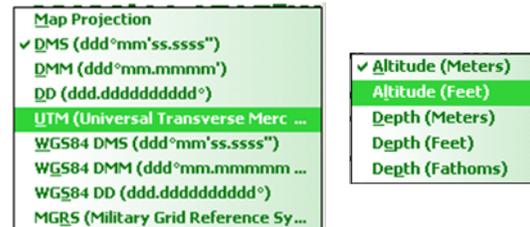
### Data tab:

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)

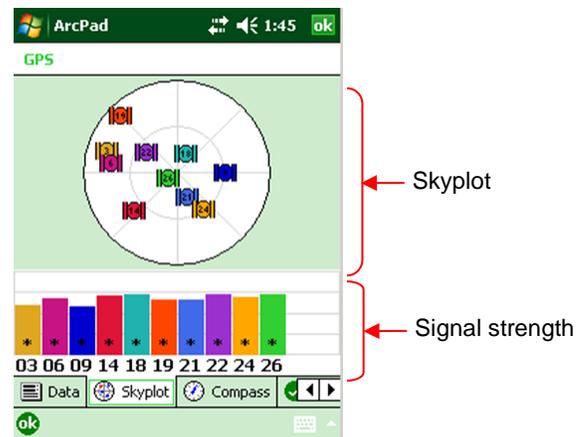
DST: distance from current location to destination

BRG: bearing from current location to destination.

See “Positioning Standards” section for specific details about these 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



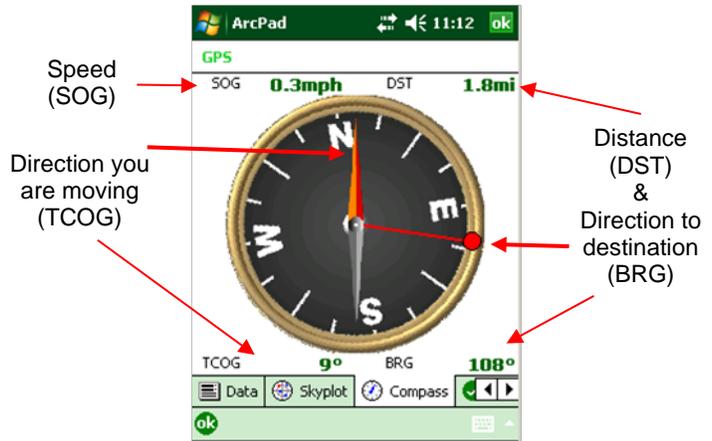
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Each satellite is displayed with its PRN number and a unique color. If the color is outlined in black, it is available and being used for calculating the GPS position. Satellites available but not used are simply colored. Grey satellites are unavailable.

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:

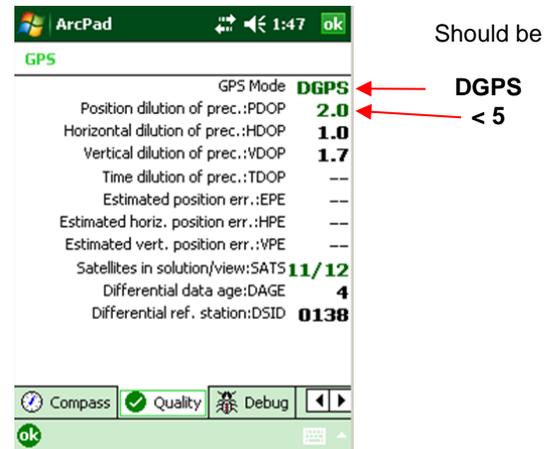
The compass screen shows the same navigation information that was on the Data screen plus a visual compass. The orange compass needle indicates the direction you are moving. The red line indicates the direction to your destination if you have set one.



### Quality tab:

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

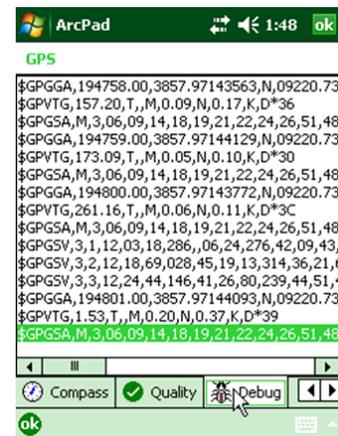
See “Positioning Standards” section for specific details about these values.



### 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

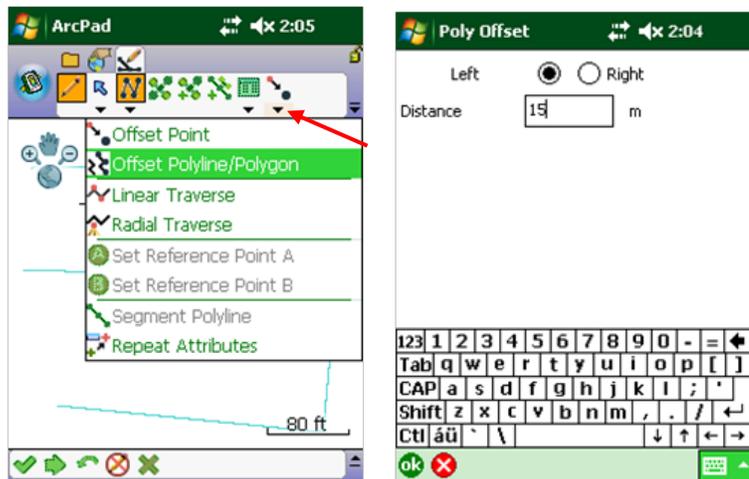
### **Offset Tools**

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).

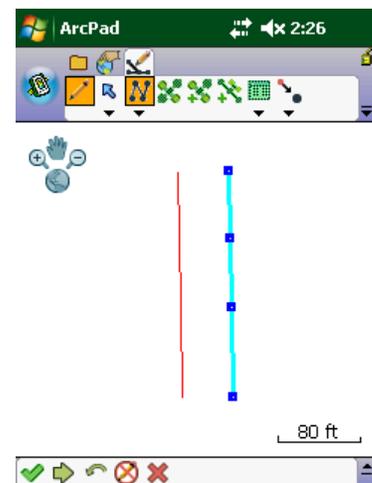


A red box around the “Offset Polyline/Polygon” button indicates that it is active.

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

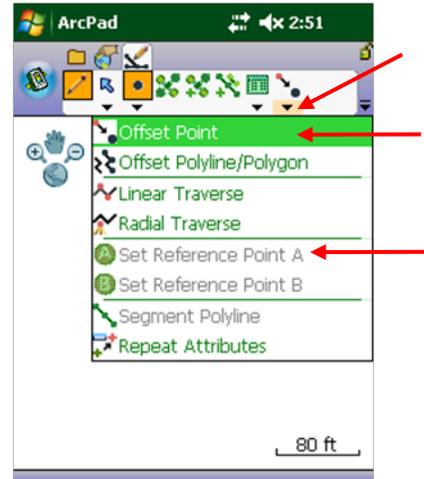
(distance-bearing) to determine the offset, will be given here. For 2 point offset instructions, you should refer to ArcPad's help resources.

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".

