AutoCAD® Civil 3D® 2015
Fundamentals

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Chapter 2

Project Management

In this chapter you learn about the various project structures that can be used inside of an AutoCAD® Civil 3D® project. Then you create a new project and learn how to move between different projects. Using data shortcuts, you practice creating references to AEC objects to share design data, which ensures that you always have the most up-to-date design data in the current model.

This chapter contains the following topics:

- **AutoCAD Civil 3D Projects**
- **Sharing Data**
- **Using Data Shortcuts for Project Management**

2.1 AutoCAD Civil 3D Projects

Learning Objective

- List the three different ways in which AutoCAD Civil 3D project drawings can be organized.

There are multiple ways of organizing AutoCAD Civil 3D project drawings. Three of the most common approaches are as follows:

Single-Design Drawing Projects

Since AutoCAD Civil 3D surfaces, alignments, and other AEC objects can be entirely drawing-based, you can have a single drawing file act as the repository for all design data. Realistically, this might only be feasible with the smallest projects and/or those worked on by only one person. The only external data would be survey databases, and possibly drawings containing plotting layouts that XREF the single design drawing.

Multiple Drawings Sharing Data using Shortcuts

This approach permits multiple survey and design drawings that share data. For example, a surface could exist in one drawing and an alignment in another. A third could contain a surface profile based on the alignment and terrain model, and all could be kept in sync with each other using Data Shortcuts. This approach is usually preferable to the single-drawing approach, because it permits more than one user to work on the project at the same time (in the different design drawings) and keeps the drawings at a more manageable size. Using data shortcuts is essential in larger projects to ensure that the regeneration time for drawings is at an acceptable speed. This approach does not create any external project data other than survey databases and XML data files that are used to share data between drawings.

Once an object has been referenced into the drawing and the drawing has been saved, the object is saved in the drawing. Therefore, it only needs access to the source drawing for validation and synchronization purposes if the source object changes. This makes it easy to share drawings with others because it ensures that the referenced objects are displayed even if the source drawings are not available.

Shortcuts tend to be efficient for projects with a small number of drawings and project team members. Since the XML data files that connect drawings must be managed manually, keeping a large number of drawings and/or people in sync with shortcuts can be cumbersome. It is highly recommended that you establish procedures to ensure that data is not unintentionally deleted or changed. You will also want to document these procedures very carefully.

Multiple Drawings Sharing Data with Autodesk Vault

The Autodesk® Vault program is a data and document management system (ADMS). It is used in conjunction with other Autodesk® applications in different industries. When working with the Autodesk Vault program, all project drawings, survey databases, and references are managed and stored inside an SQL-managed database. Autodesk Vault consists of user-level access permissions, drawing check-in/out, project templates, automated backups, data versioning, etc. These benefits are offset by the additional time required to manage and administer the database, and in some cases purchasing additional hardware and software. If you work on large projects with multiple design drawings or have many team members (more than 10), you might find that the Autodesk® Vault is the best way to keep those projects organized.

2.2 Sharing Data

Learning Objective

- List the ways in which teams can collaborate with each other and share design information within the AutoCAD Civil 3D software.

In the AutoCAD Civil 3D workflow, you can use two methods of project collaboration to share AutoCAD Civil 3D design data: Data Shortcuts and Vault references.

Autodesk Vault and Data Shortcuts can be used to share design data between drawing files in the same project, such as alignment definitions, profiles, surfaces, pipe networks, and View Frames. They do not permit the sharing of profile views, assemblies, corridors, sample line groups, or other AutoCAD Civil 3D objects. Drawing sets using shortcuts typically use XREFs and reference other line work and annotations between drawings. Whether using Vault Shortcuts or Data Shortcuts, the process is similar.

The example in Figure 2–1 shows the sharing of data in a project collaboration environment. The data is divided into three distinctive levels. Using either Data Shortcuts or Autodesk Vault, these levels can be accessed and contributed to, on a local or remote server or across a WAN.

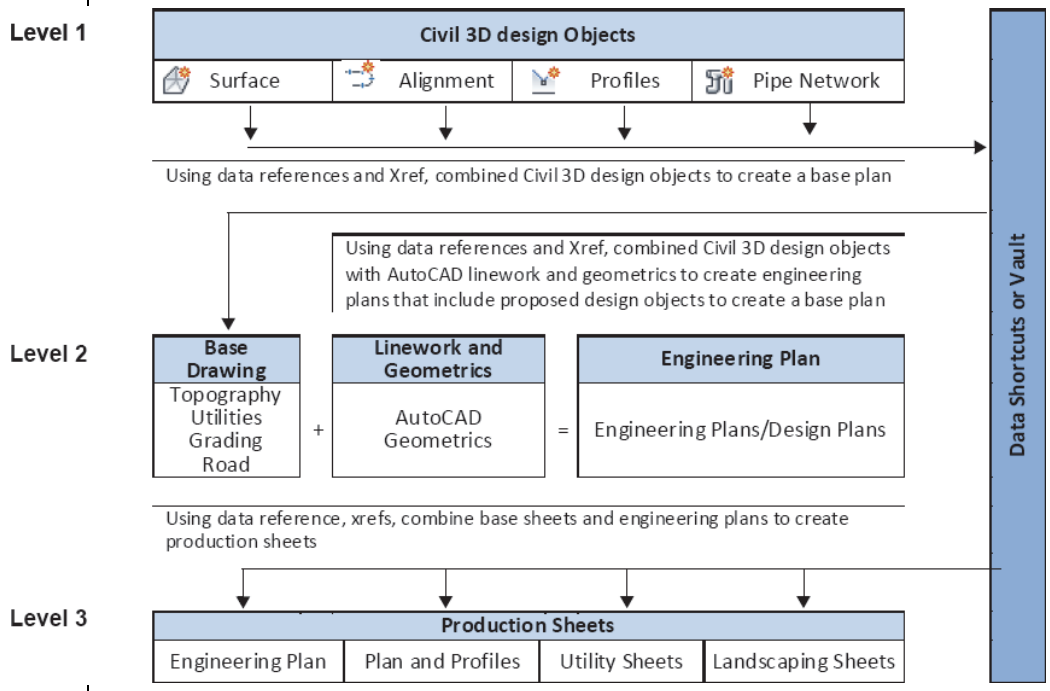

Figure 2–1

2.3 Using Data Shortcuts for Project Management

Autodesk Certified Professional Objectives

Topic:

- *Managing and Sharing Data*

Objectives:

- *Create a data sharing setup*

Learning Objective

- Share design information with other members of the design team using data shortcuts.

Data Shortcuts can be used to share design data between drawing files through the use of XML files. Using Data Shortcuts is similar to using the Autodesk Vault software, but does not provide the protection of your data or the tracking of versions the way the Autodesk Vault software does.

Data Shortcuts are managed using the *Prospector* tab in the Toolspace in the *Data Shortcuts* collection or in the *Manage* tab>Data Shortcuts panel, as shown in Figure 2–2. The shortcuts are stored in XML files within one or more working folders that you create. They can use the same folder structure as the Autodesk Vault software. This method simplifies the transition to using the Autodesk Vault software at a future time.

