State of Florida Department of Transportation



# **FDOT Civil 3D Drainage**

## **Course Guide**

## Chapters 1-16

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PRODUCTION SUPPORT CADD OFFICE TALLAHASSEE, FLORIDA

http://www.fdot.gov/cadd/

## FDOT Civil 3D Drainage

## **Description**

This manual serves two primary functions. It is a training manual for instructor-led training, and a user's manual for drainage engineers, designers, and technicians. Lab exercises are provided in the chapters, although the instructor-based classes may not use all the exercises or cover all the chapters.

This manual is a comprehensive guide demonstrating FDOT Civil 3D workflows for defining drainage basins, pipe and structure placement, editing and labeling Civil 3D's intelligent objects, and visualization techniques to promote ease of understanding and facilitating communication of design intent

This manual demonstrates the workflows for base map compilation, rules-based layout of pipes and structures, displaying and editing network parts in plan and profile views, and creating finished ground terrain models. Roadway alignments, profile views, and digital terrain models are utilized to display and edit the network parts during the design process. Terrain models are used to communicate flow direction, delineate watershed boundaries, set rim elevations, and represent existing and design grades.

This manual contains an example of a closed drainage system for paved areas utilizing inlet, junction and outfall structures with connecting pipes. 3D visualization tools enable the user to quickly recognize errors and effectively communicate design intent.

Hydrologic analysis, hydraulic analysis, and plan production are not topics covered by this manual.

## **Objectives**

The student will have a basic understanding of ....

- FDOT Civil 3D State Kit Tools
- Pipe Network Creation, Layout, and Editing
- Alignments and Profiles
- Surfaces
- Grading
- Annotation
- Data Management Techniques Annotating Drainage Plans

#### <u>Audience</u>

This course is intended for roadway designers and drainage engineers.

### **Prerequisites**

Participants need to have an understanding of AutoCAD and Civil 3D Essentials.

#### Duration: 24 Hours

#### Professional Credit Hours: 24 PDHs

*Note* PDH Credit will only be available with Instructor lead or Computer Based Training (CBT) thru Learning Curve.

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# **1** GETTING STARTED

## DESCRIPTION

This chapter provides the background information and context to help the user prepare to use this manual.

## **OBJECTIVES**

This chapter is divided into two sections:

- Introduction
  - Purpose
  - Terminology
  - Civil 3D Objects
  - o About Civil 3D
  - o About this Manual
  - Resources
- Project Components
  - Civil 3D Drawings
  - o Pipe Network Part Catalogs
  - Entity Manager Database
  - Survey Database
  - Drainage Design Workflow Using Civil 3D

## CHAPTER SETUP

Basic understanding of AutoCAD and Civil 3D.

## INTRODUCTION

### PURPOSE

This manual serves two primary functions. It is a training manual for instructor-led training, and a user's manual for drainage engineers, designers, and technicians. Lab exercises are provided at the end of the chapters, although the instructor-based classes may not use all the exercises or cover all the chapters.

## TERMINOLOGY

Throughout this document the term "Department" refers to the Florida Department of Transportation. The Department's standards for drainage design are provided in the Drainage Manual. Guidelines for drainage design are provided in the various drainage handbooks (Storm Drain, Hydrology, etc.). The Department's Plans Preparation Manual and CADD Manual provide the standards for preparing the construction plan sets. Discussions about how to best use Civil 3D to comply with the Department's CADD standards and guidelines are included in this document where appropriate.

## CIVIL 3D OBJECTS USED IN THE DATASETS FOR THIS MANUAL

- Surface
- Feature Line
- Grading
- Alignment
- Profile
- Profile View
- Catchment

*Note* Descriptions for each object can be found in the Civil 3D Online Help system:

https://knowledge.autodesk.com/support/autocad-civil-3d

## ABOUT CIVIL 3D

Civil 3D is a comprehensive application for designing and analyzing storm drain systems. Civil 3D includes a comprehensive set of tools for designing storm water conveyance systems in a dimensionally accurate 3D model. The FDOT Civil 3D State Kit contains over 1500 3D structures in the Custom FDOT Part Catalog.

The pipe and structure objects can be edited graphically or numerically using a variety of convenient user interface features including interactive dialog boxes, cursor menus, tool tips, toolbars, ribbons, palettes, with most of these having context sensitive behaviors. Predefined styles compliant with FDOT standards are included with the FDOT Civil 3D State Kit. These styles control the graphical appearance of pipes, structures, surfaces, their labels and much more.

Preset command behaviors simplify the use of commands so pipes and structures are created and labeled simultaneously using the desired styles. Designs are produced with less effort and eliminate labeling errors.

## ABOUT THIS MANUAL

This manual is a comprehensive guide demonstrating FDOT Civil 3D workflows for defining drainage basins, pipe and structure placement, editing and labeling Civil 3D's intelligent objects, and visualization techniques to promote ease of understanding and facilitating communication of design intent.

This manual demonstrates the workflows for rules-based layout of pipes and structures that can be displayed in plan and profile views. Roadway alignments, profile views, and digital terrain models are utilized by the network parts during the design process. Terrain models are used to communicate flow direction, delineate watershed boundaries, and represent existing and design grades.

This manual contains an example of a closed drainage system for paved areas utilizing inlet, junction and outfall structures with connecting pipes. 3D visualization tools enable the user to quickly recognize errors and confirm satisfaction of design intent.

### Resources

Roadway Drainage

http://www.fdot.gov/roadway/Drainage/Manualsandhandbooks.shtm

- CADD Manual
   <a href="http://www.fdot.gov/cadd/downloads/publications/CADDManual/default.shtm">http://www.fdot.gov/cadd/downloads/publications/CADDManual/default.shtm</a>
- FDOT Civil 3D State Kit
   <a href="http://www.fdot.gov/cadd/downloads/software/software.shtm">http://www.fdot.gov/cadd/downloads/software/software.shtm</a>

## **PROJECT COMPONENTS**

Civil 3D has four major Components within each project:

- Civil 3D Design File (\*.dwg)
- Pipe Network Catalogs (\*.xml) for both Structures and Pipes
- Entity Manager Database (\*.xml)
- Survey Database (\*.sdbx) storage for all Survey Information of the project

#### CIVIL 3D DRAWINGS

Civil 3D Drawing Files are in a binary format with a .dwg file extension. They contain object tables and databases. When opened in an AutoCAD environment the drawing displays graphical and textual content. Civil 3D objects are created and stored in this .dwg file format along with native AutoCAD objects.

#### PIPE NETWORK PART CATALOGS

Civil 3D comes with a pipe network part catalog that contains a variety of pipe and structure shapes organized into part families and part sizes. Since the part catalog contains many items, you can create a parts list containing only the parts (pipes and structures) that you will use for a particular pipe network. Using a parts list saves you from having to navigate through the entire part catalog to find a desired part.

Pipe Network Part Catalogs are defined external to the .dwg file. The FDOT Civil 3D State Kit contains a customized Part Catalog named FDOT Drainage containing over 1500 structures and pipes conforming to the Department's standards.

Refer to Civil 3D Help for more details on Pipe Network Part Catalogs and Parts Lists.

## ENTITY MANAGER DATABASE (EMX)

Entity Manager uses a Pay Item Database in an .xml format. Entity Manager is used to assign, modify, and append pay items to AutoCAD objects for the purpose of querying drawings to create quantity reports.

When you open Entity Manager there is a Help button in the upper right corner of the dialog box. This link opens the Entity Manager Reference Guide.

### SURVEY DATABASE

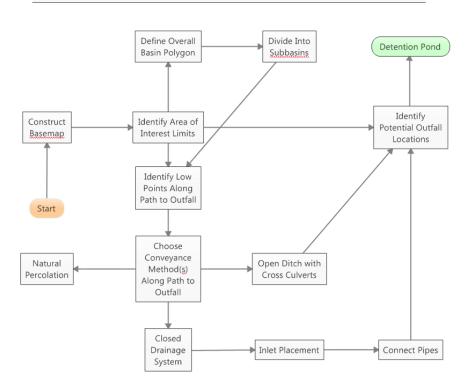
In Civil 3D, survey data is not drawing dependent and is stored in an external database. For display and visualization, survey data can be manually and automatically inserted into a drawing when the survey database is updated or when data is imported into the survey database.

The Survey database consists of two files, the sdbx file is the main survey database and it contains all the data in the survey database collections except for the Extended Properties definitions and values. The Survey sdxx file contains the Extended Properties definitions and values. The.sdbx file is a Microsoft® SQL Server® Compact 3.5 file format.

## DRAINAGE DESIGN WORKFLOW USING CIVIL 3D

#### GENERAL PROCESS OVERVIEW

## Drainage Design Workflow Using Civil 3D



The Basemap is the background data assembled in a Drainage Map drawing file. Background data can be in the form of external references to other drawings from Survey, Roadway Design, Geotech, and Right of Way Mapping. The Survey Database can provide point and breakline data for surfaces representing existing conditions. Data references to surfaces from design tasks can be used to automatically place structures at corresponding design rim elevations.

- Surface Analysis and styles are used to define the boundaries of Watershed areas.
- Watershed areas and basins and subbasins are terms used interchangeably.
- Inlets and Junctions are types of Civil 3D Pipe Network Structures. Pipes are Civil 3D Pipe Network objects that connect structures and determine flow direction.
- Grading tasks use Civil 3D Grading objects and Feature Line objects. Objects created during grading tasks are added as source data to a Civil 3D Surface object. Changes in source data will cause Civil 3D objects to react dynamically Data Shortcuts are a mechanism for sharing original Civil 3D object data with other .dwg files.
- Data Shortcuts enable you to maintain one drawing containing the defining editable content and use a non-editable instance of the object in other .dwg files. The display of the shared objects can be altered using the same object styles as if it were the original object. Linking to the original source is known as creating a data reference.

# **2** PIPE NETWORK SETUP

## DESCRIPTION

This chapter introduces the Parts Catalog from which a Civil 3D Pipe Network adds content to drawings and derives parameters such as identity, description, and dimension. It also contains a brief overview of the custom configuration provided by the FDOT Civil 3D State Kit.

## **O**BJECTIVES

In this chapter, you will learn about:

- Pipe Network Catalogs
- Parts Lists

## **PIPE-NETWORK CATALOGS**

## DRAINAGE COMPONENTS

Pipe Network catalogs (\*.*xml*) - The Pipe Network catalogs is utilized for numerous projects, as it contains the standards for an entire organization. The Pipe Network catalogs contains the Rainfall Parameters, standard inlet types, standard pipes configurations, spread sections, and land use symbology tables. All of these items are merely referenced by each project to accommodate standardization and information sharing among projects. The Department provides Pipe Network catalogs as part of the FDOT Civil 3D State Kit. If the designer needs to modify any of the standard provided files, he needs to include these updated files as part of his project deliverable.

Civil 3D organizes the components of a drainage system according to their spatial characteristics. Spatial information is stored as *Structures, Pipes* and *Pipe Networks*.

- **Structures:** Structure (inlets, manholes, etc.) is a point with a user-defined location. The location may be in Cartesian coordinates (x,y), State Plane (northing, easting) or in curvilinear coordinates (station, offset).
- **Pipes:** Pipes represents a linear feature depicting a path connecting two nodes, traversing upstream to downstream. The path may be straight line or curvilinear (along a graphic element).
- **Pipe Networks**: A network is a system of interconnected structures and pipes that form a system through which water can flow to a single outlet. A drainage project can accommodate any number of Pipe Networks.

## HOW THE PARTS CATALOG WORKS

When pipe networks are created or edited, Civil 3D references the parts catalog for information about each part (pipe or structure).

The FDOT Civil 3D State Kit installs the default pipe network parts catalog at:

C:\FDOT20xx.C3D\Data\Pipes Catalog.

## PIPE NETWORK CATALOG SETTINGS DIALOG BOX

Use this dialog box to configure Civil 3D to access the FDOT pipe network parts catalog, or to access specific FDOT pipe and structure catalogs within the imperial catalog folders.