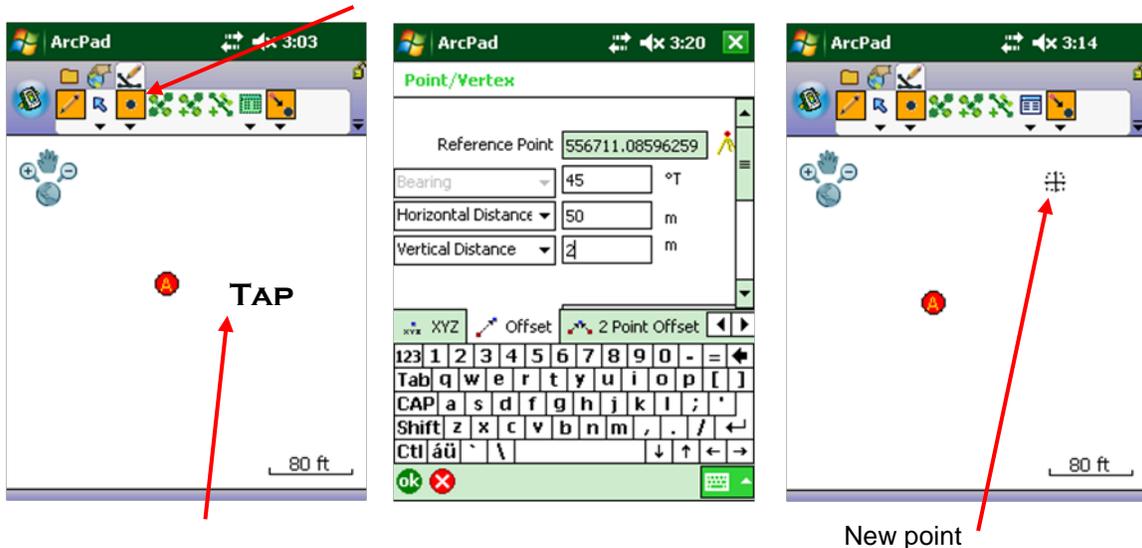
**TAP** drop-down arrow under the "Offset" icon on the Edit toolbar and select "Set Reference Point A".

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

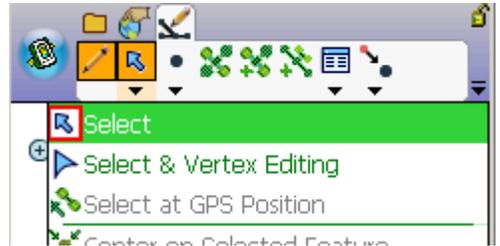
ArcPad provides some basic editing functions that can be performed on your data. As mentioned earlier, this requires that editing be enabled for the desired shapefile. This can be done using either the method given in the **Error! Reference source not found.** section (using Start/Stop Edit on the Edit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



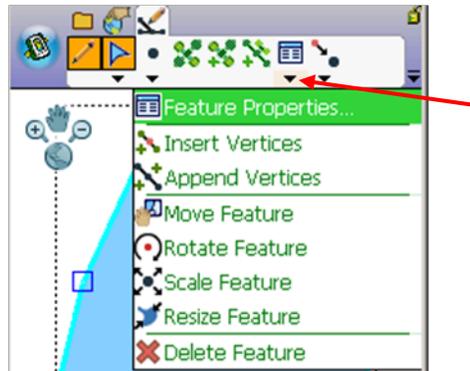
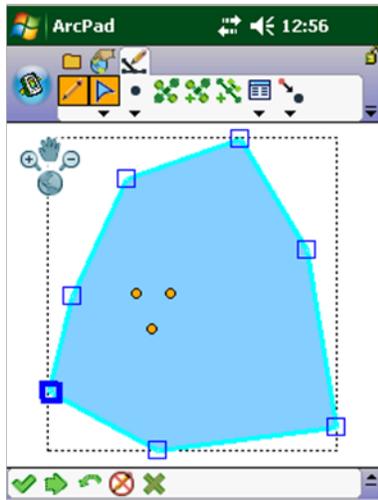
Switch to the Edit toolbar. From the drop-down list of the “Select” icon (second from left), choose the desired select tool.

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.

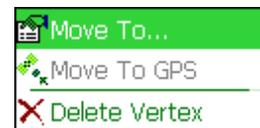
**TAP** on the desired feature to select it. It will be highlighted with a color and with a dashed box around it. If the “Select and Vertex Editing” tool was chosen, a blue box will be placed around each vertex as shown below. To modify the entire feature or the feature’s attributes, **TAP** the drop-down 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.

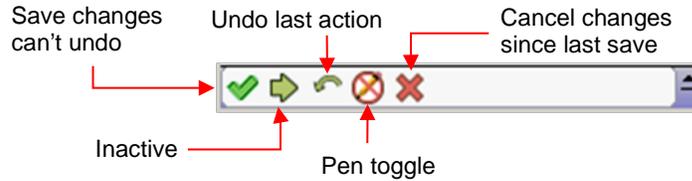
Use “Move To...” to move the vertex to a keyed-in x,y location or to a specified offset.

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).

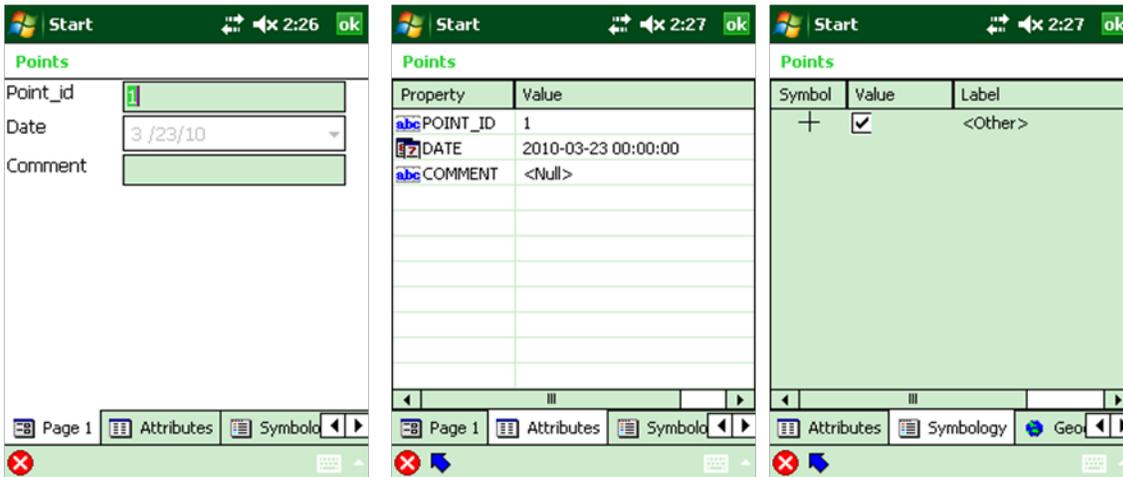
## Appendix G – Identify, Navigate, Measure Tools

### Identify Tool

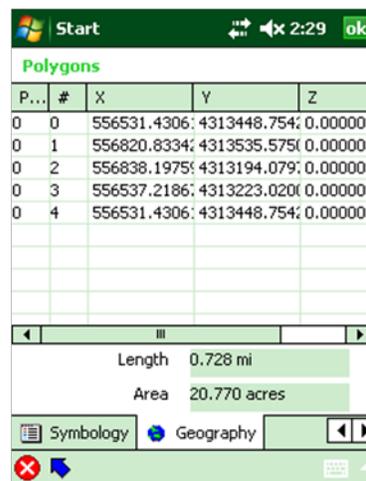
The “Identify” tool can be used to view (not edit) information about a selected feature. To activate this tool, **TAP** on the identify icon on the “Browse” toolbar. Remember to enable the “identify “ tool in the “Layers” tab of Table of contents for the layer containing feature of interest.



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.