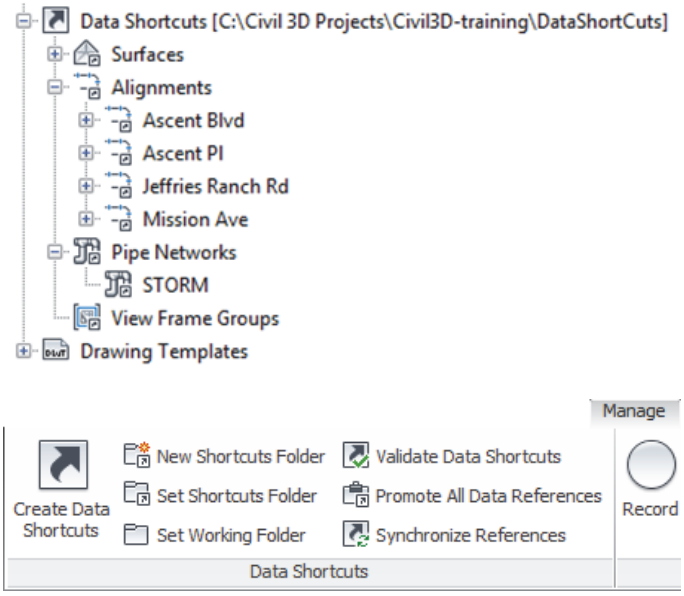

Figure 2–2

Whether using the Autodesk Vault software or Data Shortcuts, the intelligent AutoCAD Civil 3D object design data can be consumed and used on different levels. However, this referenced data only can be edited in the drawing that contains the original object. As referenced data can be assigned a different style than those in the source drawing, you can separate the design phase (where drawing presentation is not critical) from the drafting phase (where drawing presentation is paramount). Therefore, after the styles have been applied at the drafting phase, any changes to the design have minimal visual impact on the completed drawings.

Changing the name of a drawing file that provides Data Shortcuts or the shortcut XML file itself invalidates the shortcut. Although the Data Shortcuts Editor outside the AutoCAD Civil 3D software permits re-pathing if a source drawing moves, shortcuts might not resolve if the source drawing practice has changed.

Update Notification

If the shortcut objects are modified and the source drawing is saved, any drawings that reference those objects are updated when opened. If the drawings consuming the data referenced in the shortcuts were open at the time of the edit, a message displays to warn you of the changes, as shown in Figure 2–3.

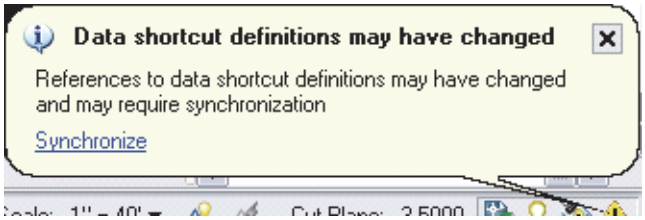

Figure 2–3

The following modifier icons help you to determine the state of many AutoCAD Civil 3D objects.

	The object is referenced by another object. In the *Settings* tab this also indicates that a style is in use in the current drawing.
	The object is being referenced from another drawing file (such as through a shortcut or Autodesk Vault reference).
	The object is out of date and needs to be rebuilt, or is violating specified design constraints.
	A project object (such as a point or surface) has been modified since it was included in the current drawing.
	You have modified a project object in your current drawing and those modifications have not yet been updated to the project.

Figure 2–4 shows how the modifier icons are used with an AutoCAD Civil 3D object as it displays in the *Prospector* tab.

Figure 2–4

To update the shortcut data, select **Synchronize** in the balloon message or right-click on the object in the Prospector and select **Synchronize**.

Removing and Promoting Shortcuts

Shortcut data can be removed from the Shortcut tree in the Prospector by right-clicking on it and selecting **Remove**, but this does not remove the data from the drawing. To do so, right-click on the object in the Prospector and select **Delete**. This removes the shortcut data from the current list, so that the item is not included if a Data Shortcut XML file is exported from the current drawing.

You can also promote shortcuts, which converts the referenced shortcut into a local copy without any further connection to the original. You can promote objects by right-clicking on them in the Prospector and selecting **Promote**.

eTransmit Data References

Projects that use Data Shortcuts can be packaged and sent to reviewers, clients, and other consultants using the AutoCAD **eTransmit** command. With the **eTransmit** command, all of the related dependent files (such as XML files, XREFs, and text fonts) are automatically included in the package. This reduces the possibility of errors and ensures that the recipient can use the files you send them. A report file can be included in the package explaining what must be done with drawing-dependent files (e.g., XML, XREFs) so that they are usable with the included files. The Create Transmittal dialog box is shown in Figure 2–5.

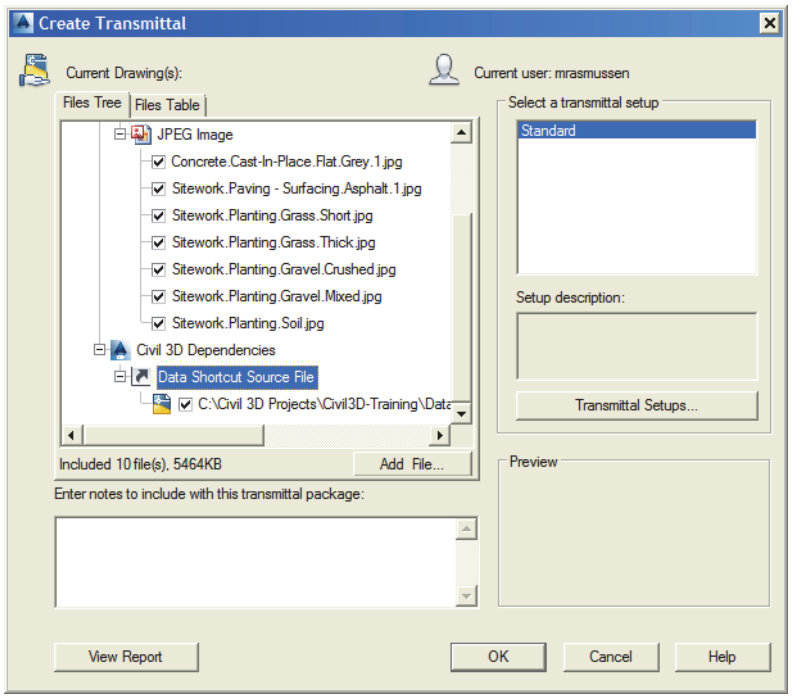

Figure 2–5

Data Shortcut Workflow

1. In the *Prospector* tab, right-click on Data Shortcuts and select **Set the Working Folder…**
2. In the *Prospector* tab, right-click on Data Shortcuts and select **New Data Shortcuts Folder…** to create a new project folder for all of your drawings.
3. Create or import the data that you want to share in the source drawing and save it in the current working folder under the correct project folder.
4. In the *Prospector* tab, right-click on Data Shortcuts and select **Associate Project to Current Drawing**.
5. In the *Prospector* tab, right-click on Data Shortcuts and select **Create Data Shortcuts**.
6. Select all of the items that you want to share, such as surfaces, alignments, or profiles, and click OK.
7. Save the source drawing (and close as required).
8. Open, create, and save the drawing to receive the shortcut data. Expand the *Data Shortcuts* collection and the relevant object trees (*Surfaces*, *Alignments*, *Pipe Networks*, or *View Frame Groups*).
9. Highlight an item to be referenced, right-click and select **Create Reference…** Repeat for all of the objects as required. You are prompted for the styles and other settings that are required to display the object in the current drawing.

10. You might also want to add an XREF to the source drawing if there is additional AutoCAD® line work that you want to display in the downstream drawing.
11. The AutoCAD Civil 3D tools for Data Shortcuts are located in the *Manage* tab (as shown in Figure 2–6), and in the *Prospector* tab.