The FDOT part catalog settings defined here enable pipe network parts lists to access the content for FDOT pipe and FDOT structure shapes.

Part catalogs are set for each drawing. When in a drawing, and you switch between drawings, the catalogs (both pipe and structure) will automatically be set to the unit it was last in that particular drawing. You can alternate between drawings that use imperial or metric units without changing any settings.

| A Pipe Network Catalog Settings                        | × |  |  |  |  |
|--|---|--|--|--|--|
| Catalog folder:<br>C:\FDOT2017.C3D\Data\Pipes Catalog\ |   |  |  |  |  |
| Pipe catalog:  |   |  |  |  |  |
| FDOT Imperial Pipe Catalog $\qquad \checkmark$         |   |  |  |  |  |
| Structure catalog:                                     |   |  |  |  |  |
| FDOT Imperial Structure Catalog $$                     |   |  |  |  |  |
| OK Cancel Help   |   |  |  |  |  |

*Note* The default catalog unit is determined by the Drawing Units setting in the Drawing Settings dialog box Units and Zone tab. For new and previously existing drawings, use this setting on initialization to set the unit of measure.

## CATALOG FOLDER

Specifies the folder that contains the current Civil 3D Pipe Network Parts Catalogs.

- Pipe Catalog:
- Specifies the current Civil 3D pipe catalog.
- Structure Catalog:
- Specifies the current Civil 3D structure catalog.

## **DRAINAGE PART LIST INFORMATION**

The FDOT Drainage parts list resides in the fdotmaster.dwt template that is used every time a design file is created using the Create File application. The path to the parts list is already set when you open Civil 3d using the FDOT State Kit icon.

#### INFORMATION TAB:

Use this tab to view or change general information for the pipe network parts list. The Name specifies the name of the current parts list. The Description specifies the description for the current parts list.

| 🗛 Network Parts List - FDOT Drainage               |                   | — 🗆 X                 |
|--|-------------------|-----------------------|
| Information Pipes Structures Summary               |                   |                       |
| Name:  | Created by:       | Date created:         |
| FDOT Drainage                                      | RD964RR           | 3/19/2015 10:20:44 AM |
| Description:                                       | Last modified by: | Date modified:        |
| Proposed Drainage Parts for FDOT Drainage Projects | ps972rr           | 2/27/2017 5:11:46 PM  |
| V  |                   |                       |
|  |                   |                       |
|  |                   |                       |
|  |                   |                       |
|  |                   |                       |
|  |                   |                       |
|  |                   |                       |
|  | OK Cance          | el Apply Help         |

#### PIPES TAB:

Inside the Parts list there are several styles that reside controlling the appearance of the parts to match FDOT standards. The image below shows what is contained within the Pipes tab of the parts list.

| e a las las solas d                     |       |       |              |          |   |
|---|-------|-------|--------------|----------|---|
| formation Pipes Structures Summary      |       |       |              |          |   |
| Name                                    | Style | Rules | Render Mater | Pay Item |   |
| FDOT Drainage                           |       |       |              |          |   |
| 📴 🗁 Box Culvert Concrete Pipe           | Ę     | Ę     | Ę            |          | Ę |
| 🕀 🕞 Vertical Elliptical Concrete Pipe   | Ę     | Ę     | E            |          | Ę |
| 🕀 🕞 Horizontal Elliptical Concrete Pipe | Ę     | Ę     | E            |          | Ę |
| 🕀 🕞 Utility Duct                        | Ę     | Ę     | E            |          | Ę |
| 🕀 🕞 Pipe Culvert S/CD                   | Ę     | Ę     |              |          | Ę |
| 🕀 🕞 Pipe Culvert SD                     | Ę     | Ę     | E            |          | Ę |
| 🕀 🕞 Pipe Culvert Gutter Drain           | Ę     | Ę     | E            |          | Ę |
|   |       |       |              |          |   |
|   |       |       |              |          |   |
|   |       |       |              |          |   |
|   |       |       |              |          |   |
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|   |       |       |              |          |   |
|   |       |       |              |          | _ |
| <                                       |       |       |              |          |   |

You can add new pipe sizes to the parts list or remove pipe sizes from the parts list. Each size selection matches a part size from an FDOT part family in the part catalog. Optional properties may also be set on the part size. The combined set of selected and optional properties is assigned to the pipe when it is inserted into the drawing.

- Name: This tree view displays the name of the FDOT parts list at the top level, and then the names of the FDOT part families included in the parts list, and then the names of the part sizes included in each part family. Note when a new size is added to the parts list, it is assigned a default unique name. The size name can be edited (renamed) to any unique name within the part family size list.
- **Style:** Specifies the default FDOT style assigned to the pipe when it is inserted into the drawing. Select an FDOT part family and click the Select All Edit icon to assign the selected FDOT style to all part sizes within that family.
- **Rules:** Specifies the default rules assigned to the pipe when it is inserted into the drawing. Select an FDOT part family and click the Select All Edit icon to assign the selected style to all part sizes within that family.
- **Render Material:** Specifies the default render material assigned to the pipe when it is inserted into the drawing. Select an FDOT part family and click the Select All Edit icon to assign the selected style to all part sizes within that family.
- **Pay Item:** Specifies the FDOT pay item ID assigned. Select a part family, or a part size within a FDOT part family, and then click to assign a pay item to all part sizes within that family, or to an individual part size within that family.

Click on the + sign to the left of FDOT Drainage style to expand the list Pipe families.

| Name                      | Style            | Rules        | Render N  |          | 1  |
|---------------------------|------------------|--------------|-----------|----------|----|
| 🖨 🗁 Pipe Culvert S/CD     |                  | e,           | e,        | Ę        |    |
| - CULVER                  | T, OPT FDOT Drai | 📽 FDOT Pipes | 📽 ByLayer | 04301751 | 12 |
| - CULVER                  | T, OPT FDOT Drai | 📽 FDOT Pipes | 📽 ByLayer | 04301751 | 15 |
| 🥪 18'' S/CD PIPE CULVER   | T, OPT FDOT Drai | 📽 FDOT Pipes | 🕝 ByLayer | 04301751 | 18 |
| 🥪 24'' S/CD PIPE CULVER   | T, OPT FDOT Drai | 📽 FDOT Pipes | 🕝 ByLayer | 04301751 | 24 |
| 🥪 30'' S/CD PIPE CULVER   | T, OPT FDOT Drai | 📽 FDOT Pipes | 🕝 ByLayer | 04301751 | 30 |
| 🥪 36'' S/CD PIPE CULVER   | T, OPT FDOT Drai | 📽 FDOT Pipes | 🕝 ByLayer | 04301751 | 36 |
| 42" S/CD PIPE CULVER      | T, OPT FDOT Drai | 📽 FDOT Pipes | 📽 ByLayer | 04301751 | 42 |
| - 🥔 48'' S/CD PIPE CULVER | T, OPT FDOT Drai | 📽 FDOT Pipes | 🕝 ByLayer | 04301751 | 48 |
| 54'' S/CD PIPE CULVER     | T, OPT FDOT Drai | 📽 FDOT Pipes | 🕝 ByLayer | 04301751 | 54 |
| 60'' S/CD PIPE CULVER     | T, OPT FDOT Drai | 📽 FDOT Pipes | 🕝 ByLayer | 04301751 | 60 |
| 66'' S/CD PIPE CULVER     | T, OPT FDOT Drai | 📽 FDOT Pipes | 😪 ByLayer | 04301751 | 66 |
| 🥪 72'' S/CD PIPE CULVER   | T, OPT FDOT Drai | 📽 FDOT Pipes | 😪 ByLayer | 04301751 | 72 |
| - Ø 78'' S/CD PIPE CULVER | T, OPT FDOT Drai | 📽 FDOT Pipes | 😪 ByLayer | 04301751 | 78 |
| 84'' S/CD PIPE CULVER     | T, OPT FDOT Drai | 📽 FDOT Pipes | 🕝 ByLayer | 04301751 | 84 |
|                           |                  |              |           |          | _  |

Click on the + sign to the left of Pipe Culvert S/CD family to expand the list and display Round Pipe sizes.

*Note* Adding additional FDOT Pipe families and sizes will be discussed in a later chapter.

#### STRUCTURES TAB:

| 🔺 Network Parts List - FDOT Drainage — 🗆 🗙 |       |    |   |  |  |  |
|--|-------|----|---|--|--|--|
| Information Pipes Structures Summary       |       |    |   |  |  |  |
| Name                                       |       |    | — |  |  |  |
| ⊕- c FDOT Drainage                         |       |    |   |  |  |  |
|  |       |    |   |  |  |  |
|  |       |    |   |  |  |  |
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|  |       |    |   |  |  |  |
| OK Cancel                                  | Apply | He | p |  |  |  |

The Structure tab contains all the Structure families added from the Structure catalog: FDOT Imperial Structure Catalog. Use this tab to view or change the FDOT structure sizes included in the parts list.

You can add new FDOT structure sizes to the parts list or remove structure sizes from the parts list. Each size selection matches a part size from a part family in the part catalog. Optional properties may also be set on the part size. The combined set of selected and optional properties is assigned to the structure when it is inserted into the drawing.

- Name: This tree view displays the name of the FDOT parts list at the top level, and then the names of the FDOT part families included in the parts list, and then the names of the part sizes included in each part family. Note when a new size is added to the parts list, it is assigned a default unique name. The size name can be edited (renamed) to any unique name within the part family size list.
- **Style:** Specifies the default FDOT style assigned to the structure when it is inserted into the drawing. Select an FDOT part family and click the Select All Edit icon to assign the selected style to all part sizes within that family.
- **Rules:** Specifies the default FDOT rules assigned to the structure when it is inserted into the drawing. Select an FDOT part family and click the Select All Edit icon to assign the selected style to all part sizes within that family.
- **Render Material:** Specifies the default render material assigned to the FDOT structure when it is inserted into the drawing. Select an FDOT part family and click the Select All Edit icon to assign the selected style to all part sizes within that family.
- **Pay Item:** Specifies the FDOT pay item ID assigned. Select an FDOT part family, or a part size within an FDOT part family, and then click to assign a pay item to all part sizes within that family, or to an individual part size within that family.

| ormation Pipes Structures Summary   |                                       |            |
|---|---------------------------------------|------------|
| Name  | Style                                 |            |
| 🖶 🕞 Index No. 425-020 (210) - Curb Inlet Type 3 (Left) with Round Bottom                |                                       |            |
| 🐨 👸 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 42 in. Dia. Riser and 42 in. Dia | a. P FDOT [                           | Drainag    |
| 👸 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 42 in. Dia. Riser and 48 in. Dia   | a. P FDOT [                           | Drainag    |
| 🗝 👸 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 48 in. Dia. Riser and 48 in. Dia | a. P FDOT [                           | Drainag    |
| 🗝 🌍 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 42 in. Dia. Riser and 42 in. Dia | a. P FDOT D                           | Drainag    |
| 👸 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 42 in. Dia. Riser and 48 in. Dia   | a. P FDOT D                           | Drainag    |
| 🗝 🌍 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 48 in. Dia. Riser and 48 in. Dia | a. P FDOT [                           | Drainag    |
| 👸 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 42 in. Dia. Riser and 60 in. Dia   | a. J FDOT D                           | Drainag    |
| 🌍 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 48 in. Dia. Riser and 60 in. Dia   | a. J FDOT D                           | Drainag    |
| 🌍 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 42 in. Dia. Riser and 72 in. Dia   | a. J FDOT D                           | Drainag    |
| 🕤 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 48 in. Dia. Riser and 72 in. Dia   | a. J FDOT D                           | Drainag    |
| 🕤 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 42 in. Dia. Riser and 84 in. Dia   | a. J FDOT D                           | Drainag    |
| - 🕤 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 48 in. Dia. Riser and 84 in. Dia | a. J FDOT [                           | Drainag    |
| - 🕤 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 42 in. Dia. Riser and 96 in. Dia | a. J FDOT [                           | Drainag    |
| - 🔓 Precast Curb Inlet - Type 3 ( Left ) ( Edge ) with 48 in. Dia. Riser and 96 in. Dia | a. J FDOT [                           | Drainag    |
|   | · · · · · · · · · · · · · · · · · · · | <b>.</b> . |
|   |                                       |            |

Click on the + sign to the left of FDOT Drainage style to expand the list of Structure families

Using the vertical slider button on the right side of the dialog box, scroll down to the structure family: Index No. 425-020 (210) - Curb Inlet Type 3 (left) with Round Bottom.