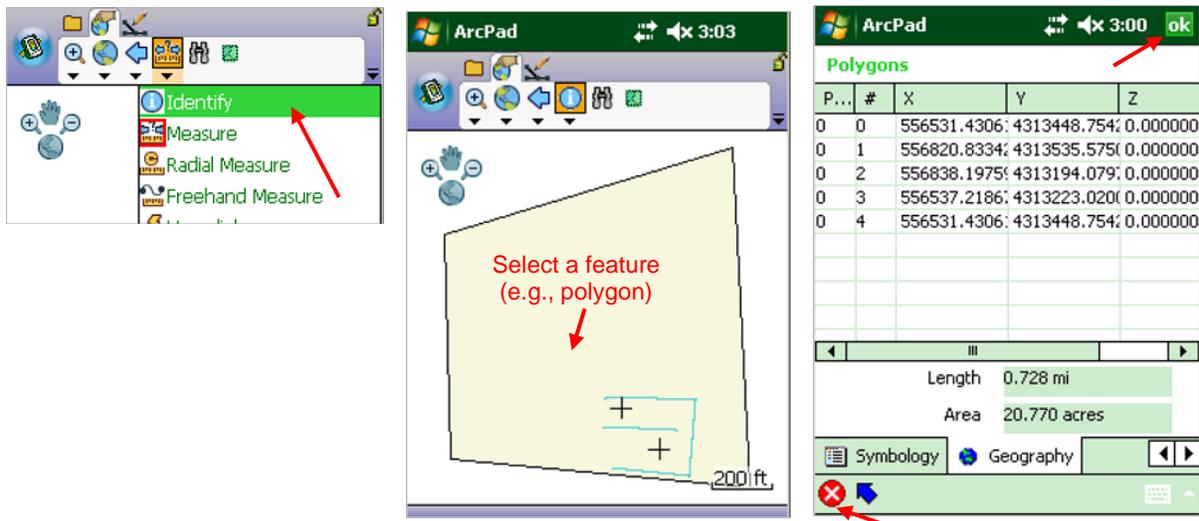


Points



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.

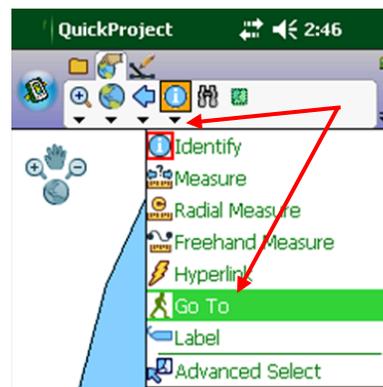


### Setting a Destination

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

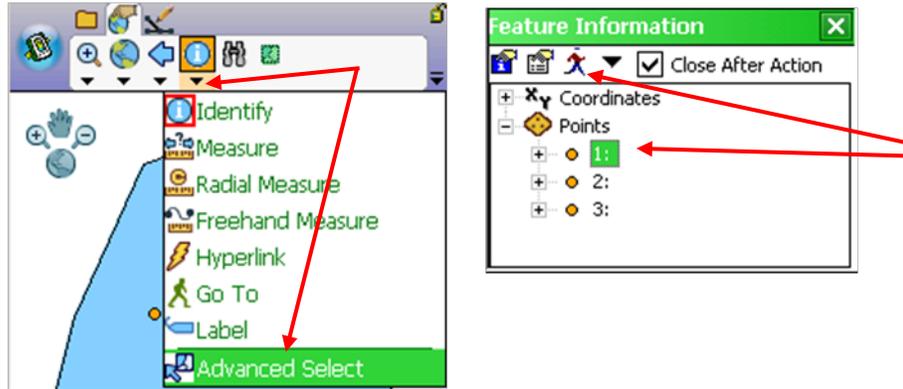
### Tapping on Map

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

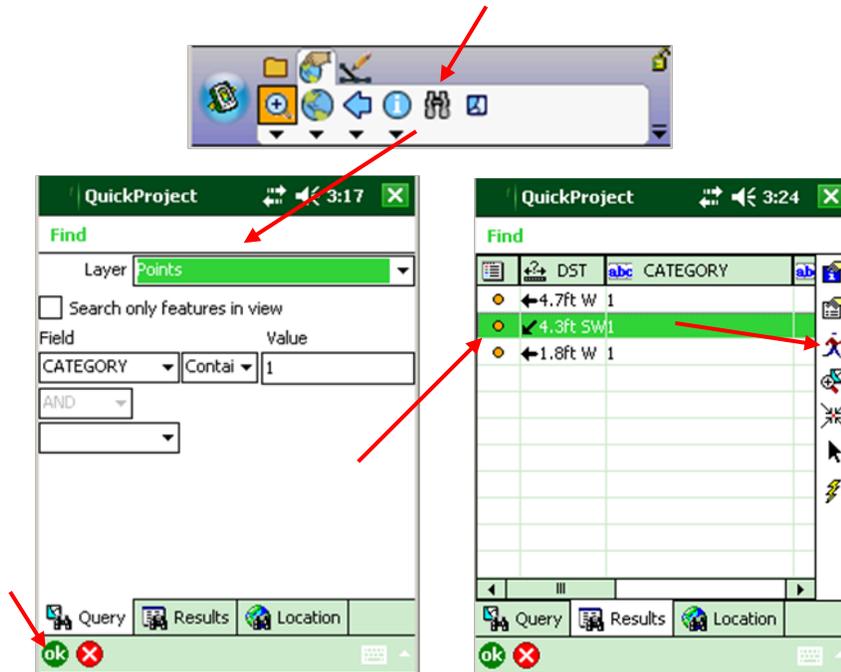
On the Browse toolbar, **TAP** the drop-down arrow under the Identify icon and select “Advanced Select”. You can then select a single feature by **TAPPING** it or multiple features by dragging a window around them. Highlight the desired feature in the “Feature Information” window and **TAP** the Go To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



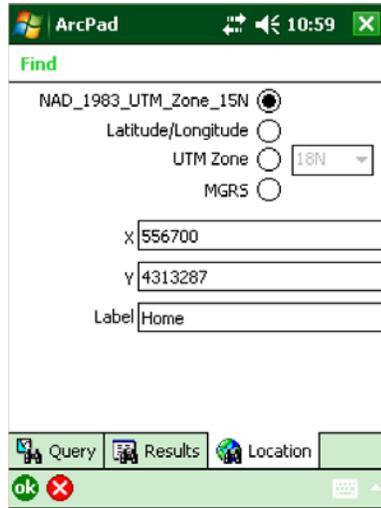
### Using Find (binoculars)

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 .

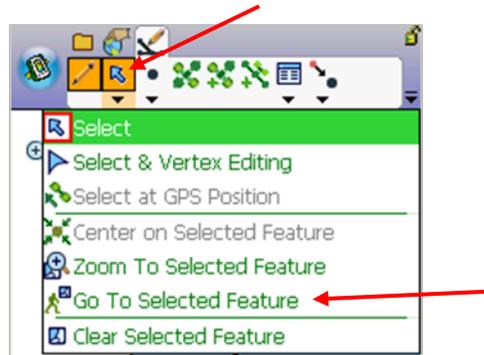


2. On the “Location” tab, select coordinate system and then specify the desired coordinates. **TAP OK.**



### 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.



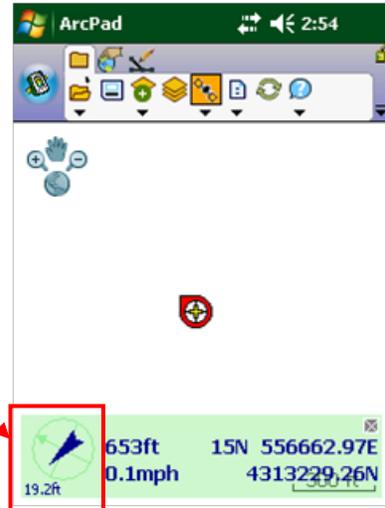
### Getting to the Destination

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

Navigational Information



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

Speed (SOG) & Direction you are moving (TCOG)

Distance (DST) & Direction to destination (BRG)



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.