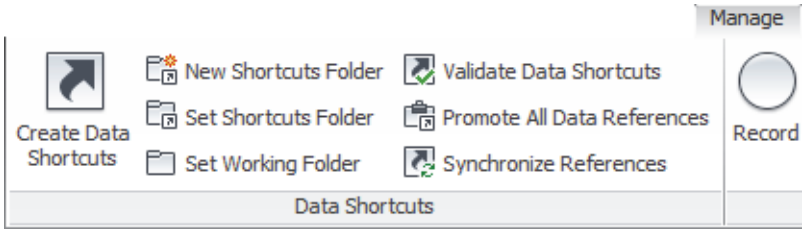

Figure 2–6

Workflow Details

- **Set Working Folder:** Sets a new working folder as the location in which to store the Data Shortcut project. The default working folder for Data Shortcut projects is *C:\Civil 3D Projects*. The default working folder is also used for Autodesk Vault projects and local (non-Vault) Survey projects. If you work with the Autodesk Vault software, local Survey, and Data Shortcut projects, you should have separate working folders for each project type for ease of management.
- **New Shortcuts Folder:** Creates a new folder for storing a set of related project drawings and Data Shortcuts.
- **Create Data Shortcuts:** Creates Data Shortcuts from the active drawing.

Data Shortcuts are stored in the *Shortcuts* folder for the active project and used to create data references to source objects in other drawings. Each Data Shortcut is stored in a separate XML file.

Advantages of Data Shortcuts

- Data Shortcuts provide a simple mechanism for sharing object data, without the added system administration needs of the Autodesk Vault software.
- Data Shortcuts offer access to an object's intelligent data while ensuring that this referenced data can only be changed in the source drawing.
- Referenced objects can have styles and labels that differ from the source drawing.

- When you open a drawing containing revised referenced data, the referenced objects are updated automatically.
- During a drawing session, if the referenced data has been revised, you are notified in the Communication Center and in the *Prospector* tab in Toolspace.

Limitations of Data Shortcuts

- Data Shortcuts cannot provide data versioning.
- Data Shortcuts do not provide security or data integrity controls.
- Unlike the Autodesk Vault software, Data Shortcuts do not provide a secure mechanism for sharing point data or survey data.
- Maintaining links between references and their source objects requires fairly stable names. However, most broken references can easily be repaired using the tools in the AutoCAD Civil 3D software.

Practice 2a

Starting a Project

Estimated time for completion: 15 minutes

Learning Objective

- Create a new data shortcut project with the correct working folder for the project being worked on.

In this practice you will walk through the steps of creating project-based Data Shortcuts folders.

Task 1 - Set the *Working* folder.

In this task, you will set up a new working folder as the location in which to store Data Shortcut projects. The default working folder for Data Shortcut projects is *C:\Civil 3D Projects*.

1. Open **DS-A1-Shortcuts.dwg** from the *C:\Civil 3D Projects\Civil3D-Training\DataShortcuts* folder.

2. In the *Manage* tab>Data Shortcuts panel, select **Set Working Folder**, as shown in Figure 2–7.

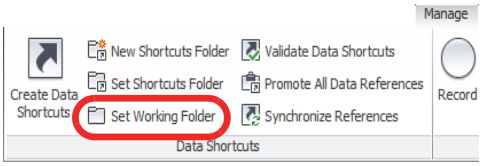

Figure 2–7

3. In the Browse For Folder dialog box, select the *Civil 3D Projects* folder and click Make New Folder, as shown on the left in Figure 2–8. Type **Learning Data Shortcuts** as the folder name and click OK, as shown on the right in Figure 2–8.

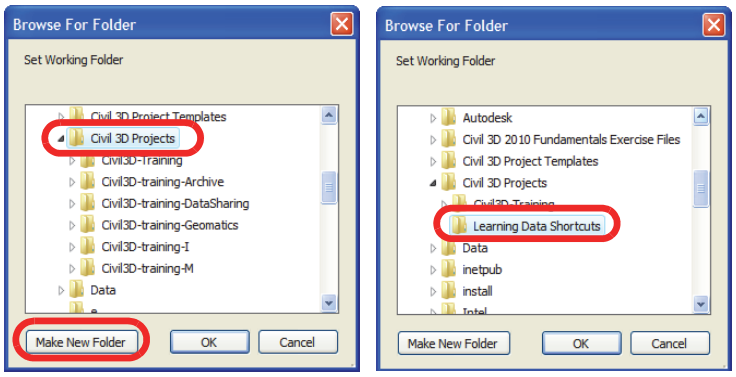

Figure 2–8

Task 2 - Create new *Shortcuts* folders.

In this task, you will create a new folder for storing a set of related project drawings and Data Shortcuts. Create a folder name that reflects the project name and specify whether or not to use a project template to organize your data. A second project folder is created to help you understand how to change the project in which you are working as required.

1. Continue working with the drawing from the previous task.

2. In the *Manage* tab>Data Shortcuts panel, select **New Shortcuts Folder**, as shown in Figure 2–9.

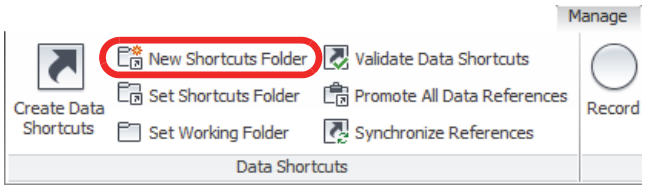

Figure 2–9

3. In the New Data Shortcut Folder dialog box, type **Ascent Phase 1** for the name and select the **Use project template** option. The template is found in the default folder *C:\Civil 3D Templates*, as shown in Figure 2–10. The AutoCAD Civil 3D software will replicate this template folder structure in the Data Shortcuts project folder. Click OK to close the dialog box.

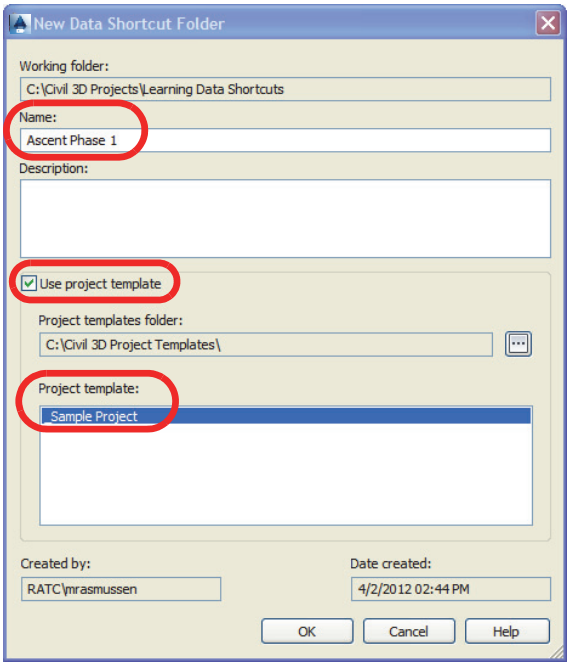

Figure 2–10

4. In the *Prospector* tab, a Data Shortcut folder should be displayed in *C:\Civil 3D Projects\Learning Data Shortcuts\Ascent Phase 1*. In Windows Explorer, verify that the *Civil 3D* folder structure has created for this project, as shown in Figure 2–11.