Click on the + sign to the left of Index No. 425-020 - Curb Inlet Type 3 (left) with Round Bottom family to expand the list and display the part sizes within the part family.

*Note* Adding additional FDOT Structure families and sizes will be discussed in a later chapter.

#### SUMMARY TAB:

The Summary tab is used for information and statistics related to the part list, such as number of structures or pipes used.

|                            | Value |             |
|----------------------------|-------|-------------|
| Property  Information      | value | <br>        |
| Information     Statistics |       |             |
|                            |       |             |
|                            |       |             |
|                            |       |             |
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|                            |       |             |
|                            |       | ]<br>[<br>] |

# **3** DEFINING A DRAINAGE MAP

## DESCRIPTION

In this chapter, you will create a Drainage Map by compiling background data from files in a variety of file formats. You will make connections to the data sources and change the display settings. These display settings will help you depict the project limits, display planimetric geometry, and elevation data within the project limits. As part of this exercise you will learn to overlay an aerial photo to align with the site's coordinate system. This compiled data serves as a basemap revealing existing site conditions which a designer can use to understand site constraints, natural drainage patterns and physical site limitations.

## **O**BJECTIVES

The objectives of this chapter are to

- Define a Drainage Map
- Create Design File
- Associate the Drawing to the Project
- Attach External References to .dwg Files
- Attach a Georeferenced Image File
- Control Display of Civil 3D Objects
- Use Layer Controls & Clip Boundaries to Display Data
- Create Data Shortcuts
- Final Data Surface Shortcuts
- Create Data References for Surfaces

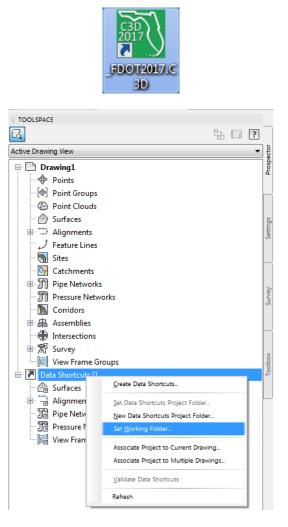
## **CHAPTER SETUP**

Run the Chapter 3 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

#### **Exercise 3.1** Define a Drainage Map for 22049555201 Drainage Project

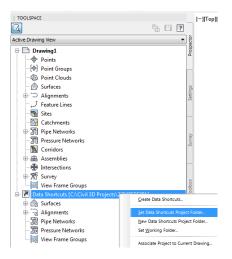
1. Start the FDOT Civil 3D State Kit by double clicking the **\_FDOT20##.C3D** icon as shown below:



2. From *TOOLSPACE* > *Prospector tab* > *Data Shortcuts*, right click to display popup menu and select **Set Working Folder.** 

| Browse For Folder          | ×         |
|----------------------------|-----------|
| Set Working Folder         |           |
|                            |           |
| Divid 3D Project Templates | *         |
| Livil 3D Projects          |           |
| Þ 퉲 22049555201            |           |
| 🛛 🖉 📕 dell                 |           |
| Documents and Settings     |           |
| Downloads                  |           |
| Drivers                    | -         |
| Make New Folder            | OK Cancel |

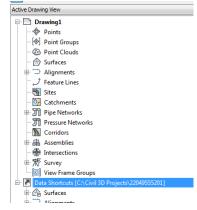
3. From the Browse For Folder dialog box, use the scroll bar to navigate and click on the C:\Civil 3D Projects folder. Click OK to close the Browse For Folder dialog box.



4. From *TOOLSPACE* > *Prospector tab* > *Data Shortcuts*, right click and select **Set Data Shortcuts Project Folder**.

|     | Name        | Description |   |
|-----|-------------|-------------|---|
| 0   | 22049555201 |             |   |
|     |             |             |   |
|     |             |             |   |
|     |             |             | + |
|     |             |             |   |
|     |             |             |   |
|     |             |             |   |
|     |             |             |   |
|     | er Name:    |             |   |
| 220 | 049555201   |             |   |

- 5. From the Set Data Shortcut Folder dialog box, select 22049555201 from the list.
- 6. Click **OK** to close the **Set Data Shortcut Folder** dialog box. The *Data Shortcuts* are now set to reference the *C:\Civil 3D Projects\22049555201* folder.



7. From the Status Bar at the bottom of the window toggle **On** *Selection Cycling* if not on by clicking on the icon as shown below. Selection Cycling is not drawing specific but an option that you can toggle on or off at any time. If a new drawing is created or opened the Selection Cycling option will retain the previous toggle setting

| Selecti | on Cy | cling | ) - On | }     |   |   |   |   |   |   |        |   |    |   |
|---------|-------|-------|--------|-------|---|---|---|---|---|---|--------|---|----|---|
| SELECT  | ION   | УСЦ   | NG     |       |   |   |   |   |   |   |        |   |    | _ |
| <br>م 🕈 | 火     | *     | 1" =   | 40' 🔻 | ۵ | • | + | G | • | ۲ | 3.5000 | P | ×× | ≡ |

## **Exercise 3.2** Create DRMPRD01.dwg Design File

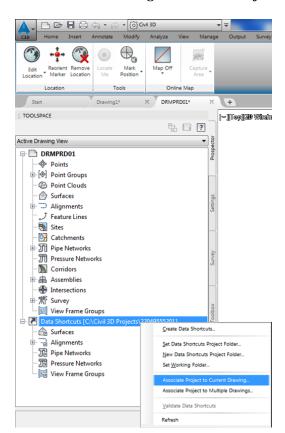
| CID    | Home Insert Annotate Modify Analyze View Manage  | e Output Survey   | Autodesk 350 Help Add-I | ns Featured Apps Express                                       | Tools Vehicle T | racking I | Bridge Modeler | FDOT | •• |
|--------|--|---|-------------------------|--|-----------------|-----------|----------------|------|----|
| Create | Let Hannier View   | FDOT Multi-Line<br>Pavement Markings<br>Place Block Group | Takeoff Manager         | ✓ QC Quick Check<br>중품 Unload QC Quick Check<br>당 File Checker | Lane Slope      | BoreHole  | Links/Contacts |      |    |
| Create | Create and Edit New Drawing Files using the FDOT Standards and Template<br>Files.  | Tools 🕶   | Quantities 👻            | Quality Control 👻  | Reports         | GeoTech   | Help           |      |    |
| TOR    | Launches the Create File application so the user can automatically create a<br>new drawing based on current FDOT Standards. The application uses an<br>active project and folder structure to place the newly created drawing into the<br>correct folder based on the selected template discipline. When the user selects<br>the proper discipline and creates a drawing file it is sequentially named.<br>numbered, and opened. |   |                         |  |                 |           |                |      |    |

1. From the *FDOT tab* > *Create File* panel, click the **Create File** tool.

| Create File (v2015.0.3.5) Workspace: FDOT2016.C3D   |  |                |  |  |  |  |  |  |  |  |
|---|--|----------------|--|--|--|--|--|--|--|--|
|   |  |                |  |  |  |  |  |  |  |  |
| Project:  | C:\Civil 3D Projects\22049555201                                 | Select Project |  |  |  |  |  |  |  |  |
| Discipline:   | ROADWAY  |                |  |  |  |  |  |  |  |  |
| File Group:   | File Group: Drainage Design Files 🔹                              |                |  |  |  |  |  |  |  |  |
| File Type:  | File Type:   |                |  |  |  |  |  |  |  |  |
| Box Culvert Wingwall Design and Special Details<br>Bridge Hydraulics Recommendation Sheet<br>Drainage Detail Sheet<br>Drainage Rood Data Form |  |                |  |  |  |  |  |  |  |  |
| Drainage Ma   |  |                |  |  |  |  |  |  |  |  |
| Drainage Str  | ucture Cross Sections  |                |  |  |  |  |  |  |  |  |
|   | uctures - Existing<br>uctures - Proposed                         |                |  |  |  |  |  |  |  |  |
| Lateral Ditch   | Cross Sections,Pattern Line and Shapes<br>Plan and Profile Sheet |                |  |  |  |  |  |  |  |  |
| Pond Cross S  |  |                |  |  |  |  |  |  |  |  |
| Pond Design<br>Storm Water  | Pollution Prevention Plan  |                |  |  |  |  |  |  |  |  |
| Summary of [  | Drainage Structures  |                |  |  |  |  |  |  |  |  |
| Wetlands De   | lineation for Drainage   |                |  |  |  |  |  |  |  |  |
| Output File:  | DRMPRD01.dwg   |                |  |  |  |  |  |  |  |  |
| Output Folder   | - drainage\  | Browse         |  |  |  |  |  |  |  |  |
| Template:   | fdotmaster.dwt   | Browse         |  |  |  |  |  |  |  |  |
| Template Pat  | h: data/templates/   |                |  |  |  |  |  |  |  |  |
| Coordinate S  | ystem: FL North  |                |  |  |  |  |  |  |  |  |
| Cre   | ate/Open File  | Close          |  |  |  |  |  |  |  |  |

- 2. From the Create File dialog box, set the following values:
  - a. Project: C:\Civil 3D Projects\22049555201
  - b. Discipline: ROADWAY
  - c. File Group: Drainage Design Files
  - d. File Type: Drainage Map
  - e. Output File: DRMPRD01.dwg
  - f. Output Folder: drainage
  - g. Template: fdotmaster.dwt
  - h. Template Path: data/templates
  - i. Coordinate System: FL North
- 3. Click Create/Open File
- 4. Click **Close** to close the **Create** File dialog box.

#### **Exercise 3.3** Associate DRMPRD01.dwg File to the Project



1. From the *TOOLSPACE* > *Prospector tab* > *Data Shortcuts* [C:\Civil 3D Projects\22049555201], right-click and select **Associate Project to Current Drawing**.

| Associate Project to Curren | t Drawing      | x |
|-----------------------------|----------------|---|
| Working Folder              |                |   |
| C:\Civil 3D Projects        |                |   |
| Select Project:             |                | _ |
| 22049555201                 | ▼              | J |
|                             | OK Cancel Help |   |

- 2. From Associate Project to Current Drawing dialog box, set the following values:
  - a. Working Folder: set to C:\Civil 3D Projects
  - b. Select Project: click 22049555201 from drop down list
- 3. Click **OK** to close Associate Project to Current Drawing dialog box. *DRMPRD01.dwg* is now associated to the C:\Civil 3D Projects\22049555201 Project.

#### **Exercise 3.4** Attach External Reference Files (Xref) TOPORD01.dwg to Open File

- 1. From the *Home tab > Layers panel*, set current *layer* to **Xreference01\_dp.** 
  - Image: Constraint of the second se
- 2. From the *Insert tab* > *Reference panel*, click **Attach**.