Speed (SOG)

Direction you are moving (TCOG)

Distance (DST) & Direction to destination (BRG)



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

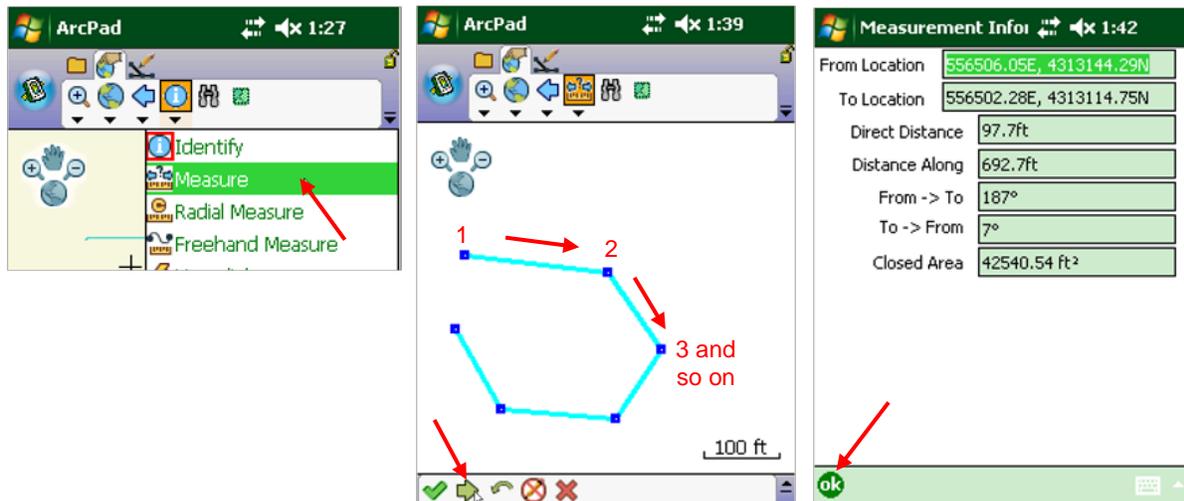


## Measuring

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

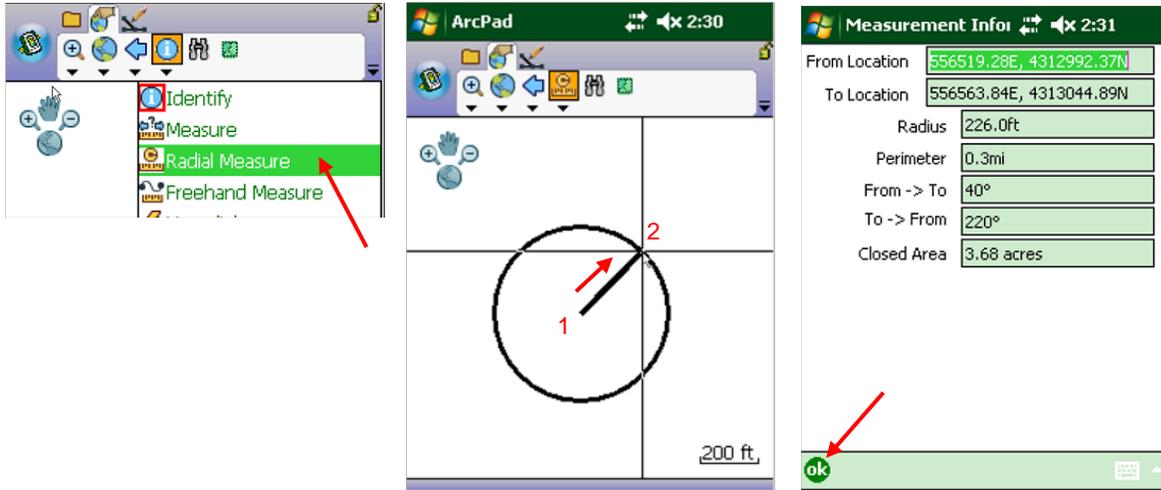
To use the measure tool, switch to the Browse toolbar and **TAP** the drop-down arrow for the “Identify” menu (fourth icon) and select Measure (see below). The icon on the toolbar will switch to the “measure” icon . **TAP** the first point where you wish to begin measuring from. Continue **TAPPING** 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

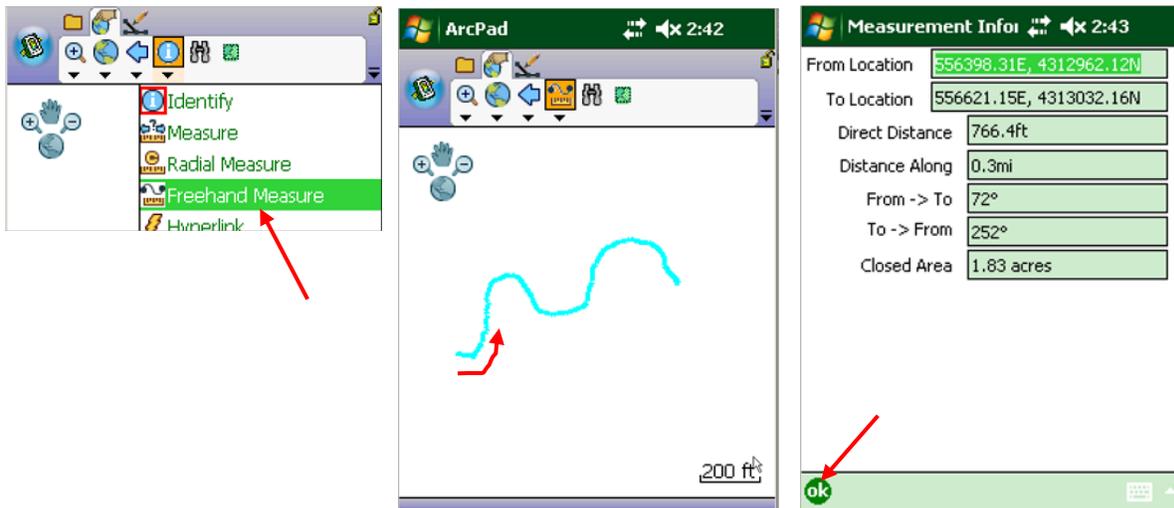
To use the radial measure tool, switch to the Browse toolbar and **TAP** the drop-down arrow for the “Identify” menu (fourth icon) and select Radial Measure (see below). The icon on the toolbar will switch to the “radial measure” icon . **TAP AND DRAG** from the first point to the second point. When 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.

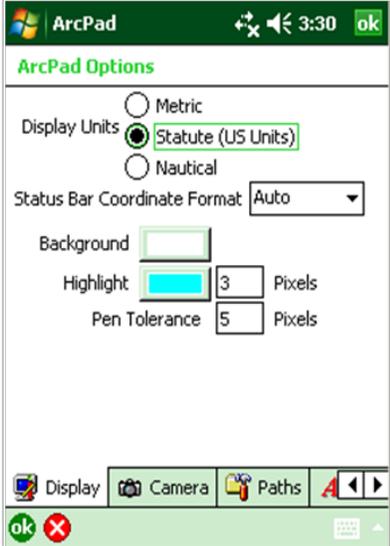


## **Appendix H– Field Guides**

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 Geo7x GPS unit in the field.