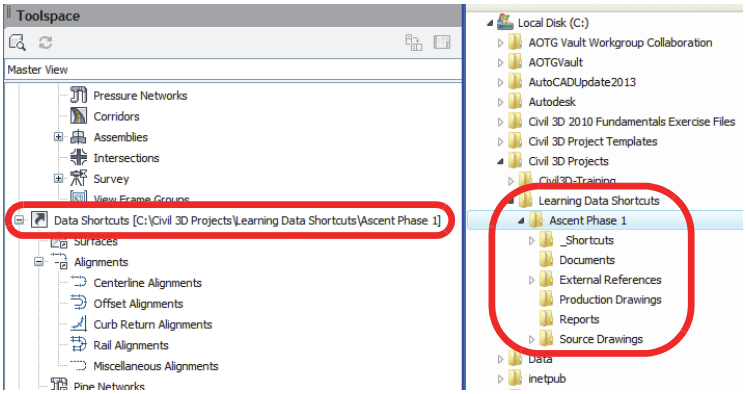

Figure 2–11

5. Create a new shortcuts folder. In the *Manage* tab>Data Shortcuts panel, select **New Shortcuts Folder**.

6. In the New Data Shortcut Folder dialog box, type **Ascent Phase 2** for the name and select the **Use project template** option. Click OK to close the dialog box.

7. You now have two projects in the working folder: *Ascent Phase 1* and *Ascent Phase 2*, as shown in Figure 2–12.

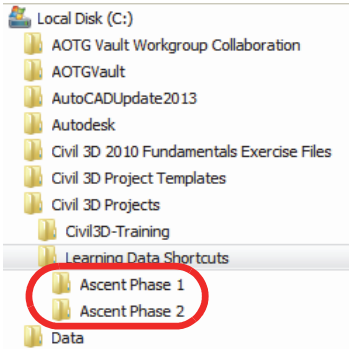

Figure 2–12

Task 3 - Set up *Shortcuts* folder.

Setting the shortcut folder specifies the project path for Data Shortcuts. The path to the current *Data Shortcuts* folder (also known as the project folder) is specified in the *Prospector* tab in the Toolspace, in the *Data Shortcuts* collection. The project folder typically contains both Data Shortcuts and source objects for data references.

1. Continue working with the drawing from the previous task.
2. In the *Manage* tab>Data Shortcuts panel, select **Set Shortcuts Folder**.
3. The current *Data Shortcut* folder is indicated by a green circle with a checkmark. Select **Ascent Phase 1** to make it current and click OK, as shown in Figure 2–13.

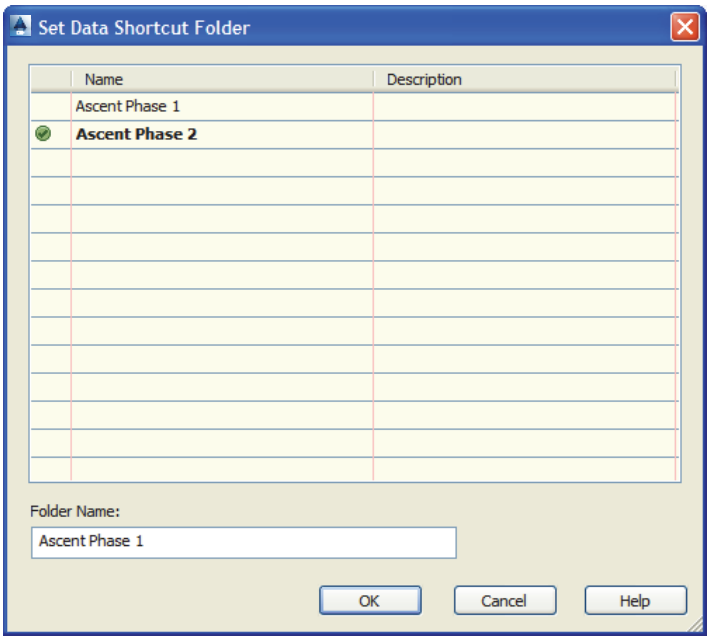

Figure 2–13

4. In the *Prospector* tab, right-click on Data Shortcuts and select **Associate Project to Current Drawing**, as shown in Figure 2–14.

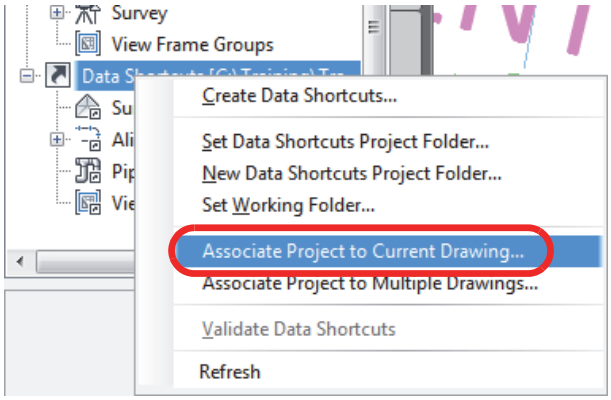

Figure 2–14

5. Verify that Ascent Phase 1 is the selected project. Click OK.

Practice 2b

Manage File Sizes with Data Shortcuts

Estimated time for completion: 20 minutes

Learning Objective

- Create Data Shortcuts from objects in a drawing to share with other team members.

In this practice you will walk through the steps of creating project-based *Data Shortcuts* folders. It simulates a situation in which some design work has been done and you now need to share elements of the design with team members.

Task 1 - Create Data Shortcuts.

1. Continue working with the drawing from the previous practice or open **DS-A1-Shortcuts.dwg**.

2. In the *Prospector* tab, verify that the Data Shortcuts points to the correct folder, as shown in Figure 2–15.

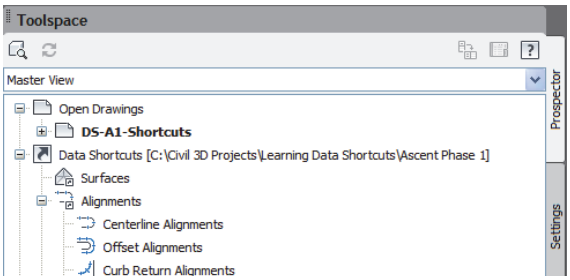

Figure 2–15

3. This drawing contains some surfaces for which you need to create Data Shortcuts. In the *Manage* tab>Data Shortcuts panel, click (Create Data Shortcuts), as shown in Figure 2–16.

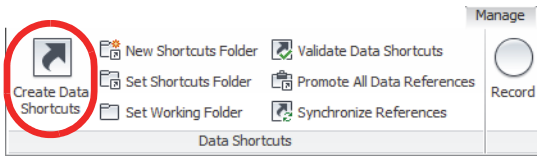

Figure 2–16

4. If you receive a message that the drawing has not yet been saved, click OK. Save the drawing and start the **Create Data Shortcuts** command again.

5. In the Create Data Shortcuts dialog box, a list of all of the available objects for use in shortcuts is displayed. Select **Surfaces** and **Alignments**, as shown in Figure 2–17, and click OK.