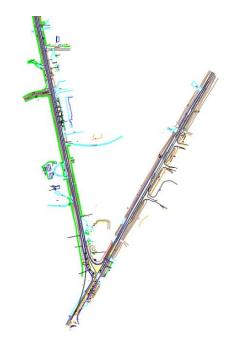
|                         | Attach Clip Adj              | ust (%) | ıy Layers<br>s vary* ▼<br>) Underlays O! | V т<br>И            | ×                         |
|-------------------------|------------------------------|---------|--|---------------------|---------------------------|
| A Select Reference File |                              |         |  |                     |                           |
| Look in: 🔒              | Survey                       | •       | 🔶 📮 🔍 📏                                  | 🕻 🛄 <u>V</u> iews 🔹 | <ul> <li>Tools</li> </ul> |
| Na Na                   | me                           |         | Dati Previe                              | w                   |                           |
|                         | data translator              |         | 5/8/                                     | 8                   |                           |
| drainage                | eng_data                     |         | 5/6/                                     |                     |                           |
|                         | GDTMRD01.dwg<br>GDTMRD02.dwg |         | 4/20<br>4/20                             | ŀ                   |                           |
|                         | SURVRD01.dwg                 |         | 4/20                                     |                     |                           |
|                         | TOPORD01.dwg                 |         | 4/20                                     |                     |                           |
|                         |                              |         |  |                     |                           |
| Survey                  |                              |         |  |                     |                           |
|                         |                              |         |  |                     |                           |
| 22049555201             |                              |         |  |                     |                           |
| 22043000201             |                              |         |  |                     |                           |
|                         |                              |         |  |                     |                           |
| Gvil 3D Proj            |                              |         |  |                     |                           |
|                         |                              |         |  |                     |                           |
| <b>IV</b> •             |                              |         | +  |                     |                           |
| Downloads               |                              |         |  |                     |                           |
| Filer                   | name: TOPORD01.dv            | vg      |  | •                   | <u>O</u> pen              |
| X22/2011111             |                              |         |  |                     | Cancel                    |
| Files                   | of type: Drawing (*.dwg      | ນ       |  | •]L                 | Galicei                   |

3. From the Select Reference File dialog box, navigate to: C:\Civil 3D Projects\22049555201\Survey folder. Select TOPORD01.dwg and then click Open to close the Select Reference File dialog box.

| me: TOPORD01                 |                                       | •                          | Browse |                            |          |  |
|------------------------------|---------------------------------------|----------------------------|--------|----------------------------|----------|--|
| review                       | Scale<br>Specify On-screen<br>X: 1.00 |                            |        | Path type<br>Relative path |          |  |
| (                            | Y: 1.00                               |                            |        | Rotation                   |          |  |
| ŀ                            | Z:                                    | 1.00                       | Scale  | e Angle: (                 |          |  |
|                              |                                       | on point<br>becify On-scre | en     |                            |          |  |
| eference Type                | X:                                    | 0.00                       |        | Block Unit                 |          |  |
| Attachment   Overlay         | Y:                                    | 0.00                       |        | Unit:                      | Unitless |  |
| Locate using Geographic Data | Z:                                    | 0.00                       |        | Factor:                    | 1        |  |

- 4. From the Attach External Reference dialog box, set the following values:
  - a. *Reference Type:* **Overlay**
  - b. Scale: Un-Check Specify On-screen
  - c. Uniform Scale: Un-check
  - d. Insertion point: Un-Check Specify On-screen
  - e. Path Type: Relative path
  - f. Rotation: Un-Check Specify On-screen
  - g. Angle: 0
- 5. Click **OK** to close Attach External Reference dialog box.

```
[-][Top][2D Wireframe]
```





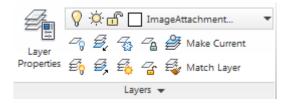
6. **Zoom** and **Pan** to display the Project location.

#### > Attach External Reference Files (Xref) DREXRD01

Using steps in Exercise 3.4 above, attach another Xreference file. Change the *layer* to **Xreference02\_dp** first. You are going to reference in the DREXRD01.dwg which stands for (Drainage Structure - Existing) to the DRMPRD01.dwg. Zoom and Pan to display the project location when complete. Your drawing should look like image below.



# **Exercise 3.5** Attach Georeferenced Raster Image - 5136L-08 File to DRMPRD01.dwg



1. From the *Home tab > Layers panel*, set current *layer* to **ImageAttachment\_dp.** 



2. From the *FDOT tab* > *Tools panel*, click **Tools** and then click **Insert Image**.

| 🛕 Insert Image |                | - 1             |       |                                    | <b>X</b>           |
|----------------|----------------|-----------------|-------|------------------------------------|--------------------|
| Look in:       | ) sid          |                 | •     | G 🤌 📂 🖽                            |                    |
| 9              | Name           | *<br>1          |       | Date modified<br>1/25/2006 3:19 PM | Type<br>1 SID File |
| Recent Places  |                |                 |       |                                    |                    |
| Desktop        |                |                 |       |                                    |                    |
| Libraries      |                |                 |       |                                    |                    |
|                |                |                 |       |                                    |                    |
| Computer       | •              | III             |       |                                    | F.                 |
| Network        | File name:     | 5136L-08.sid    |       | •                                  | Open               |
|                | Files of type: | All Images      |       | •                                  | Cancel             |
|                |                |                 |       |                                    | Help               |
| Show Frame(s   | ) Only 📝 Mod   | ify Correlation | Infom | nation >>                          |                    |

3. From the Insert Image dialog box, navigate to the

C:\Civil 3D Projects\22049555201\Roadway\aerials\sid folder, select 5136L-08.sid, then click Open to close the Insert Image dialog box.

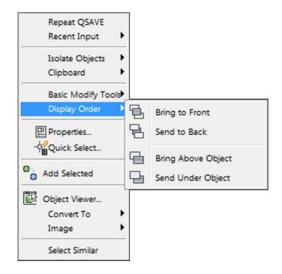
| Image | Correlati  | on         | 1.00         |         |                 | ×           |  |  |  |  |
|-------|--|------------|--------------|---------|-----------------|-------------|--|--|--|--|
|       | Sour   | ce         | Inser        | tion    |                 |             |  |  |  |  |
|       | Correla  | tion Sou   | rce:         | Wor     | ld File         | •           |  |  |  |  |
|       | Inser  | tion Valu  | es           |         |                 |             |  |  |  |  |
|       | Inse   | rtion Poir | nt:          | Rot     | ation:          |             |  |  |  |  |
|       | X:   | 19996      | 11.5512      | 0       |                 |             |  |  |  |  |
|       | Y:   | 394793     | 3.0974       | Sca     | cale:           |             |  |  |  |  |
|       | Z: 0   |            |              | 1:      | 1               |             |  |  |  |  |
|       | Dens   | sity       |              |         |                 | 5           |  |  |  |  |
|       | 1 x  | 1          |              |         | pixels per unit |             |  |  |  |  |
|       | Units for Insertion Point and Density<br>Units: Inches |            |              |         |                 |             |  |  |  |  |
| File  | e name:  | C:\Civ     | vil 3D Proje | cts\220 | 49555201\Roadv  | vay\aerials |  |  |  |  |
|       |  | ОК         | Cance        | ) (     | Apply           | Help        |  |  |  |  |

4. From the Image Correlations dialog box, review settings, then click **OK** to close the Image Correlations dialog box.

## **Exercise 3.6** Control Display Order of Civil 3D Objects



- 1. Zoom and Pan to display the **5136L-08.sid** *image*.
- Hold the Shift key down and click on the 5136L-08.sid *image* to select.
   <OR> Select any edge on the *5136L-08.sid image* frame.



- 3. Right-click to open popup menu, hover over *Display Order* and select **Send to Back**.
- 4. Results of sending 5136L-08.sid image to back:

ľ



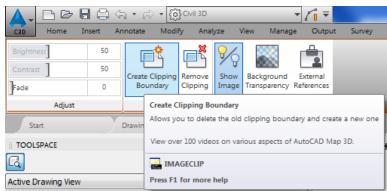


#### **Exercise 3.7** Use Layer Controls & Create Clip Boundary to Display Data

1. Hold the Shift key down and click on the 5136L-08.sid image to select.

<OR> select any edge of the 5136L-08.sid image frame to select.

|                        | 8 😂 🔇         | h • 6∂ • ₹                  | Civil 3D |       |                              | -                     |        | - Anna anna anna |      |         | Aut           | odesk AutoCAD C | ivil 3D 2016 DRMP | RD01.dwg (22049555 | 201]  | -           | -    |
|------------------------|---------------|-----------------------------|----------|-------|------------------------------|-----------------------|--------|------------------|------|---------|---------------|-----------------|-------------------|--------------------|-------|-------------|------|
| C3D Home               | Insert Ar     | nnotate Mod                 | ify Anal | yze V | /iew Manage                  | Output                | Survey | Autodesk 360     | Help | Add-ins | Featured Apps | Express Tools   | Vehicle Tracking  | Bridge Modeler     | Image | Geolocation | FDOT |
| Brightness<br>Contrast | 50<br>50<br>0 | Create Clipping<br>Boundary |          |       | Background<br>Transparency F | External<br>eferences |        |                  |      |         |               |                 |                   |                    |       |             |      |
| Adjust                 |               | Clippin                     | g        |       | Options                      |                       |        |                  |      |         |               |                 |                   |                    |       |             |      |
|                        |               |                             |          |       |                              |                       |        |                  |      |         |               |                 |                   |                    |       |             |      |



2. From the *Image tab > Clipping panel*, select **Create Clipping Boundary.** 



- 6 2

Enter image clipping option [ON/OFF/Delete/New boundary] <New>: \_N Outside mode - Objects outside boundary will be hidden. Specify clipping boundary or select invert option:

- IMAGECLIP [Select polyline Polygonal Rectangular Invert clip] <Rectangular>:
- 3. On the *command line* select the **Rectangular** option, by typing **R** then enter.
- 4. Click **two points** to define *project boundary* as shown by the red circles displayed above.

× ×





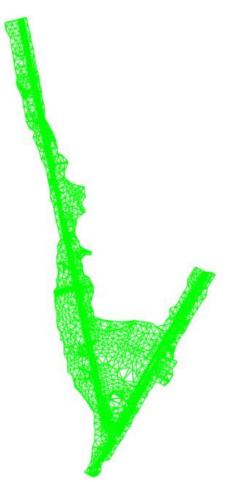
- 5. Zoom and Pan to display the SR61 Project location.
- 6. Save *DRMPRD01.dwg* file.

#### **Exercise 3.8** Create Data Shortcuts for the SR61 - Existing Surface

1. Open the *GDTMRD01.dwg* located in the **Survey** folder.

| Look in:                                  | 3 Survey                |  | 🙈 💥 🖳 Views 🔻 Tools |
|---|-------------------------|--|---------------------|
| -   | Name                    | Date modified                          | Preview             |
|   | 🔒 data translator       | 5/8/2016 8:39 PM                       |                     |
|   | 📕 dgn                   | 5/9/2016 1:44 PM                       | N N                 |
|   | 🕌 eng_data              | 5/6/2016 3:02 PM                       | 1                   |
|   | DREXRD01.dwg            | 4/20/2016 5:44 PM                      |                     |
|   | DREXRD02.dwg            | 4/22/2016 7:50 PM                      |                     |
|   | GDTMRD01.dwg            | 5/10/2016 10:25 PM                     |                     |
| L =                                       | GDTMRD02.dwg            | 4/20/2016 1:34 PM                      |                     |
|   | SURVRD01.dwg            | 4/20/2016 1:36 PM<br>4/20/2016 8:34 AM |                     |
| 655201<br>D Proj                          |                         |  | Initial View        |
| 1125201                                   | к [                     | ,                                      |                     |
|   | File name: GDTMRD01.dwg |  | ✓ Open              |
| 1. S. |                         |  |                     |

2. From the Select File dialog box, navigate to the *C:\Civil 3D Projects\22049555201\Survey* folder and select **GDTMRD01.dwg**. Click **Open** to close the Select File dialog box.



| TOOLSPACE                                 |  |
|---|--|
|   |  |
| Active Drawing View                       | <b>•</b>                               |
| GDTMRD01                                  | Prospecto                              |
| Points                                    | č.                                     |
| 🕀 🚱 Point Groups                          |  |
| - Doint Clouds                            |  |
| 🖽 💮 Surfaces                              | 5                                      |
| ⊕- 🗘 Alignments                           | Settings                               |
| -  → Feature Lines                        |  |
| 🕀 🚮 Sites                                 |  |
| - 🔯 Catchments                            |  |
| 🕀 🎢 Pipe Networks                         | ~                                      |
|   | Survey                                 |
| - M Corridors                             |  |
| Assemblies                                |  |
| - Intersections                           |  |
| ⊕ 🛣 Survey                                | X(                                     |
| View Frame Groups                         | olbox                                  |
| 🖻 🚺 Data Shortcuts [C:\Civil 3D Projects\ | <u>Create Data Shortcuts</u>           |
| Surfaces                                  | Set Data Shortcuts Project Folder      |
| ⊕ - Alignments                            | New Data Shortcuts Project Folder      |
| Pipe Networks                             | Set Working Folder                     |
| Pressure Networks                         |  |
| View Frame Groups                         | Associate Project to Current Drawing   |
|   | Associate Project to Multiple Drawings |
|   | Validate Data Shortcuts                |
|   | Refresh                                |
|   |  |

3. From *TOOLSPACE > Prospector tab*, right-click, then select **Create Data Shortcuts**.

| Create Data Shortcuts - Current Project  |
|--|
| To create data shortcuts, the current Data<br>Shortcuts project folder must be the same as<br>the project associated to the current drawing.   |
| In Prospector, select the Data Shortcuts node, and then<br>right-click and select either the Set Data Shortcuts Project<br>Folder or Associate Project to Current Drawing command to<br>specify the correct project. |
| Close  |

- 4. If the Create Data Shortcuts Current Project dialog box **opens** and you receive this message, click **Close** to close the Create Data Shortcuts Current Project dialog box. You must **associate** the *GDTMRD01.dwg* to the Project. Continue on to the *Associate GDTMRD01 Drawing to Project* section.
- 5. If the Create Data Shortcuts Current Project dialog box does NOT open, then continue on to the *Create Data Shortcuts Surface* section following the *Associate GDTMRD01 Drawing to 22049555201 Project* section.