**Table of Contents & ArcPad Options**

### ArcPad Options Recommended Settings






1

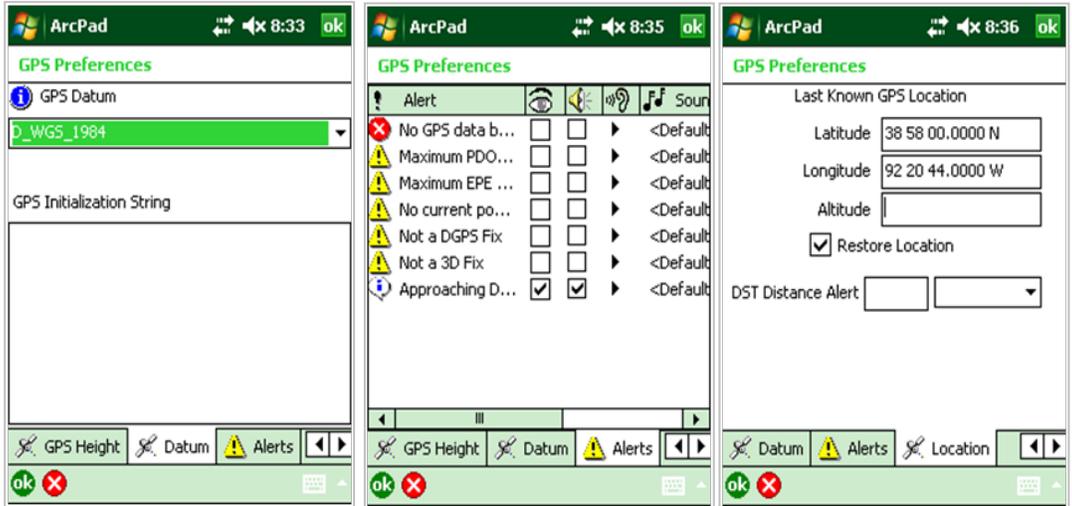
Fold

## 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     |
| Collecting Data .....                     | 8-9   |
| Viewing Data .....                        | 10-11 |
| Editing Data .....                        | 12    |
| Setting a destination .....               | 13    |
| Measuring .....                           | 14-15 |
| Troubleshooting .....                     | 16    |

**GPS Preferences**

GPS Preferences (page 2)

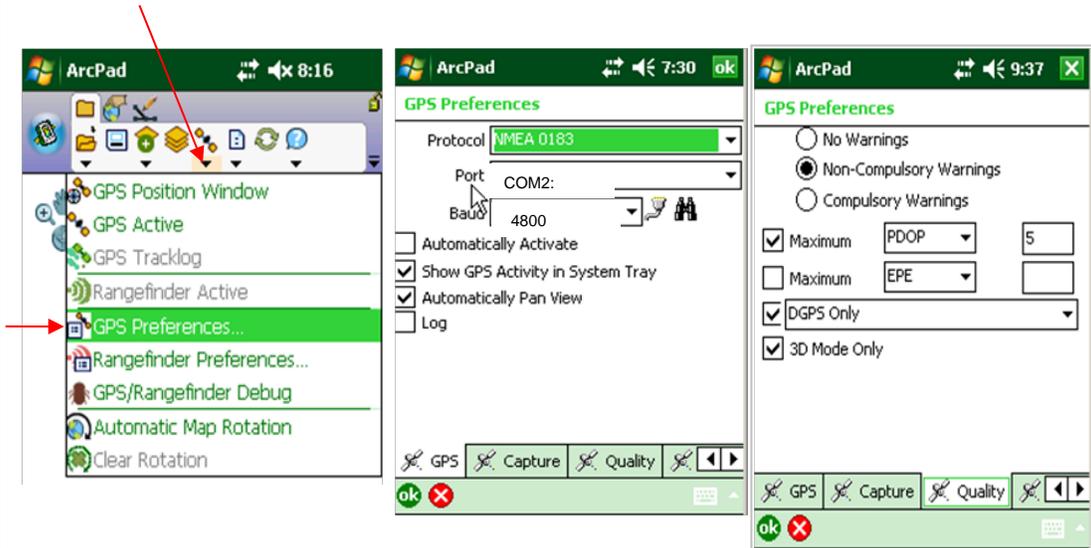


If unit has trouble finding satellites, enter coordinates of current location on location tab (these do not have to be exact).

3

Fold

GPS Preferences (page 1)

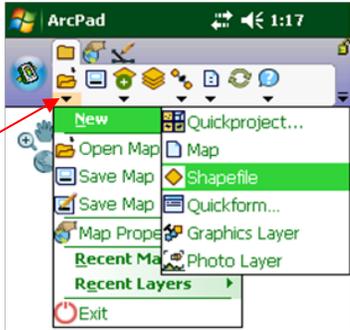


NOTE: Protocol, Port, and Baud must be set as shown above.

2

## Create New Quick Project / New Shapefile

### Create New Shapefile



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

Define fields  
(See "Add Fields" card)



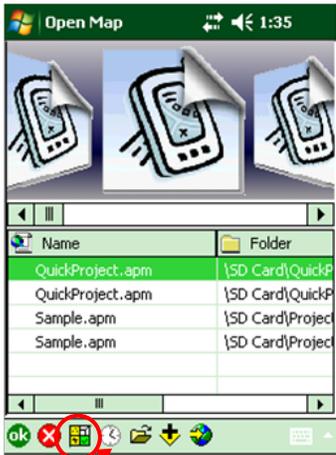
Define QuickForm  
(See "QuickForm" card)

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.

3) Enter field info.  
Tap OK.

4) Repeat steps 2 and 3  
for each field.

2) Tap +.

or use [Import...]

5) Tap OK.

6

**Collecting Data**

### Collecting Data (page 2)

Continuous



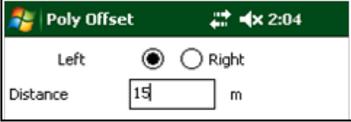
Set "Streaming" settings in GPS Preferences -> Capture



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

Fold

### Collecting Data (page 1)



Put in point mode.  
**TAP** GPS Capture Point icon.



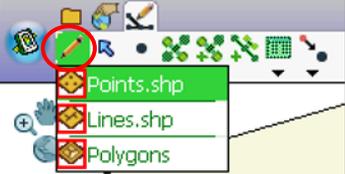
Put in polyline or polygon mode.  
**TAP** GPS Capture Vertex icon.  
 Repeat for each vertex.



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

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

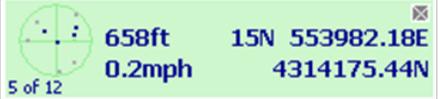
8



Turn on edit of desired feature(s).



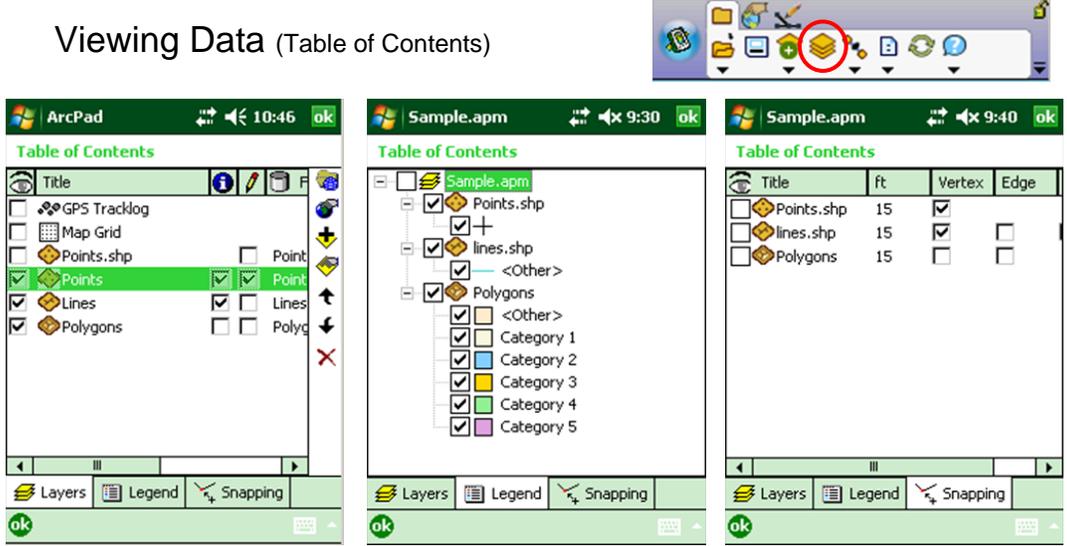
Activate GPS.



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

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.