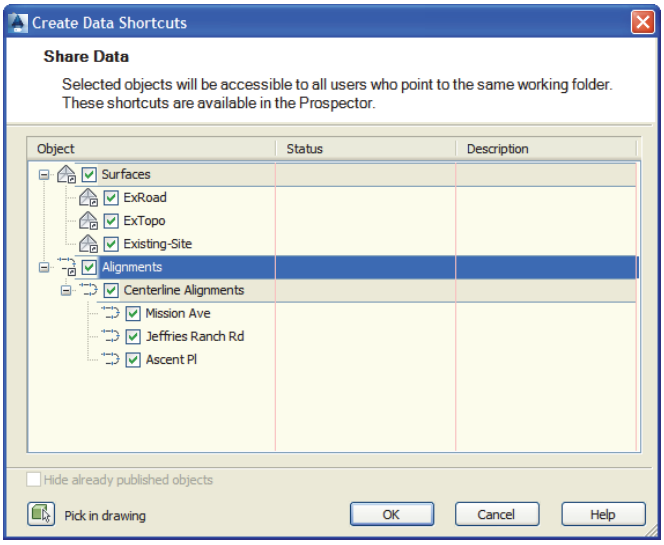

Figure 2–17

6. You have now created shortcuts for the surfaces and alignments. This means that if the shortcuts and drawings are in a shared network folder, anyone on the network has access to these AutoCAD Civil 3D objects.

Note that in the *Prospector* tab, under the *Data Shortcuts* and *Surfaces* collections, you can now access all of the surfaces. In the list view, the source file name and source path are displayed, as shown in Figure 2–18.

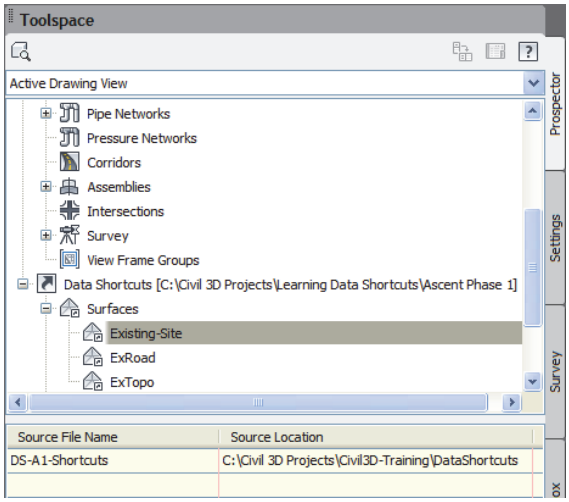

Figure 2–18

7. Save the drawing, but do not close it.

Task 2 - Data-reference Data Shortcuts.

1. Start a new drawing from **_AutoCAD Civil 3D (Imperial) NCS.dwt**. Save the file as **DS-B2-Shortcuts.dwg**.

2. In the *Prospector* tab, ensure that the Data Shortcuts points to the *C:\Civil 3D Projects\Civil3D-training-DataSharing\Training Shortcuts\Ascent Phase 1* folder.

3. In the *Prospector* tab, under the *Data Shortcuts* collection, expand the *Surfaces* collection (if not already expanded) and expand the *Alignments>Centerline Alignments* collection, as shown in Figure 2–19.

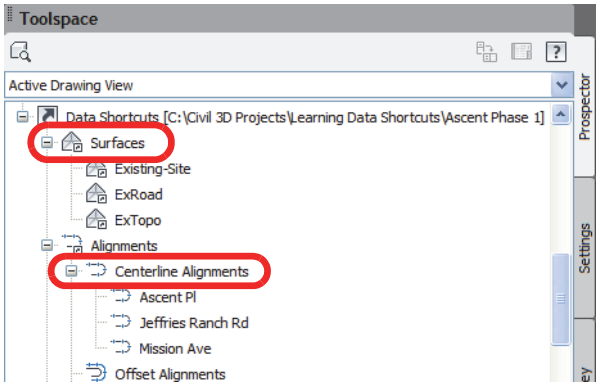

Figure 2–19

4. Under the *Surfaces* collection, select the surface **Existing-Site**, right-click, and select **Create Reference**, as shown in Figure 2–20.

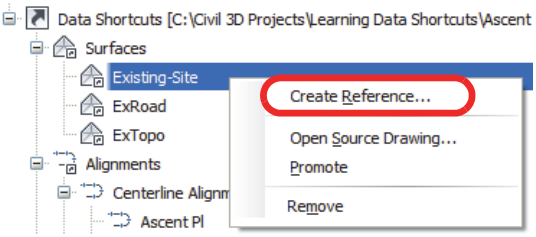

Figure 2–20

5. In the Create Surface Reference dialog box, you can rename the reference surface and assign a different surface and render style. Type **ExSurface** for the *Name*, type **Data referenced surface** for the *Description*, and select **Contours 5' and 25' (Background)** for the *Style*, as shown in Figure 2–21. Click OK to close the dialog box. Type **ZE** and press <Enter> to display the surface reference.

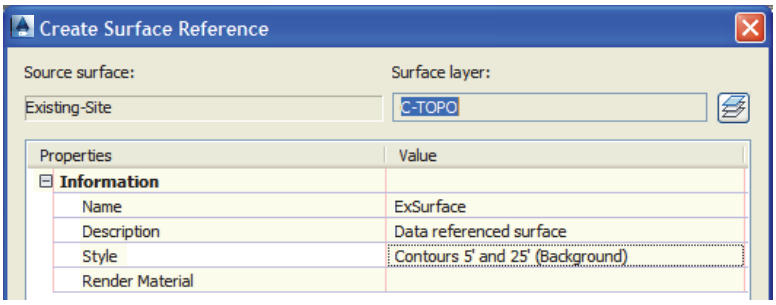

Figure 2–21

6. You will now create a data reference to the alignment. In the *Alignments* collection, select **Ascent PI**, right-click, and select **Create Reference**.

7. In the Create Alignment Reference dialog box, accept the default for the *Name*. Type **Data referenced alignment** for the *Description*. Set the *Alignment style* to **Layout** and set the *Alignment label set* to **Major and Minor only**. Click OK when done, as shown in Figure 2–22.