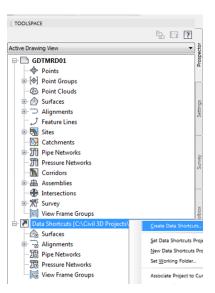
#### **Exercise 3.9** Associate GDTMRD01.dwg File to Project

| TOOLSPACE                       |                                       |            |
|---------------------------------|---------------------------------------|------------|
| Q                               | ?                                     |            |
| Active Drawing View             | -                                     | ector      |
| 🖶 📄 GDTMRD01                    |                                       | Prospector |
| Points                          |                                       |            |
| 🐵 🚱 Point Groups                |                                       |            |
| - 🐵 Point Clouds                |                                       |            |
| 🖮 🌧 Surfaces                    |                                       | ŝ          |
| Alignments                      |                                       | Settings   |
| Teature Lines                   |                                       |            |
| 🐵 🖏 Sites                       |                                       |            |
| 📴 Catchments                    |                                       |            |
| 🐵 🎢 Pipe Networks               |                                       | >          |
| - 🎢 Pressure Networks           |                                       | Survey     |
| 🕅 Corridors                     |                                       | 1          |
| 🖮 🛗 Assemblies                  |                                       |            |
| ··· 🛟 Intersections             |                                       |            |
| ● 〒 Survey                      |                                       | ×          |
| 🔤 View Frame Groups             |                                       | xodloc     |
| 🖻 🚺 Data Shortcuts [C:\Civil 3D | Create Data Shortcuts                 | .0         |
| - 🕞 Surfaces                    | <u>e</u> rate bala shoreada.          |            |
| 🗄 📋 Alignments                  | Set Data Shortcuts Project Folder     |            |
| - 📅 Pipe Networks               | New Data Shortcuts Project Folder     |            |
| ···· 🔐 Pressure Networks        | Set Working Folder                    |            |
| 🔤 View Frame Groups             | Associate Project to Current Drawing. |            |
|                                 | Associate Project to Multiple Drawing | s          |

1. From the *TOOLSPACE* > *Prospector tab* > *Data Shortcuts* [C:\Civil 3D Projects\22049555201] right-click and select Associate Project to Current Drawing.

| Associate Project to Curren | t Drawing      | × |
|-----------------------------|----------------|---|
| Working Folder              |                |   |
| C:\Civil 3D Projects        |                |   |
| Select Project:             |                |   |
| 22049555201                 |                | • |
|                             | OK Cancel Help |   |

- 2. From Associate Project to Current Drawing dialog box, set the following values:
  - a. Working Folder: set to C:\Civil 3D Projects
  - b. Select Project: click 22049555201 from drop down
- 3. Click on **OK** to close Associate Project to Current Drawing dialog box. *GDTMRD01.dwg* is now associated to the C:\Civil 3D Projects\22049555201 project.



4. From *TOOLSPACE > Prospector tab*, right-click to open popup menu and select **Create Data Shortcuts**.

| 🛕 Create Data Shortcuts   |             |                                  |
|---|-------------|----------------------------------|
| Share Data<br>Selected objects will be acc<br>These shortcuts are availab |             | oint to the same working folder. |
| Object  | Status      | Description                      |
| 🖃 🏠 🔽 Surfaces  |             |                                  |
| ∟ 🕞 🔽 SR61 - Existing   | To be added | Triangles                        |
| Hide already published objects  |             |                                  |
| Pick in drawing   | ОК          | Cancel Help                      |

- 5. From the Create Data Shortcuts dialog box, select the Surfaces box.
- 6. Click **OK** to close the **Create Data Shortcuts** dialog box.

- -

| Data Shortcuts [C:\Civil 3D Projects\22049555201] |
|---|
| 🗠 🗁 Surfaces                                      |
| SR61 - Existing                                   |

- 7. Review **Data Shortcuts for Surfaces**, from *TOOLSPACE* > *Prospector tab*, expand **Data Shortcuts** [C:\Civil 3D Projects\22049555201], expand **Surfaces**.
- 8. Close and Save *GDTMRD01.dwg*.

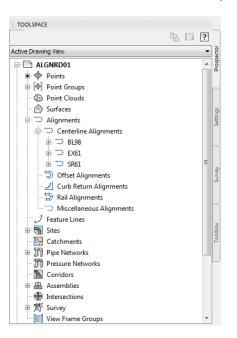
| Look in:                                   | 🕌 Roadway         |   | 🔍 💥 🛄 🛛 Yews 🔹 Too |
|--|-------------------|---|--------------------|
| -  | Name              | Date modified                           | Preview            |
| × 1  | 📕 aerials         | 5/9/2016 6:50 AM                        | 1                  |
| ago  | 👪 data translator | 5/10/2016 10:23 PM                      | 1.                 |
|  | 🌽 dgn             | 5/10/2016 10:38 PM                      | ¥                  |
| 9  | 🕌 eng_data        | 5/6/2016 3:02 PM                        |                    |
|  | ALGNRD01.dwg      | 4/20/2016 3:47 PM<br>5/10/2016 10:18 PM |                    |
| vey<br>555201<br>0 Proj<br>Noads<br>011111 |                   |   | Initial View       |
| 125201                                     | • [m              | •                                       |                    |
|  |                   |   |                    |

## **Exercise 3.10** Create Data Shortcuts for Alignments

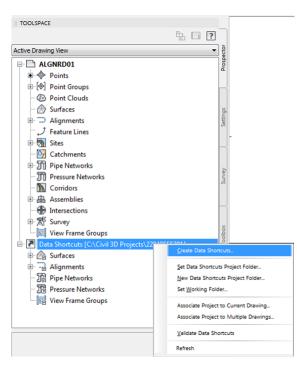
- 1. From the Select File dialog box, navigate to the C:\Civil 3D Projects\22049555201\Roadway folder.
- 2. Select ALGNRD01.dwg, then click Open to close the Select File dialog box.



3. Double-click the *scroll wheel* on the mouse to **Zoom to** the Project location.



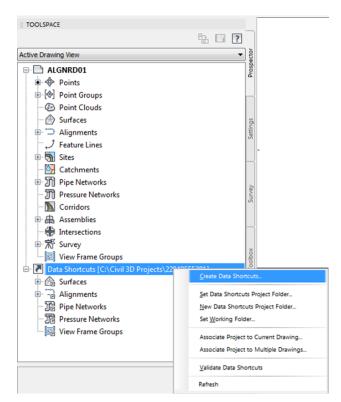
- 4. Review *Alignments* in ALGNRD01 from *TOOLSPACE* > *Prospector tab*, expand Alignments > Centerline Alignments.
- Create Data Shortcuts for the EX61, BL98, and SR61 Alignments



- 1. From *TOOLSPACE > Prospector tab*, right-click to open popup menu, select **Create Data Shortcuts**.
- 2. If the Create Data Shortcuts Current Project dialog box does NOT open, then continue on to the *Create Data Shortcuts Alignments* section following the *Associate ALGNRD01 Drawing to 22049555201 Project* section.

#### Associate ALGNRD01 Drawing to the 22049555201 Project

- 1. From the *TOOLSPACE > Prospector tab > Data Shortcuts* [C:\Civil 3D Projects\22049555201] right-click to open the popup menu, select **Associate Project to Current Drawing** and make selections based off of earlier steps.
- 2. From *TOOLSPACE > Prospector tab*, right click to open popup menu, select **Create Data Shortcuts**.



| Create Data Shortcuts  |             | ×           |  |  |  |  |
|--|-------------|-------------|--|--|--|--|
| Share Data<br>Selected objects will be accessible to all users who point to the same working folder.<br>These shortcuts are available in the Prospector. |             |             |  |  |  |  |
| Object   | Status      | Description |  |  |  |  |
| ⊟- <sup>+</sup> -⊖ ✓ Alignments  |             |             |  |  |  |  |
| 🚊 🚍 🔽 Centerline Alignments  |             |             |  |  |  |  |
| *> 🔽 EX61  | To be added |             |  |  |  |  |
| *> 🔽 BL98  | To be added |             |  |  |  |  |
| L "⇒ 🗹 \$R61   | To be added |             |  |  |  |  |
| Hide already published objects   |             |             |  |  |  |  |
| Pick in drawing  | OK          | Cancel Help |  |  |  |  |

3. From the Create Data Shortcuts dialog box, check Alignments, then click OK to close Create Data Shortcuts dialog box.

#### Review Data Shortcuts - Alignments

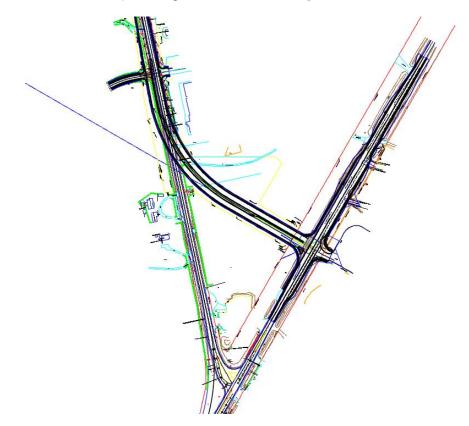
The next steps will show you how to review Data Shortcuts for the EX61, BL98, and SR61 Alignments.

- TOOLSPACE Active Drawing View 🗄 🚮 Sites Catchments • m Pipe Networks m Pressure Networks Corridors Assemblies # Intersections 🗄 📅 Survey View Frame Groups Data Shortcuts [C:\Civil 3D Projects\22049555201] Burfaces Alignments 🗄 🗇 Centerline Alignments 🗇 BL98 🗇 EX61 🗇 SR61 Dffset Alignments I Curb Return Alianments
- 1. From the *TOOLSPACE* > *Prospector tab*, expand **Data Shortcuts** [C:\Civil 3D Projects\22049555201], expand **Alignments**, expand **Centerline Alignments**.
- 2. Close and Save ALGNRD01.dwg.