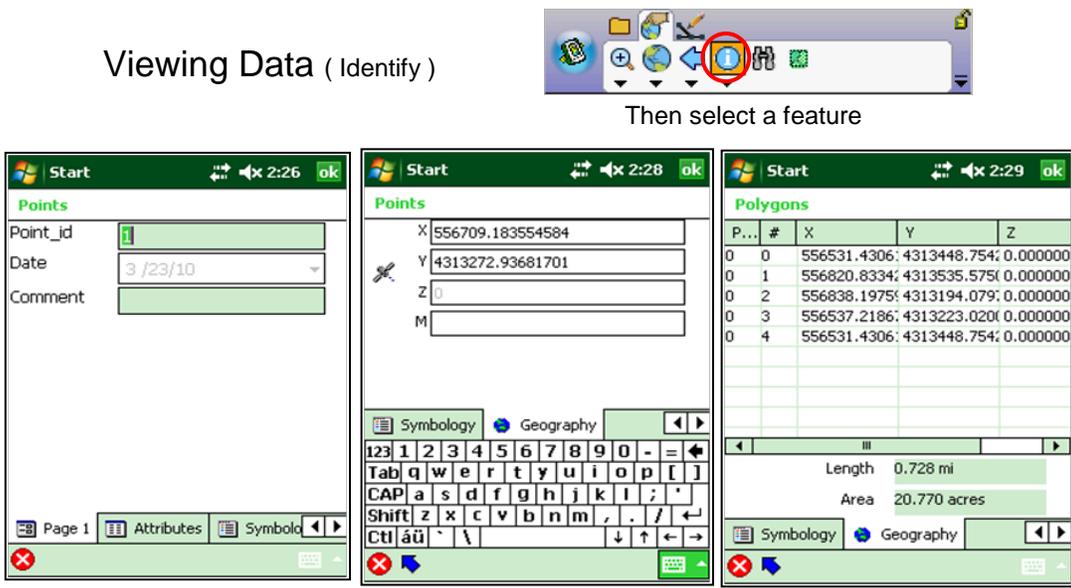
Set snapping criteria.

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).

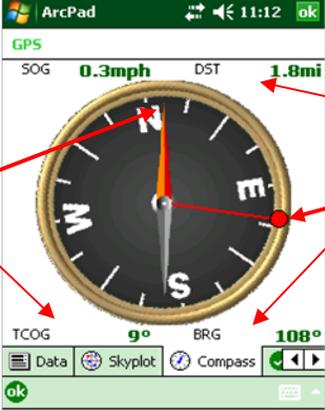
**Edit Select:**  
Edit toolbar > Select icon > select feature > Select drop-down > Go To Selected Feature.

### Getting to the destination



Activate GPS.

Use compass on GPS Position window to navigate to destination.



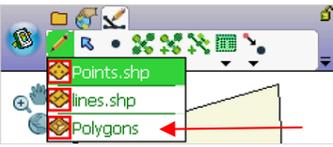
Distance (DST) & Direction to destination

Direction you are moving (TCOG)

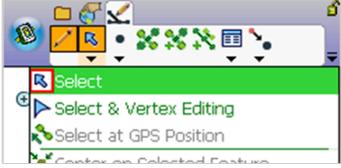
13

Fold

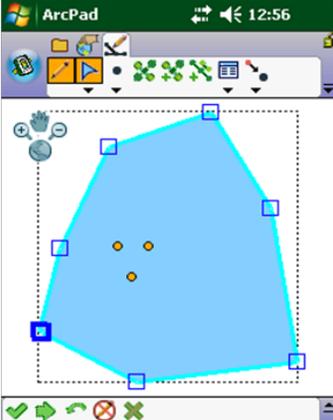
### Editing Data



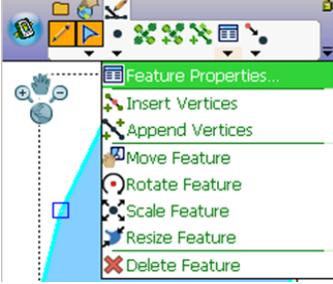
Ensure feature is in "edit" mode.



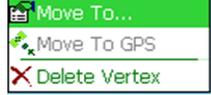
Choose appropriate  
Select tool on Edit toolbar.



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



Save changes can't undo

Undo last action

Cancel changes since last save

Does nothing

Pen toggle



12

**Measuring**

**Measuring (page 2)**

**Freehand Measure**



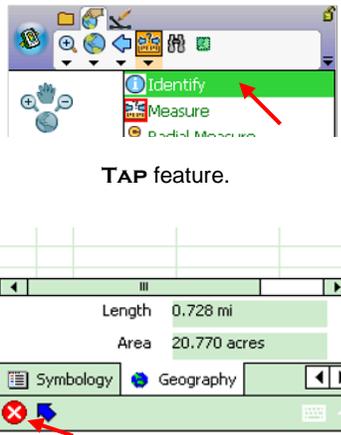
**TAP AND DRAG**  
to draw freehand line.  
Lift stylus.

**Measurement Info**

|                 |                         |
|-----------------|-------------------------|
| From Location   | 556398.31E, 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**



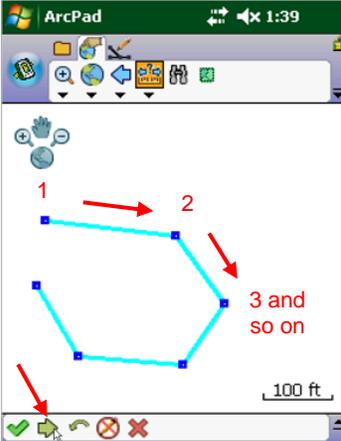
Length and area given on  
"Geography" page.  
**TAP** cancel icon to exit.