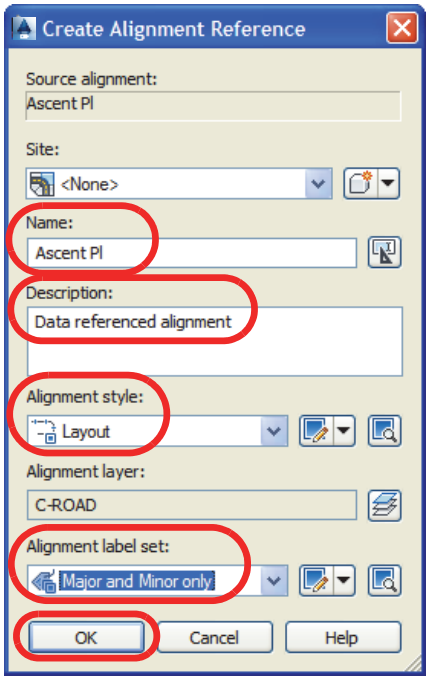

Figure 2–22

8. Zoom in to the end of the Ascent PI alignment, as shown in Figure 2–23.

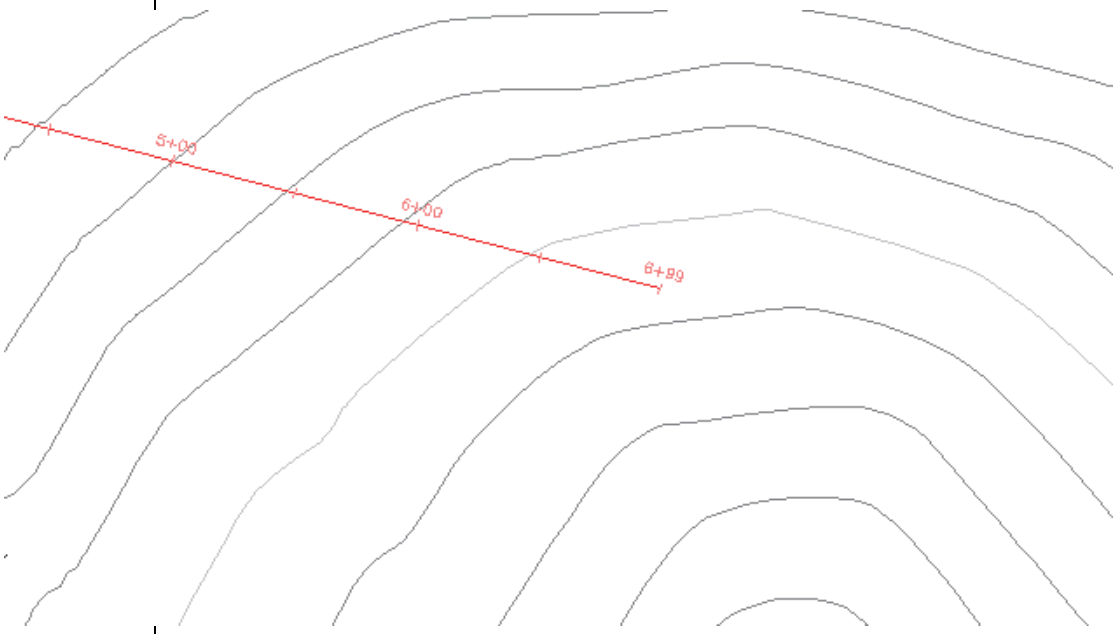

Figure 2–23

9. In Model Space, select the **Ascent PI** referenced alignment. Note that there are no grips and you cannot graphically redefine this alignment. However, you can add labels using the contextual tab.

10. In the contextual tab>Labels & Tables panel, expand Add Labels and select **Station/Offset - Fixed Point**, as shown in Figure 2–24.

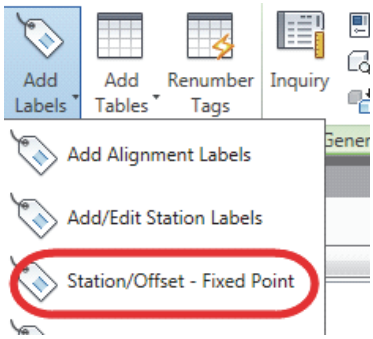

Figure 2–24

11. When prompted to select a point, select the end point of Ascent PI, as shown on the left in Figure 2–25. Select the label and move its location so that it is easier to read, as shown on the right. Note that the station is 6+98.72.

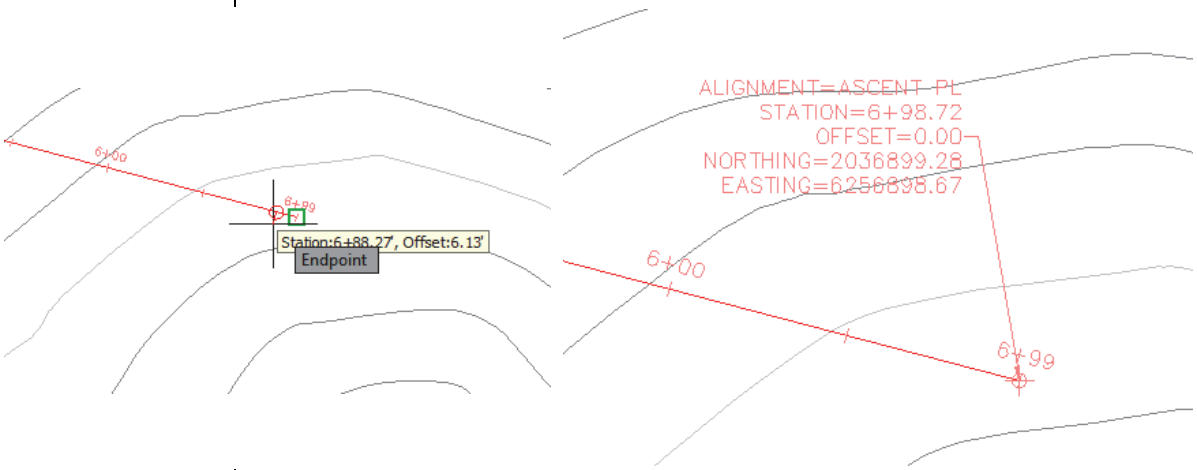

Figure 2–25

12. In the *Prospector* tab, expand the *Surfaces* and *ExSurface* collections, as shown on the left in Figure 2–26. Note that it does not contain the definition elements that might otherwise be displayed in a surface that is not data-referenced, as shown on the right. Therefore, you cannot edit or make design changes to a referenced surface.

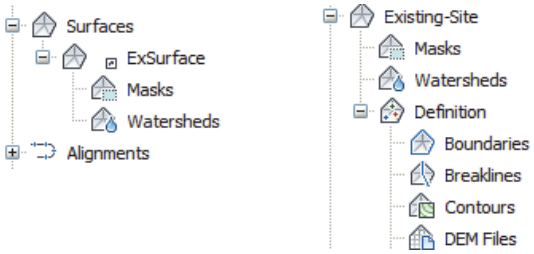

Figure 2–26

13. Save the drawing but do not close it.

Task 3 - Revise original referenced object.

1. In the *Prospector* tab, ensure that the Data Shortcuts points to the *C:\Civil 3D Projects\Civil3D-training-DataSharing\Training Shortcuts\Ascent Phase 1* folder.

2. Ensure that the **Master View** is enabled in Toolspace so that all of the drawings that are loaded are displayed. Select **DS-A1-Shortcuts**, right-click and select **Switch to**, as shown in Figure 2–27. **DS-A1-Shortcuts.dwg** is now the current drawing. However, if you had closed the drawing, you need to open **DS-A1-Shortcuts.dwg.**

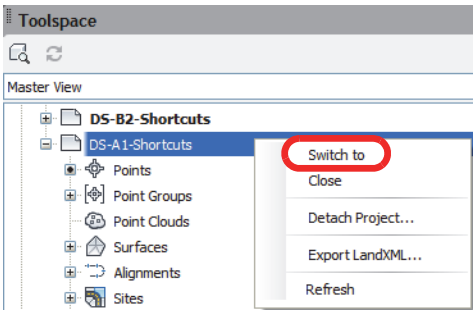

Figure 2–27

3. Zoom into the end of Ascent PI to get a better view of the cul-de-sac.

4. You will now change the length of this alignment. In Model Space, select the alignment, select the grip that signifies the end of the alignment, and move it to the intersection where it crosses the cul-de-sac bulb, as shown in Figure 2–28.