#### **Exercise 3.11** Creating a Data Shortcut of the Final Surface

The next steps will show you how to create a data shortcut of the SR61\_Final Surface from the DSGNRD01.dwg

1. From the *Roadway* folder open the **DSGNRD01.dwg** file.



- TOOLSPACE e 🔋 🔁 Active Drawing View • DSGNRD01 Points 😥 🔄 Point Groups Point Clouds 🗉 🔗 Surfaces 🗄 😳 Alignments J Feature Lines Sites 🔄 📴 Catchments Pipe Networks m Pressure Networks Corridors 🗄 🔒 Assemblies Intersections ⊞ 🕅 Survey 🔄 View Frame Groups 🗄 🚺 Data S 🗄 🏠 Surfaces - Alignments Set Data Shortcuts Project Folder... Pipe Networks New Data Shortcuts Project Folder... Pressure Networks Set Working Folder... 🕞 View Frame Groups Associate Project to Current Drawing... Associate Project to Multiple Drawings... Validate Data Shortcuts Refresh
- 2. From the *TOOLSPACE > Prospector tab*, right-click to open popup menu, select **Create Data Shortcuts..**

3. From the *TOOLSPACE > Prospector tab > Data Shortcuts* [C:\Civil 3D Projects\22049555201] right-click to open popup menu, select **Create Data Shortcuts.** 

| 🛕 Create Data Shortcuts   |             | ×                          |
|---|-------------|----------------------------|
| Share Data<br>Selected objects will be acces<br>These shortcuts are available |             | ) the same working folder. |
| Object  | Status      | Description                |
| 🖃 🏠 🔽 Surfaces  |             |                            |
| k   | To be added | Triangles                  |
| Hide already published objects  |             |                            |
| Pick in drawing   | ОК          | Cancel Help                |

- 4. From the Create Data Shortcuts dialog box, check Surfaces.
- 5. Click **OK** to close the **Create Data Shortcuts** dialog box.

### **Exercise 3.12** Review Attached External Reference Files (Xrefs)

The next steps will show you how to review the attached External Reference files (Xrefs) in the DRMPRD01.dwg

| ▲, □ ☞ 님 は \               | • ि • {Õ} €vil 3D                                    | - / 1                                   | ₹             | _   |  |  | Autodesk A  | AutoCAD Civil 3D                         | 2016      |  |
|----------------------------|--|---|---------------|---|--|--|---|--|-----------|--|
| C3D Home Insert Ann        | notate Modify Analyz                                 | ze View Manage O                        | utput Survey  | Autodesk 360                              | Help Add-ins   | Featured Apps  | Express Tools   | Vehicle Track                            | ing B     | ridge Modeler 🛛 G                              |
| Import<br>Points from File | Storm Sewers Import Survey Data Import Subassemblies | insert<br>♥ Edit<br>♥ Edit Attributes ♥ | Attach Clip   | Adjust (x) *Fran                          | erlay Layers<br>mes vary*  ▼<br>o to Underlays ON  ▼ | Autodesk<br>ReCap  | Field   | Update Fields<br>OLE Object<br>Hyperlink | Link      | Download from<br>Upload to Sou<br>Extract Data |
| Import 👻                   |  | Block 👻                                 |               | Reference 👻                               | R  | Point Cloud  |   | Data                                     |           | Linking & Extraction                           |
| Start DF                   | RMPRDO1 ×  | +                                       | [–][Top][2D W | ireframe]                                 | -  | External Reference<br>Shows or hides the<br>The External Referen<br>files, such as DWG (<br>images.<br>Press F1 for more l | external referer<br>nces palette ori<br>files (xrefs), DW | ganizes, displays,                       | , and mar | nages referenced                               |
|                            |  | Attach Clip                             | Adjust        | 말 Under<br>교 *Fram<br>한 Snap t<br>rence 모 |  | s ON 🔹   |   |  |           |  |

1. From the *Insert Tab* > *Reference panel*, click the **arrow** located in the lower right hand corner to open the *External Reference* tool palette.

| R      |                 |        |         |         |                      |  | 16  | F |
|--------|-----------------|--------|---------|---------|----------------------|--|-----|---|
|        | eference Name 🔺 | Status | Size    | Туре    | Date                 | Saved Path   |     |   |
| DF     | RMPRD01*        | Opened | 3.61 MB | Current | 5/10/2016 10:18:25 P |  |     |   |
|        | 36L-08          | Loaded | 8.36 MB | SID     | 1/25/2006 419:00 PM  | C\/Civil 3D Projects\22049555201\/Roadway\aerials\sid\5136L-08.sid |     |   |
| 한 DF   | REXRD01         | Loaded | 3.57 MB | Overlay | 4/20/2016 5:44:39 PM | .\.\.\.\Civil 3D Projects\22049555201\Survey\DREXRD01.dwg          |     |   |
| 1 TO   | OPORD01         | Loaded | 1.42 MB | Overlay | 4/20/2016 8:34:36 AM | .\Survey\TOPORD01.dwg  |     |   |
| Detail |                 |        |         |         |                      |  | 0 🖬 |   |

- 2. The External References tool palette is displayed.
  - o 5136L-08.sid is listed and loaded as an SID (Image) attachment.
  - o DREXRD01.dwg is listed and loaded as an Overlay attachment.
  - o TOPORD01.dwg is listed and loaded as an Overlay attachment.
- 3. Close External References tool palette.

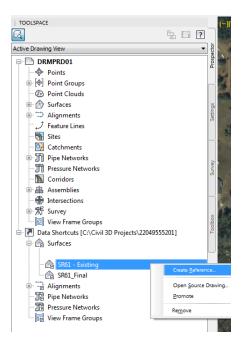
#### **Exercise 3.13** Create Data References for Surfaces SR61 - Existing and SR61\_Final

The next steps will show you how to create Data References for the Surfaces SR61 - Existing and SR61\_Final to the DRMPRD01.dwg.

1. From the *TOOLSPACE* > *Prospector tab* > *Data Shortcuts* [C:\Civil 3D Projects\22049555201], expand **Surfaces**.

#### > Add SR61 - Existing Surface

The next steps will show you how to create a Data Reference for SR61 - Existing Surface to the DRMPRD01.dwg. You created Data Shortcuts in the previous steps, Data Reference is when you bring in the Shortcut.



- 1. From *TOOLSPACE > Prospector tab > Data Shortcuts* [C:\Civil 3D Projects\22049555201], expand **Surfaces**, right-click on **SR61\_Existing**, and select **Create Reference**.
- 2. From Create Surface Reference dialog box, under *Properties > Information*, select the Style Value box.

| ource surface:  | Surface layer:         |
|-----------------|------------------------|
| R61 - Existing  | DTM                    |
| Properties      | Value                  |
| Information     |                        |
| Name            | SR61 - Existing        |
| Description     | Triangles              |
| Style           | Border-Proposed [Blue] |
| Render Material | Global                 |
|                 |                        |

| ſ | A Select Surface Style  |
|---|-------------------------|
|   | Border-Existing [Green] |
|   | OK Cancel Help          |

- 3. From the Select Surface Style dialog box, set the *Style* to **Border-Existing** [Green] from the drop down list.
- 4. Click **OK** to close the **Select Surface Style** dialog box

| ource surface:  | Surface layer:          |
|-----------------|-------------------------|
| R61 - Existing  |                         |
| Properties      | Value                   |
| Information     |                         |
| Name            | SR61 - Existing         |
| Description     | Triangles               |
| Style           | Border-Existing [Green] |
| Render Material | Global                  |
|                 |                         |

5. Click **OK** to close **Create Surface Reference** dialog box. SR61 - Existing Surface data reference displays in the SR61 Project location.



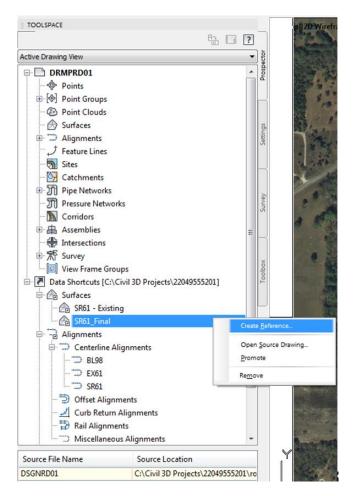
| 1 |   |
|---|---|
|   |   |
|   |   |
| h | X |

[-][Top][2D Wireframe]

\_ 0 %

#### > Add SR61\_Final Surface

The next steps will show you how to Create Reference for SR61\_Final Surface to the DRMPRD01.dwg.



1. From *TOOLSPACE > Prospector tab > Data Shortcuts* [C:\Civil 3D Projects\22049555201], expand **Surfaces**, right-click on **SR61\_Final**, and select **Create Reference**.

| Source surface: | Surface layer:         |          |
|-----------------|------------------------|----------|
| R61_Final       | DTM                    | <i>\</i> |
| Properties      | Value                  |          |
| Information     |                        |          |
| Name            | SR61_Final             |          |
| Description     | Triangles              |          |
| Style           | Border-Proposed [Blue] | ••••     |
| Render Material | Global                 |          |
|                 |                        |          |

2. From Create Surface Reference dialog box, under *Properties > Information*, select the Style Value box.

| Select Surface Style   | 22    |
|------------------------|-------|
| Border-Proposed [Blue] | - 💽 🖪 |
| OK Cancel              | Help  |

- 3. From Select Surface Style dialog box, set the *Style* to **Border-Proposed** [Blue] from the drop down list.
- 4. Click **OK** to close the **Select Surface Style** dialog box.

| ource surface:<br>R61_Final | Surface layer:         |
|-----------------------------|------------------------|
| Properties                  | Value                  |
| Information                 |                        |
| Name                        | SR61_Final             |
| Description                 | Triangles              |
| Style                       | Border-Proposed [Blue] |
| Render Material             | Global                 |
|                             |                        |

5. Click **OK** to close **Create Surface Reference** dialog box. SR61\_Final Surface data reference displays in the SR61 Project location.



× ×

[-][Top][2D Wireframe]

- 8 %

#### > Review Data References Surfaces In DRMPRD01

The next steps will show you how to review the Data Referenced Surfaces in the DRMPRD01.dwg.

| TOOLSPACE   |   |   |            |
|---|---|---|------------|
|   | ₽ | ? |            |
| Active Drawing View                                     |   | • |            |
| P. DRMPRD01   |   |   | Prospector |
|   |   |   | 1          |
| ⊕ 🐵 Point Groups  |   |   | _          |
| 🐵 Point Clouds  |   |   |            |
| 🖃 🄗 Surfaces  |   |   | 5          |
| 🖽 💮 🍙 SR61 - Existing                                   |   |   | Settings   |
| 🗄 🖽 👩 👩 SR61_Final                                      |   |   |            |
| 🖶 🗇 Alignments  |   |   |            |
|   |   |   |            |
| - 🚮 Sites   |   |   |            |
| 📴 Catchments  |   |   | Survev     |
| 🕀 🎹 Pipe Networks                                       |   |   | ľ          |
| III Pressure Networks                                   |   |   |            |
| - M Corridors   |   |   |            |
| 🕀 🖶 Assemblies  |   |   |            |
| Intersections   |   |   | Toolbox    |
| 🕀 📅 Survey  |   |   | ļ₽         |
| 🖾 🖾 View Frame Groups                                   |   |   |            |
| 🗄 🗷 🚺 Data Shortcuts [C:\Civil 3D Projects\22049555201] |   |   | -          |
| 🗄 🇁 Eurfaces  |   |   |            |
| 🗄 📑 Alignments  |   |   |            |
| 🎦 Pipe Networks   |   |   |            |
| Pressure Networks                                       |   |   |            |
| 📰 View Frame Groups                                     |   |   |            |
|   |   |   |            |

- 1. From *TOOLSPACE > Prospector tab*, expand **Surfaces**.
- 2. Save and Close *DRMPRD01 file*.

# **4** WATER FLOW DIRECTIONS

# DESCRIPTION

This chapter contains examples of FDOT surface styles to display watershed areas, contours, flow direction arrows as well as usage of the water drop command.