**15**

Fold

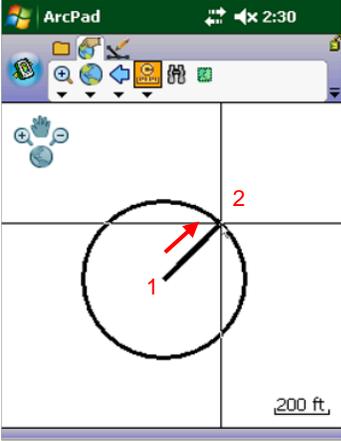
**Measuring (page 1)**

**Measure**



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

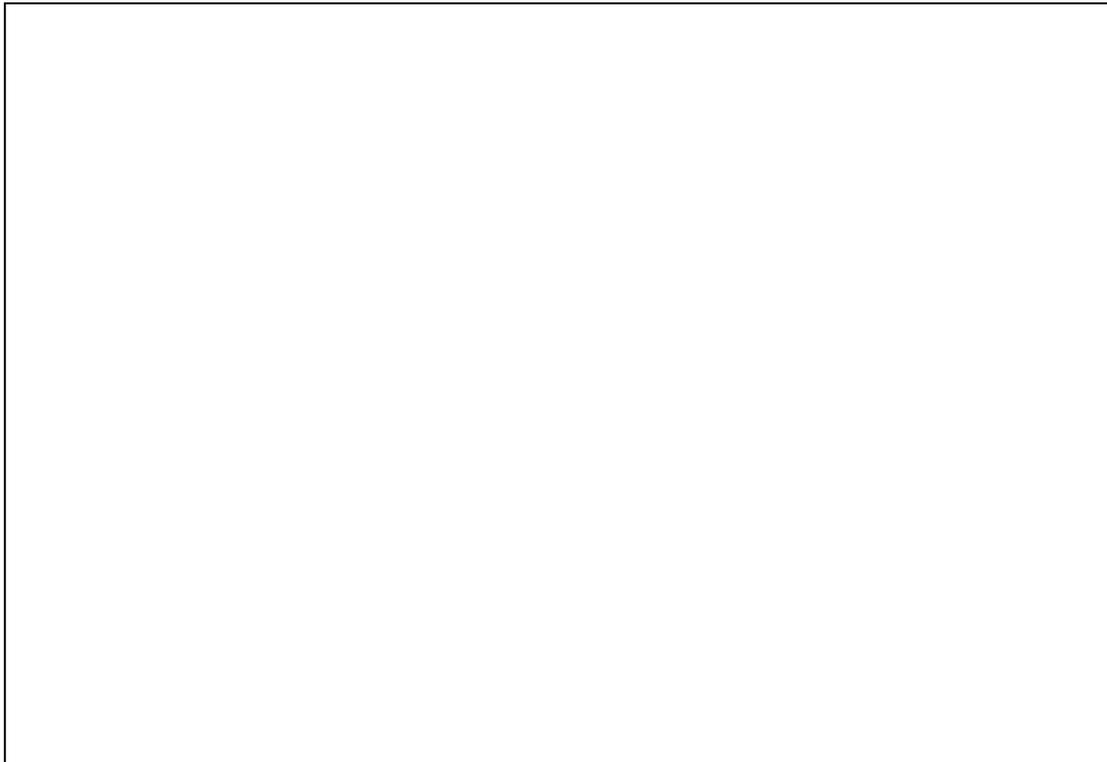
**Radial Measure**



**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”.

16

## **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.

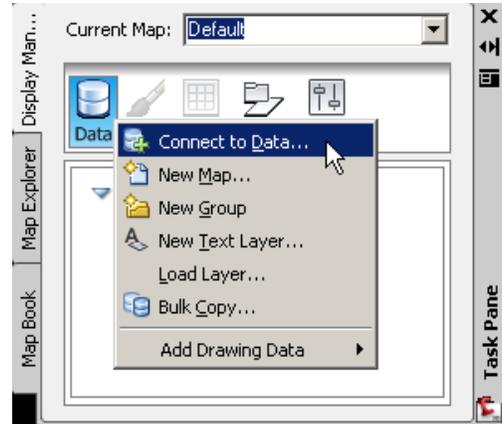
If that is not the case, you should then reset the device. Hold down power button until menu appears. **TAP** Reset. The unit should reboot and the problem should (hopefully) be resolved.

## Appendix J – Importing Shapefiles into AutoCAD

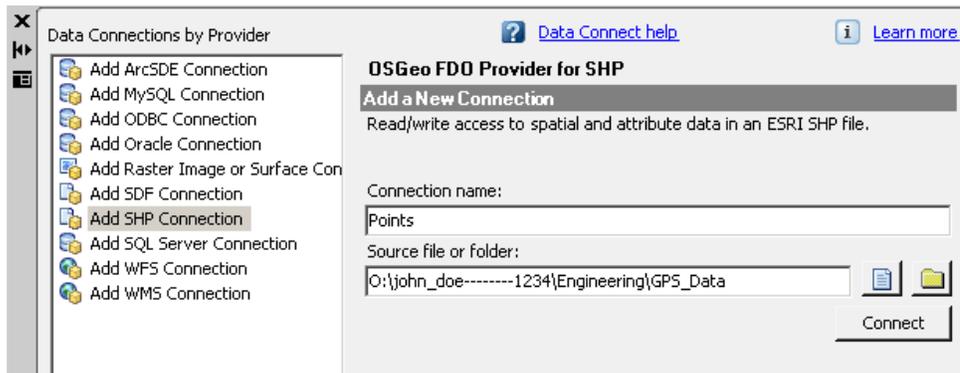
### **Method I**

This method creates 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.

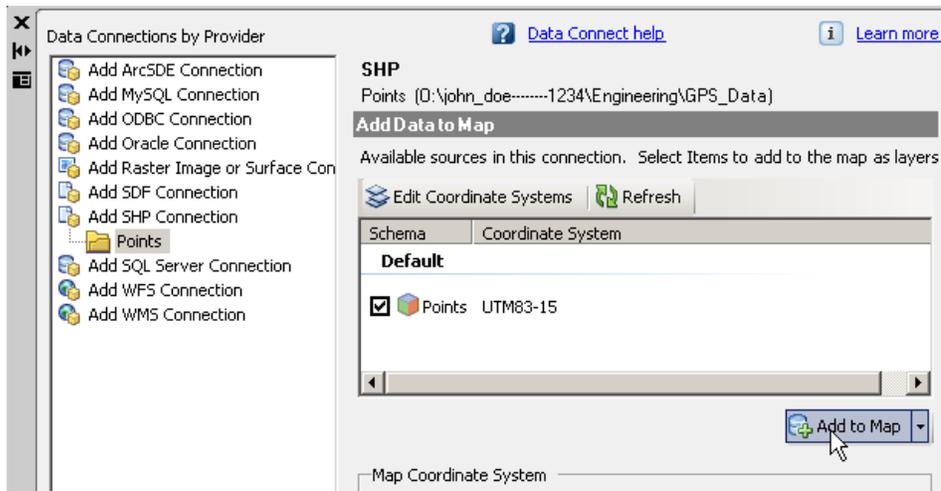
Open the “Task Pane” palette and select the “Display Manager” tab.  
 Click on the “Data” icon in top toolbar.  
 Select *Connect to Data...*



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.

### Method II

This method imports shapefiles in a way that each of the points, lines or polygons becomes a drawing object. If any change is made to the drawing objects, such change will not be reflected in the original shapefiles. The modified drawing objects can be exported out as new shapefiles.

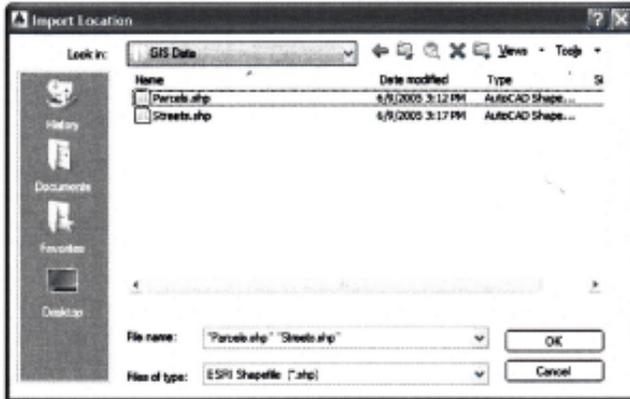
1. Start a new drawing using the AutoCAD.dwt template
2. Click on the Workspace  button on the status bar and set the current workspace to **Planning and Analysis**.



3. Select **Ribbon: Insert => Import => Map Import**.

The *Import Location* dialog box opens.





4. Browse to the dataset
5. Set the Files of type to **ESRI Shapefile (\*.shp)**
6. Select the files **Parcels.shp** and **Streets.shp**
7. Click <<**OK**>> to continue.

## Appendix K – Training Exercises

### Activity #1

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

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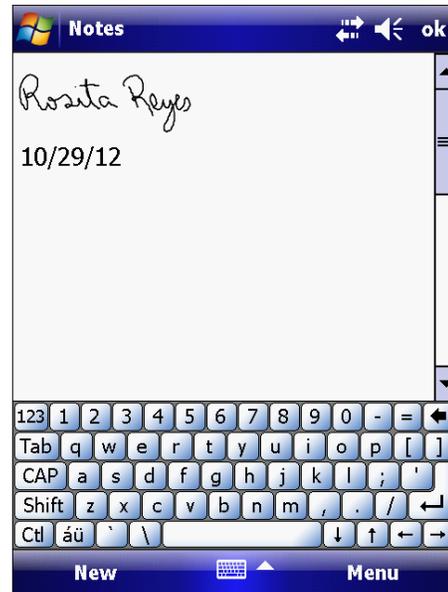
- Using the Geo7x, open File Explorer and navigate to SD Storage Card
  - Open folder named '**docs**'
  - Rename file **oldname.txt** to **activity1.txt** (if those files are not visible, click on Menu, make sure the option to 'Show all Files' is checked)
  - Create a subfolder named '**temp**' under **docs**
  - Copy '**original.txt**' to temp folder
- Using NOTES file :
  - Click *START* > *NOTES*
  - Verify that the default folder name (upper left corner) is set to '**All Folders**' as shown below