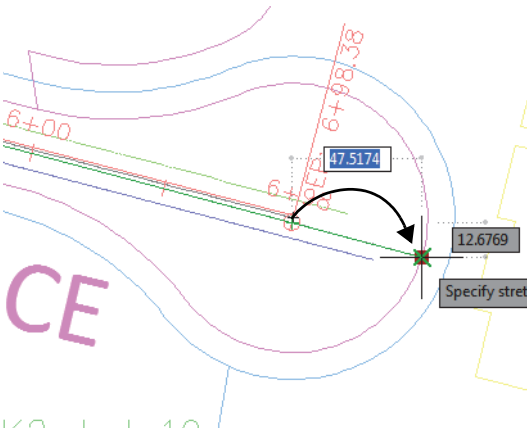

Figure 2–28

5. In the contextual tab>Modify panel, select **Alignment Properties**, as shown in Figure 2–29.

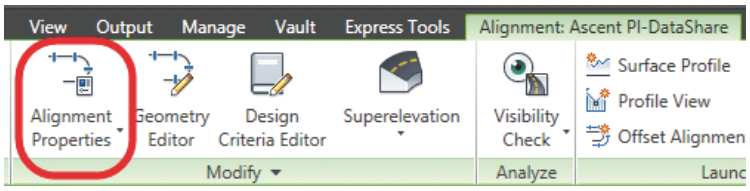

Figure 2–29

6. In the *Station Control* tab in the Alignment Properties - Ascent PI dialog box, set the reference point Station to **100**, as shown in Figure 2–30. A warning displays prompting you that changing the station will affect objects and data that have already been created. Click OK to dismiss the warning. Click OK to close the Alignment Properties dialog box.

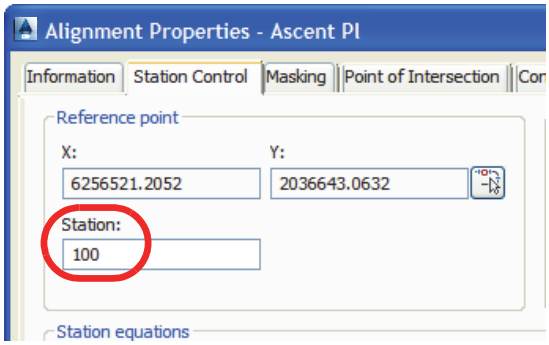

Figure 2–30

7. Save the drawing. This will cause the Data Shortcut to update.

8. If you are continuing with the drawing from the previous task, ensure that the Master view is enabled in the Toolspace so that you can see all of the drawings that are loaded. Select **DS-B2-Shortcuts**, right-click, and select **Switch to**. **DS-B2-Shortcuts.dwg** is now the current drawing.

9. If you closed the drawing in Step 8, open the drawing **DS-B2-Shortcuts.dwg** (move to Step 12).

10. At the bottom right corner of the application window, a message displays prompting you that the data shortcut definitions might have been changed. To synchronize your current drawing, select the **Synchronize** link in the balloon notification, as shown in Figure 2–31.

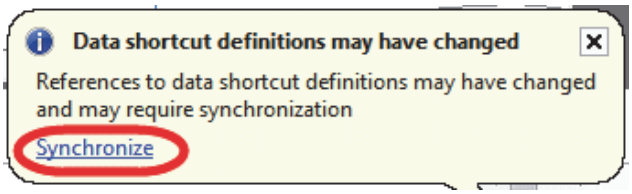

Figure 2–31

11. Alternatively, in the *Prospector* tab, select the alignment **Ascent Pl** in the *Alignments* collection. Right-click and select **Synchronize**, as shown in Figure 2–32.

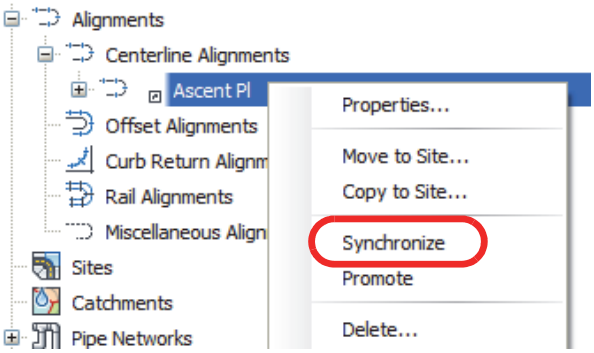

Figure 2–32

12. If **DS-B2-Shortcuts.dwg** was not previously created, open **DS-B3-Shortcuts.dwg**.

13. Note that the alignment has updated geographic information, as shown in Figure 2–33. The end of the alignment has been extended to intersect the cul-de-sac bulb, and the station label is updated to reflect the change to the original alignment design.

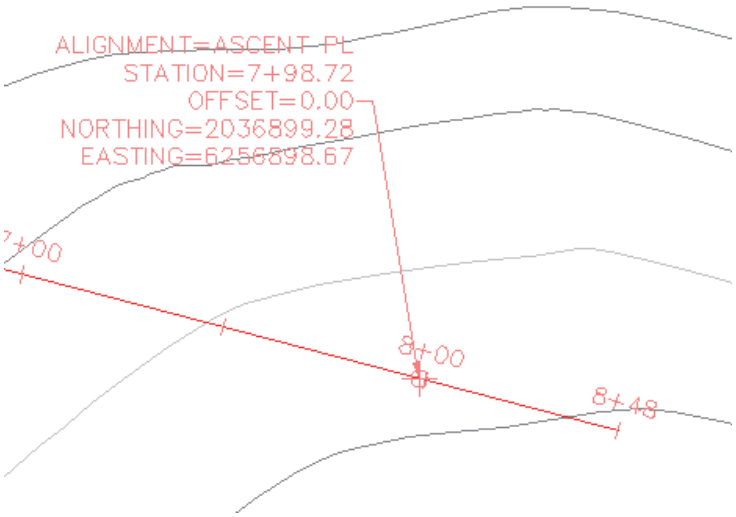

Figure 2–33

14. Save the drawing.

Practice 2c

Share Projects with Team Members Outside the Office Network

Estimated time for completion: 5 minutes

Learning Objective

- Create a transmittal package to send to other design professionals on the project team, which includes all of the referenced object drawings, XREFs, and other required files.

1. Continue working with the previously opened drawing **DS-B2-Shortcuts.dwg**.

2. Expand (Application Menu), expand Publish, and select **eTransmit**, as shown in Figure 2–34. If a Warning dialog box opens stating that the current drawing is not saved, click Yes to save it.