## **OBJECTIVES**

In this chapter, you will learn about:

- Displaying Water Flow Directions
- XREF'S Files
- XLIST Command
- Define Catchments Using Surface & Water Drop

# **CHAPTER SETUP**

Run the Chapter 4 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

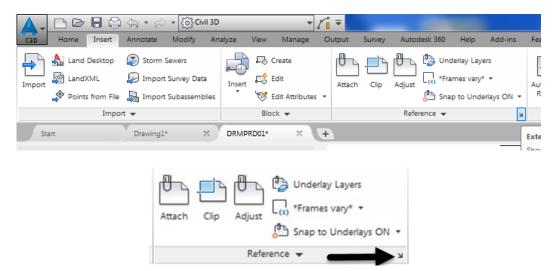
Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

#### **Exercise 4.1** Displaying Water Flow Directions

#### > Unload Attached Xrefs in DRMPRD01 File

The next steps will show you how to unload an attached Xrefs in DRMPRD01.dwg. When you unload a drawing, it does not remove it from the Xref list, it removes it from memory and visibility.

1. Start the FDOT Civil 3D State Kit and open the DRMPRD01.dwg located in the Chapter 4 dataset drainage folder.



2. From the *Insert Tab* > *Reference panel*, click the **arrow** located in the lower right hand corner to open the *External Reference* tool palette.

| File Reference                                  | 25   |                                   |         |                |                      |  |
|---|--|-----------------------------------|---------|----------------|----------------------|--|
|   | Name 🔺   | Status                            | Size    | Туре           | Date                 | Saved Path   |
| DRMPRD0   | )1*  | Opened                            | 3.69 MB | Current        | 5/11/2016 2:57:40 PM |  |
| 5136L-08  |  | Loaded                            | 8.36 MB | SID            | 1/25/2006 4:19:00 PM | C:\Civil 3D Projects\22049555201\Roadway\aerials\sid\5136L-08.si |
| DREXRDO   |  | Loodod                            | 3.57 MB | Overlay        | 4/20/2016 5:44:39 PM | _\_\_\Civil 3D Projects\22049555201\Survey\DREXRD01.dwg          |
| TOPORD  | Oper   | n                                 | 1.42 MB | Overlay        | 4/20/2016 8:34:36 AM | _\Survey\TOPORD01.dwg  |
|   | Attac  | h                                 |         |                |                      |  |
|   | Unlo   | ad                                |         |                |                      |  |
|   | Reloa  | d                                 |         |                |                      |  |
|   | Deta   | :h                                |         |                |                      |  |
|   | Bind   |                                   |         |                |                      |  |
|   | bing.  | -                                 |         |                |                      |  |
|   |  |                                   |         |                |                      |  |
|   | Xref 1   | ſype ►                            |         |                |                      |  |
|   | Xref 1<br>Path   | Type ►                            |         |                |                      |  |
|   |  |                                   | ]       |                |                      |  |
| Details   | Path   | •                                 |         |                |                      |  |
| Reference Na.                                   | Path   | •                                 | ]       |                |                      |  |
| Reference Na.<br>Status                         | Path<br>DREXRD<br>Loaded   | N01                               | ]       |                |                      |  |
| Reference Na.<br>Status<br>Size                 | Path<br>DREXRD<br>Loaded<br>3.57 MB                                      | ×1<br>×                           |         |                |                      |  |
| Reference Na.<br>Status<br>Size<br>Type         | Path<br>DREXRD<br>Loaded<br>3.57 MB<br>Overlay                           | ×01                               |         |                |                      |  |
| Reference Na.<br>Status<br>Size<br>Type<br>Date | Path<br>DREXRD<br>Loaded<br>3.57 MB<br>Overlay<br>4/20/202               | 101<br>16 5:44:39 PM              |         |                |                      |  |
| Reference Na.<br>Status<br>Size<br>Type<br>Date | Path<br>DREXRD<br>Loaded<br>3.57 MB<br>Overlay<br>4/20/202<br>C:\Civil 3 | 16 5:44:39 PM<br>ID Projects/2204 |         | ey\DREXRD01.dw |                      |  |

- 3. The *External References* tool palette displays. Right-click on **DREXRD01** in the *Reference Name* column and select **Unload**.
- 4. Right-click on **TOPORD01** and select **Unload**.
- 5. In the Status column notice the two files are now listed as *Unloaded*. **Close** *External References* tool palette.



6. Review the results of unloading the DREXRD01 and TOPORD01Xref's.

#### Elevation Analysis of SR61\_Final surface

The next steps will show you how to perform an Elevation Analysis of the SR61\_Final surface

- TOOLSPACE a ? Active Drawing View P DRMPRD01 Points 🕀 🔄 Point Groups Point Clouds 🗄 🄗 Surfaces SR61 - Existing 🗄 💮 🔊 🕞 🕞 🗄 🗁 Alignment Edit Surface Style... J Feature Lin 🗄 Sites Synchronize 🔄 Catchment Promote 😐 🎢 Pipe Netwo Delete... m Pressure N Corridors Select 🕀 📇 Assemblies Zoom to Intersection Pan to 🗄 🛣 Survey Lock 🔟 View Frame Unlock - 🗷 Data Shortcuts 201] Export to DEM... 🗄 🏠 Surfaces Export LandXML - Alignment ÷. Pipe Netwo Refresh Pressure Netwo View Frame Groups
- 1. From the *TOOLSPACE* > *Prospector tab*, expand **Surfaces**, then right-click on **SR61\_Final** and select **Surface Properties**.

| *                |       |
|------------------|-------|
| Name:            |       |
| SR61_Final       |       |
| Description:     |       |
| Triangles        |       |
|                  |       |
|                  |       |
|                  |       |
| Default styles   |       |
| Surface style:   |       |
| Eevation Banding | - 💽 - |
| Render Material: |       |
|                  |       |

2. From the Surface Properties – SR61\_Final dialog box, select the *Information* tab. From the *Surface style: drop-down list*, select **Elevation Banding**.

| A Surface Properties - | SR61_Fina | I          |        |   |  |
|------------------------|-----------|------------|--------|---|--|
| Information Definition | Analysis  | Statistics |        |   |  |
| Analysis type:         |           |            |        |   |  |
| Elevations             |           |            |        |   |  |
| Contours<br>Directions |           |            |        |   |  |
| Elevations             |           |            |        |   |  |
| Slopes<br>Slope Arrows |           |            |        |   |  |
| User-defined contours  |           |            |        |   |  |
| Watersheds             |           |            |        |   |  |
| Number of ranges       |           |            | $\sim$ | 8 |  |
| Datum elevation:       |           |            |        |   |  |
| 0.000000               |           |            |        |   |  |
|                        |           |            |        |   |  |
|                        |           |            |        |   |  |
| - Donce Detaile        |           |            |        |   |  |

3. Select the *Analysis* tab. Under the *Analysis type: drop down list*, select **Elevations**.

|   | ,              | -    |               |   |
|---|----------------|------|---------------|---|
| formation Definition Analy                  | sis Statistics |      |               |   |
| Analysis type:                              |                |      |               |   |
| Elevations                                  |                |      |               |   |
| Legend                                      |                |      |               |   |
| E Standard                                  |                |      |               | ~ |
|   |                |      |               |   |
| Ranges                                      |                |      |               |   |
| Create ranges by:                           |                |      |               |   |
| Number of ranges                            |                | ~    | 8             |   |
| Number of ranges                            |                |      |               |   |
| Range interval<br>Range interval with datum |                |      |               |   |
|   |                |      |               |   |
| Range Details                               |                |      |               |   |
| ✓ Scale scheme to fit                       |                |      |               |   |
| ID  |                | Mini | mum Elevation |   |
|   |                |      |               |   |

*Note* Under *Ranges* > *Create ranges by: drop down list,* select **Range interval with datum**.

4. Set the *Range interval with datum* field to **1** and *Datum elevation:* field to **30**.

| Bevations   Legend   Standard   Ranges   Create ranges by:   Range interval with datum   1   Datum elevation:   30   State scheme to fit   D   Minum Elevation   Scale scheme to fit   1   29.007   30.007   30.007   30.007   31.007   32.007   30.007   31.007   32.007   30.007  | tion Definition Analysis          | Statistics   |   |              | 1 |            |
|---|-----------------------------------|--|---|--------------|---|------------|
| Legend<br>Sandard  Sandard<br>Ranges Create ranges by: Range interval with datum<br>30<br>Range Details<br>Scale scheme to fit<br>D<br>1<br>2<br>2<br>30<br>Minimum Elevation<br>2<br>30<br>Minimum Elevation<br>1<br>2<br>30<br>Minimum Elevation<br>30<br>Minimum Elevation<br>30<br>Minimum Elevation<br>30<br>Minimum Elevation<br>30<br>Minimum Elevation<br>4<br>30<br>Minimum Elevation<br>30<br>Minimum Elevation<br>4<br>30<br>Minimum Elevation<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4   |                                   |  | Preview   |              |   |            |
| Ranges   Creater ranges by:   Range therval with datum   3     Datum devation:   33     Range Details     Scale scheme to fit     D   Minum Elevation   Assuma Elevation   Color Scheme   1   29.007   30.007   20.007   30.007   20.007   31.007   22.007   33.007   30.007     Color Scheme     Image: Color Scheme     Im  |                                   |  |   |              |   |            |
| D     Maximum Elevation       30     30.00°       Scale scheme to fit       1       2     20.00°       3     30.00°   |                                   |  |   |              |   |            |
| Create ranges by:<br>Range Interval with datum  | Standard                          | - I III - IIII - III - IIII - III - IIII - IIIII - IIII - IIII - IIII - IIII - IIIII - IIII - IIII - IIII - IIII - IIIII - IIIII - IIII - IIII - IIIII - IIIII - IIIII - IIIII - IIII - IIII - IIIIII | ▼ 🖪 🛛   |              |   |            |
| Definition         Maximum Elevation           30         Image Details           Image Details         Image Details           Image De  |                                   |  |   |              |   |            |
| Range interval with datum     1       Datum elevation:     30       30     Image Details       Image Details     Image Details       Image Details     Image Details       1     29.00'       2     30.00'       31.00'     31.00'       3     31.00'       3     31.00'       4     32.00'       4     32.00'       3     31.00'   |                                   |  |   |              |   |            |
| atura elevation:<br>30 ange Detals<br>Scale scheme to fit<br>10 Minimum Elevation Maximum Elevation Color Scheme 1 2 2 2 00 3 00 3 1 00 3 1 00 3 0 0  |                                   |  |   |              |   |            |
| 30 Example Details  Interpretails  Scale scheme to fit  D Minimum Elevation Maximum Elevation Color Scheme  1 2 30.00° 31.00°  2 30.00° 31.00°  3 4 32.00° 32.00°  4 32.00° 33.00°  5 11 11 11 11 11 11 11 11 11 11 11 11 11  | nge interval with datum           | - 1  |   |              |   |            |
| D         Mnimum Elevation         Color Scheme           1         25,00°         30,00°         #           2         30,00°         31,00°         #           3         31,00°         32,00°         #           4         32,00°         33,00°         #           4         13,00°         33,00°         #   | um elevation:                     |  |   |              |   |            |
| D         Mnimum Elevation         Color Scheme           1         25,00°         30,00°         #           2         30,00°         31,00°         #           3         31,00°         32,00°         #           4         32,00°         33,00°         #           4         13,00°         33,00°         #   |                                   |  |   |              |   |            |
| ID         Minimum Elevation         Color Scheme         III           1         29.00'         30.00'         IIII           2         30.00'         31.00'         IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII   |                                   |  |   |              |   |            |
| ID         Mnimum Elevation         Color Scheme         III           1         29,00'         30,00'         III           2         30,00'         31,00'         IIII           3         31,00'         32,00'         IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII  |                                   | 6  |   |              |   |            |
| ID         Mnimum Elevation         Color Scheme           1         29.00°         30.00°           2         30.00°         31.00°           3         31.00°         32.00°           4         32.00°         33.00°           ×         13.00°         33.00°  |                                   | <u>Ó</u>   |   |              |   |            |
| 1 29,00' 30,00'<br>2 30,00' 31,00'<br>3 31,00' 32,00'<br>4 32,00' 33,00'<br>4 32,00' 33,00'<br>4 32,00' 33,00'<br>4 32,00' 33,00'<br>↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓  | ge Details                        |  |   |              |   |            |
| 2 30.00' 31.00'<br>3 31.00' 32.00'<br>32.00' 33.00'<br>4 1.00' 41.00'<br>4 1.00' 41.00'<br>4 1.00' 41.0  | ge Details                        | ٨  |   |              |   |            |
| 2 30.00' 31.00'<br>3 31.00' 32.00'<br>32.00' 33.00'<br>4 1.00' 41.00'<br>4 1.00' 41.00'<br>4 1.00' 41.0  | ge Details<br>Scale scheme to fit |  |   | Color Scheme | A |            |
| 32.00' 33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'<br>33.00'   | ge Details<br>Scale scheme to fit | Minimum Elevation  | Maximum Elevation   | Color Scheme |   |            |
| 4 32.00 <sup>7</sup> 33.00 <sup>7</sup><br>31.00 <sup>7</sup><br>32.00 <sup>7</sup><br>33.00 <sup>7</sup><br>32.00 <sup>7</sup><br>33.00 <sup>7</sup><br>30.00 <sup>7</sup><br>30.0 <sup></sup> | ge Details<br>Scale scheme to fit | Minimum Elevation<br>29.00'  | Maximum Elevation   | Color Scheme |   |            |
|   | ge Details<br>Scale scheme to fit | Minimum Elevation<br>29.00'<br>30.00'  | Maximum Elevation<br>30.00'<br>31.00'   | Color Scheme |   |            |
|   | ge Details<br>Scale scheme to fit | Minimum Elevation<br>29.00'<br>30.00'<br>31.00'  | Maximum Elevation<br>30.00'<br>31.00'<br>32.00'                               | Color Scheme |   |            |
|   | ge Details<br>Scale scheme to fit | Minimum Elevation<br>29.00'<br>30.00'<br>31.00'<br>32.00'  | Maximum Elevation<br>30.00'<br>31.00'<br>32.00'<br>33.00'                     | Color Scheme | E | <b>(1)</b> |
| Run   | ge Details<br>Scale scheme to fit | Minimum Elevation<br>29.00'<br>30.00'<br>31.00'<br>32.00'  | Maximum Elevation<br>30.00'<br>31.00'<br>32.00'<br>33.00'<br>33.00'<br>34.00' | Color Scheme | E |            |
|   | ge Details<br>Scale scheme to fit | Minimum Elevation<br>29.00'<br>30.00'<br>31.00'<br>32.00'  | Maximum Elevation<br>30.00'<br>31.00'<br>32.00'<br>33.00'<br>33.00'<br>34.00' | Color Scheme | E |            |
|   | ge Details<br>Scale scheme to fit | Minimum Elevation<br>29.00'<br>30.00'<br>31.00'<br>32.00'  | Maximum Elevation<br>30.00'<br>31.00'<br>32.00'<br>33.00'<br>33.00'<br>34.00' | Color Scheme | E |            |