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

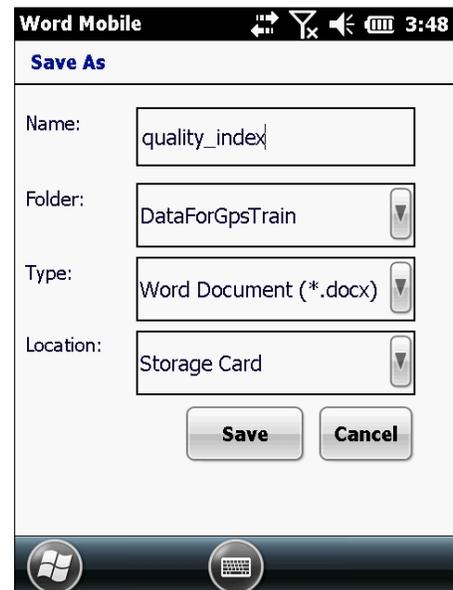


- **FYI:** The Notes file created will be named with the first alphanumeric characters entered with the keyboard. If you did not use the keyboard, the operating system assigns a default name (e.g. NOTE1) to the new file created.
- Click OK to close Notes file
- Click  button to exit Notes interface



- Using the Geo7x, open File Explorer and navigate to '**My Documents**' (i.e. My Device\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**

- Using Office Mobile Applications:
  - Click *START > Office Mobile 2010*
  - Click on an application of your choice (e.g. Word Mobile 2010, Excel Mobile 2010 etc.)
  - Click on *New* to open a new document
  - Click *Menu > File > Save as..* to save this document under '**DataForGPSTrain**' on the SD card with a name of your choosing



- Perform a soft reset on the Geo7x

**End of Activity #1**

### Activity #2a

- Create a '**GPS\_Data**' folder on your workstation under [C:\Users\*<first name.last name>*]
- Connect your Geo7x and workstation using a 'Guest' connection
- Open new Explore session for Geo7x from **Windows Mobile Device Center** 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

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### Activity #2b

- Open ArcMap Editor:
  - If Toolkit is available, open Toolkit Training Customer, launch Toolkit\_Template.mxd
  - If Toolkit is **not** available, launch ArcMap (click  > *All Programs > ArcGIS > ArcMap*)
- Add the following layers located in *DataForGpsTrain* folder:
  - PLU\_template.shp
  - ortho\_1-2\_1n\_s\_fl<FIPS>\_2013\_1.<ext>
- Zoom to PLU\_template.shp
- Using ArcPad Data Manager, export fields from PLU\_template.shp in a new customer folder (Datafor<your\_last\_name>), under GPS\_Data. **Be sure to create an ArcPad document** by entering a map name (e.g. T1234) in the dialog box
- Transfer customer folder from GPS\_data to the Geo7x SD Card
- Optional: If Toolkit is available, open a customer folder and practice exporting a field from the Case PLU to a folder (e.g. DataForTestCust) as per instructions in this manual.*

### End of Activity #2b

### **Activity #3a**

- Using Geo7x, launch ArcPad document from customer folder DataFor<your\_last\_name> on SD Card
- Edit symbology of shapefile containing field boundary
- Load county ortho imagery under the geodata folder on SD card
- Save ArcPad document as *prax\_cert.apm*
- Close ArcPad

### **End of Activity #3a**

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### **Activity #3b**

- Open ArcMap Editor:
  - If Toolkit is available, open Toolkit Training Customer, launch Toolkit\_Template.mxd
  - If Toolkit is **not** available, launch ArcMap (click  > All Programs > ArcGIS > ArcMap)
- Add the following layers located in *DataForGpsTrain* folder:
  - partner\_plu.shp
  - ortho\_2-2\_1n\_s\_fl<FIPS>\_2013\_1.<ext>
- Zoom to partner\_plu.shp
- Without using using ArcPad Data Manager, export *partner\_plu* shapefile into a new customer folder, **DataforJaneDavis**
- Transfer customer folder *DataforJaneDavis* from *GPS\_data* to the Geo7x SD Card
- Launch new ArcPad document on the Geo7x
- Load county ortho imagery under the geodata folder on SD card
- Add *partner\_plu.shp* located in *DataForJaneDavis* folder
- Zoom to the location of the shapefile
- Save ArcPad document as *partner.apm* under *DataforJaneDavis*
- Close ArcPad

### **End of Activity #3b**

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### **Activity #4a**

- Using Geo7x, 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**

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### **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
- Save ArcPad document
- Close ArcPad

### **End of Activity #4b**

**Activity #5**

- Check GPS Controller settings on Geo7x
- Check ArcPad Preferences settings on Geo7x

**End of Activity #5**

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**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**

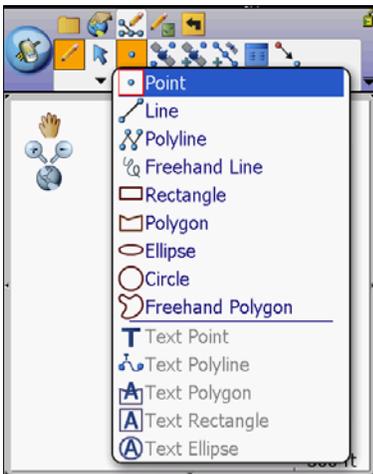
**Activity #7**

- In your group, list major steps involved in the process of preparing to carry out data collection using the Geo7x.

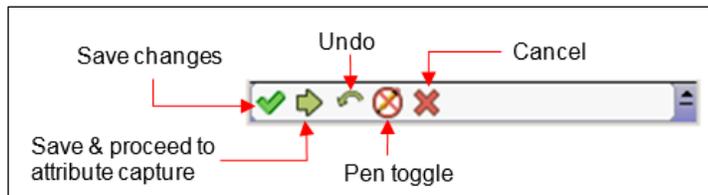
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
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- \_\_\_\_\_
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- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_



| 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     |



- : 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).



**End of Activity #7**

### **Activity #8a**

- Using Geo7x, 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
- Capture a photo of a feature in practice area

### **End of Activity #8a**

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### **Activity #8b**

- Using Geo7x, 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)
- Capture a photo of one or more certified practice

### **End of Activity #8b**

### **Activity #9a**

- Copy MasterProject<utm\_zone> from Geo7x to GPS\_Data folder on workstation
- If Toolkit is not available, export certified features from MasterProject<utm\_zone> to shapefiles under **C:\Users\<first name.last name>\GPS\_DATA\Datafor<customer\_name>** folder
- If Toolkit is available, export certified features from MasterProject<utm\_zone> to shapefiles under **C:\Users\<first name.last name>\My Customer Files Toolkit\<customer\_folder>\Resource\_Maps** folder.
- Using Windows Explorer, copy photo(s) of certified practices to customer's folder

### **End of Activity #9a**

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### **Activity #9b**

- Open an ArcMap document and calculate length and area measurements for features in practice certification shapefiles (**customer name\_<feature type>\_cert.shp**)
- If Toolkit is available, create labels for features using the *Map Labels* tool for practice certification shapefiles. Make sure such labels include units of measurements where appropriate.
- If Toolkit is **not** available, use ArcGIS shapefile properties' label tab to create labels for features in practice certification shapefiles. Make sure such labels include units of measurements where appropriate.
- Create a hyperlink to a picture for a certified practice.

### **End of Activity #9b**

### **Activity #10**

- If Toolkit is available, open ArcMap document and create layout for practice certification features using the '*Map Products*' tool. Make sure all the required elements are included, as per example on page 58.
- If Toolkit is **not** available, open ArcMap document and use the Layout View to create layout for practice certification features. Make sure all the required elements are included, as per example on page 59.
- Export layout to PDF or JPG file with your name as part of the filename. Store file in assigned directory.

### **End of Activity #10**