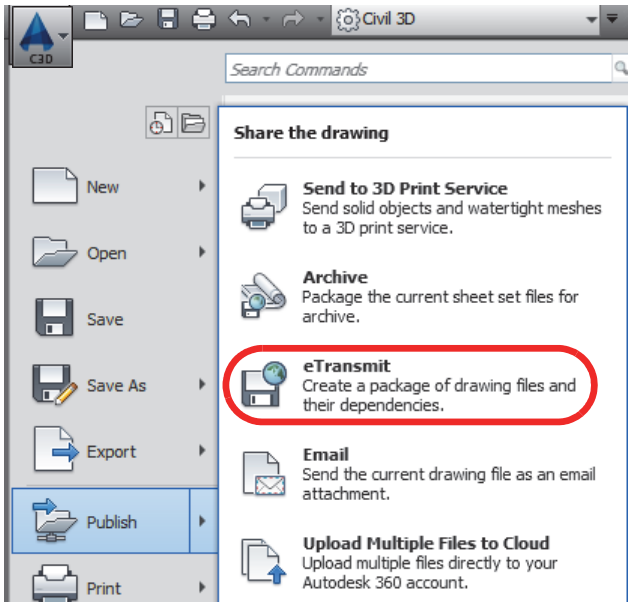

Figure 2–34

3. In the eTransmit dialog box, click Transmittal Setups..., as shown in Figure 2–35.

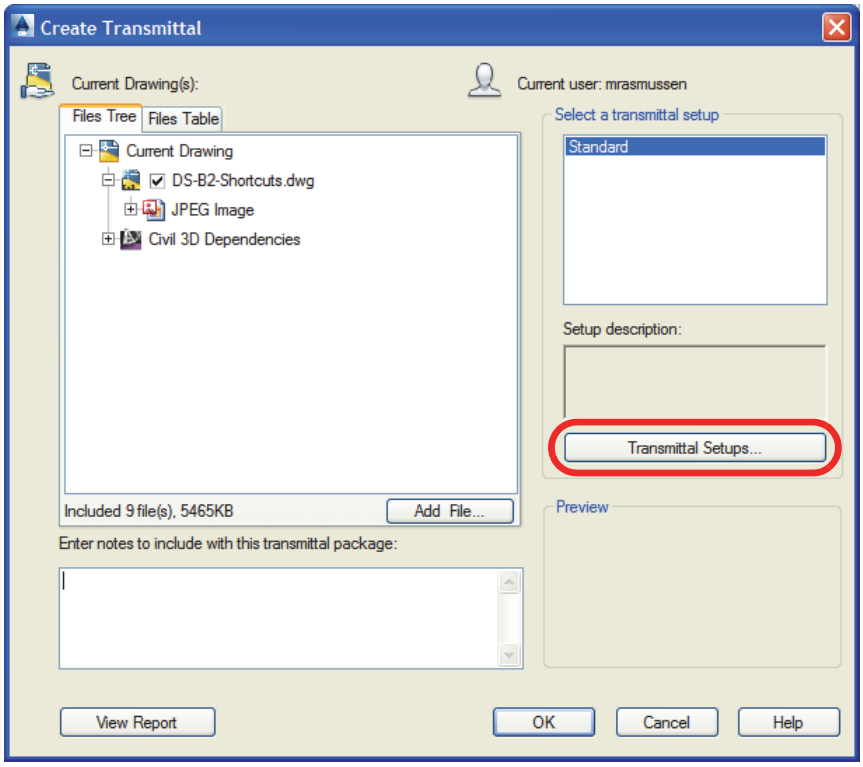

Figure 2–35

4. In the Transmittal Setups dialog box, select the **Standard** setup and click Modify..., as shown in Figure 2–36.

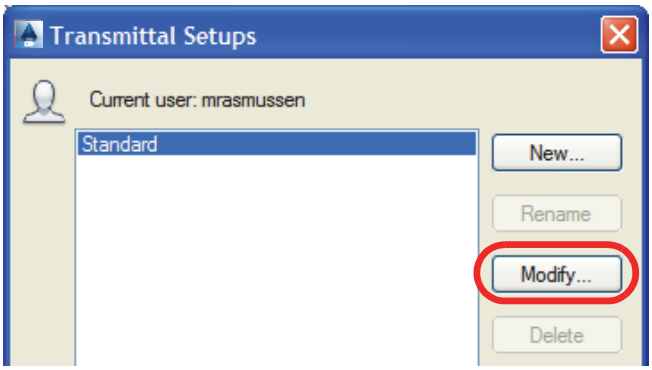

Figure 2–36

5. In the Modify Transmittal Setup dialog box, accept the default for *Transmittal file folder*. Expand the Transmittal file name drop-down list and select **Prompt for a filename**. Select the **Keep files and folders as is** option. In the *Include options* area, select all of the options, as shown in Figure 2–37.

   Accept the remaining defaults and click OK to close the dialog box.

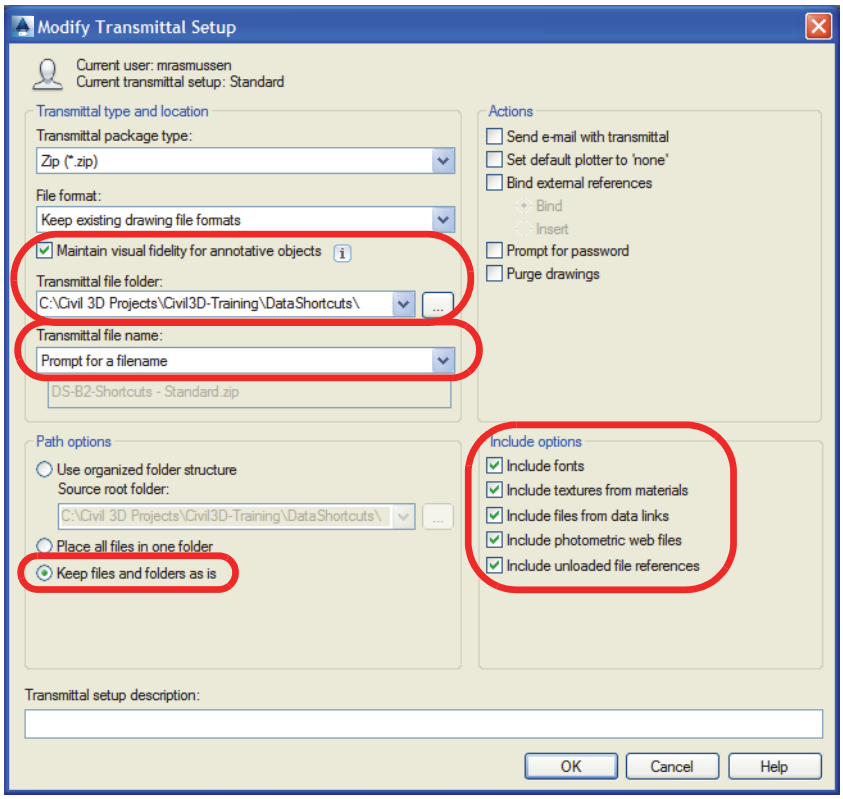

Figure 2–37

6. Close the Transmittal Setups dialog box.

7. Click OK to close the Create Transmittal dialog box and create the transmittal.

8. When prompted for the filename for the transmittal file, accept the default and save it. The AutoCAD Civil 3D software will create a compressed file of all of the relevant data.

Chapter Review Questions

1. In the AutoCAD Civil 3D workflow, what are the two main methods of project collaboration (or the sharing of intelligent AutoCAD Civil 3D design data)?
   a. Windows Explorer and X-refs.
   b. Data shortcuts and Vault references.
   c. X-refs and Data shortcuts.
   d. Vault references and X-refs.
2. Why would you want to use Vault references over Data Shortcuts?
   a. Added security and version control.
   b. Permit more people to have access.
   c. It works more like Land Desktop.
   d. It works better with multiple offices.
3. When sharing data in a project collaboration environment, what is the recommended number of levels into which the data should be broken?
   a. 1 level
   b. 2 levels
   c. 3 levels
   d. 4 levels
4. How can you edit an object referenced through Data Shortcuts?
   a. Open the source drawing.
   b. With grips.
   c. Using the Panorama view.
   d. You cannot.
5. What is the file format that Data Shortcuts use to share design data between drawing files?
   a. .SHP
   b. .DWT
   c. .DWG
   d. .XML

Command Summary

Button	Command	Location
	Create Data Shortcuts	**Ribbon:** *Manage* tab>Data Shortcuts panel **Command Prompt:** CreateDataShortcuts
	New Shortcuts Folder	**Ribbon:** *Manage* tab>Data Shortcuts panel **Command Prompt:** NewShortcutsFolder
	Set Shortcuts Folder	**Ribbon:** *Manage* tab>Data Shortcuts panel **Command Prompt:** SetShortcutsFolder
	Set Working Folder	**Ribbon:** *Manage* tab>Data Shortcuts panel **Command Prompt:** SetWorkingFolder