- 5. Click the down **arrow** to *Run analysis*. The *Range Details* at the bottom will populate with *Minimum Elevation, Maximum Elevation values,* and *various colors* under the Color Scheme column.
- 6. Click Apply, then OK to close the Surface Properties dialog box.



7. Notice the *Elevation Banding* surface style displays the color range in model space as shown above. Setting a Datum Elevation sets the starting point for the sequence of colors in the Color Scheme. When all the colors have been used the pattern repeats at the next range interval. In this color scheme red is at the beginning and blue is at the end.

#### **Exercise 4.2** Slope Arrows / Watershed Analysis of SR61\_Final Surface

The next steps will show you how to repeat the Analysis process to create and display a Slope Arrows / Watershed surface style.

| TOOLSPACE             |                    |
|-----------------------|--------------------|
| A                     |                    |
| Active Drawing View   |                    |
|                       |                    |
|                       |                    |
| ⊕ [�] Point Groups    |                    |
| Point Clouds          |                    |
| 🖶 🌧 Surfaces          |                    |
| 🗉 🌧 🍙 SR61 - Existing |                    |
| 🗄 💮 👩 🖬 SR61_Final    |                    |
|                       | Surface Properties |
| - J Feature Lines     | Edit Surface Style |
| Sites                 | Synchronize        |

1. From the *TOOLSPACE > Prospector tab*, expand **Surfaces**, then right-click on **SR61\_Final** and select **Surface Properties**.

| Surface Properties - SR61_Final |  |
|---------------------------------|--|
| Name:<br>SR61_Final             |  |
| Description:                    |  |
| Triangles                       | *  |
| Default styles                  |  |
| Surface style:                  |  |
| Elevation Banding 🗸             |  |
| Render Material:                | Create New   |
| © <sub>∎</sub> Global           | Copy Current Selection                ✓ Edit Current Selection                 ✓ Edit Current Selection                 ✓ Edit Current Selection |

2. From the Surface Properties - SR61\_Final dialog box, select the *Information tab*. Click the down **arrow** next to the *Edit* button and select **Copy Current Selection.** 

| formation Borders Contours Grid Points | Triangles Watersheds Analysis | Display Summary      |
|--|-------------------------------|----------------------|
| Name:                                  | Created by:                   | Date created:        |
| Slope Arrows - Watersheds              | RD964MG                       | 12/6/2016 5:58:15 PM |
| Description:                           | Last modified by:             | Date modified:       |
| Slope Arrows - Watersheds              | ▲ INSTR1                      | 12/8/2016 8:09:47 PM |
|  |                               |                      |
|  | Ŧ                             |                      |
|  |                               |                      |
|  |                               |                      |
|  |                               |                      |
|  |                               |                      |
|  |                               |                      |
|  |                               |                      |
|  |                               |                      |
|  |                               |                      |
|  |                               |                      |
|  |                               |                      |

3. From the Surface Style – Slope Arrows dialog box, select the *Information tab*. Enter Slope Arrows - Watershed into the *Name*: and *Description*: fields, then click Apply.

| Plan               | -        | 1          |         |          |          |            |            |   |
|--------------------|----------|------------|---------|----------|----------|------------|------------|---|
| Component display: |          | J          |         |          |          |            |            |   |
| Component Type     | Visible  | Laver      | Color   | Linetype | LT Scale | Lineweight | Plot Style |   |
| Major Contour      |          | ContoursM  | BYLAYER |          | 1        | ByBlock    | ByBlock    |   |
| Minor Contour      | <b>a</b> | ContoursMi | _       |          | 1        | ByBlock    | ByBlock    |   |
| User Contours      | 9        | 0          | BYLAYER |          | 1        | ByBlock    | ByBlock    |   |
| Gridded            | 9        | 0          | BYLAYER |          | 1        | ByBlock    | ByBlock    |   |
| Directions         |          | 0          | BYLAYER |          | 1        | ByBlock    | ByBlock    |   |
| Elevations         | 9        | 0          | BYLAYER |          | 1        | ByBlock    | ByBlock    | = |
| Slopes             |          | 0          | BYLAYER |          | 1        | ByBlock    | ByBlock    |   |
| Slope Arrows       | 0<br>0   | 0          | BYLAYER |          | 1        | ByBlock    | ByBlock    |   |
| Watersheds         | <u>0</u> | 0          | BYLAYER | ByBlock  | 1        | ByBlock    | ByBlock    |   |
|                    |          |            | -       |          |          |            |            | - |
|                    |          |            |         |          |          |            |            |   |
|                    |          |            |         |          |          |            |            |   |
|                    |          |            |         |          |          |            |            |   |
|                    |          |            |         |          |          |            |            |   |

- 4. From the Surface Style Slope Arrows Watersheds dialog box, select the Display tab.
- 5. Under Component display: highlight elevations in the Component column.
- 6. The *Visible* column contains Light Bulb icons. "Yellow" Light Bulb, status is *On*. "Blue" Light Bulb, status is *Off*.
  - a. Click the *Elevations Light Bulb* to turn **Off** the Elevations component.
  - b. Click the *Slope Arrows* and *Watersheds Light Bulbs* to turn Turn **On** the Slope Arrows and Watersheds components.
- 7. Click Apply, and then OK to close the Surface Style Slope Arrows Watersheds dialog box.

| nformation Definition | Analysis Stausuc | °     |   |
|-----------------------|------------------|-------|---|
| Name:                 |                  |       |   |
| SR61_Final            |                  |       |   |
| Description:          |                  |       |   |
| Triangles             |                  |       | ~ |
|                       |                  |       |   |
|                       |                  |       | - |
| Default styles        |                  |       |   |
| Surface style:        |                  |       | _ |
| Slope Arrows - V      | Vatersheds       | - 🏹 - |   |
| Render Material:      |                  |       | _ |
| 🖓 Global              |                  | •     |   |
|                       |                  |       |   |
|                       |                  |       |   |
|                       |                  |       |   |
|                       |                  |       |   |
|                       |                  |       |   |

8. From the Surface Properties - SR61\_Final dialog box, select the *Information tab*, make sure the *Surface style*: is set to Slope Arrows - Watersheds.

| nalysis type:<br>Slope Arrows<br>Legend |               | Preview       | [               |  |
|---|---------------|---------------|-----------------|--|
| Ranges<br>Number:<br>8                  | _             |               |                 |  |
| Range Details                           | Minimum Slope | Maximum Slope | Scheme: Rainbow |  |
|   |               |               |                 |  |

- 9. Select the Analysis tab, set the Analysis type: to Slope Arrows from the drop down list.
- 10. In the Ranges area, set the *Number*: field to 8 and click the down **arrow** to *Run the Slope Arrow* analysis.

| <b>M</b>     |  |
|--------------|--|
| Run analysis |  |

11. Review the *Range Details* at the bottom that display values for *Minimum Slope*, *Maximum Slope*, and various colors for *Scheme: Rainbow* values.

|  | alysis Statistics   |   |                 |        |
|--|---|---|-----------------|--------|
| nalysis type:                                      |   | Preview   |                 |        |
| lope Arrows  |   | • <u> </u>  |                 | _      |
| Legend   | -   |   |                 |        |
| Ranges   |   |   |                 |        |
| Number:  |   |   |                 |        |
|  | (******)  |   |                 |        |
| 8  | 長   |   |                 |        |
| 8  | Q   |   |                 |        |
| 8  | Ō   |   |                 |        |
|  | Ō   |   |                 |        |
| 8  | Ō   |   |                 |        |
| Range Details                                      | 5.<br>Minimum Slope                                       | Maximum Slope                                       | Scheme: Rainbow | •      |
| Range Details                                      |   | Maximum Slope<br>1.4926%                            | Scheme: Rainbow | ·      |
| Range Details<br>Scale scheme to fit<br>ID         | Minimum Slope   |   | Scheme: Rainbow | *<br>E |
| Range Details       ID       1       2       3     | Minimum Slope<br>0.0000%                                  | 1.4926%   | Scheme: Rainbow | •      |
| Range Details  Scale scheme to fit  ID  1  2  3  4 | Minimum Slope<br>0.0000%<br>1.4926%                       | 1.4926%<br>2.0153%                                  | Scheme: Rainbow | •      |
| Range Details V Scale scheme to fit I I 2 3 4 5    | Minimum Slope<br>0.0000%<br>1.4926%<br>2.0153%            | 1.4926%<br>2.0153%<br>2.8937%<br>6.0040%<br>6.0174% | Scheme: Rainbow |        |
| Range Details  Scale scheme to fit  ID  1  2  3  4 | Minimum Slope<br>0.0000%<br>1.4926%<br>2.0153%<br>2.8937% | 1.4926%<br>2.0153%<br>2.8937%<br>6.0040%            | Scheme: Rainbow |        |

12. Do NOT Close the Surface Properties - SR61\_Final dialog box

#### > Process for the Watersheds Analysis

The next steps will show you how to repeat the Analysis process to run a Watersheds analysis.

| Surface Properties - SR61_Final            |
|--|
| Information Definition Analysis Statistics |
| Analysis type:                             |
| Watersheds 🔹                               |
| Legend                                     |
| 🗐 FDOT Watershed 🔽 📝 🗖                     |
| FDOT Watershed                             |
| Standard                                   |
|  |
| 0  |
| Merge adjacent boundary watersheds         |

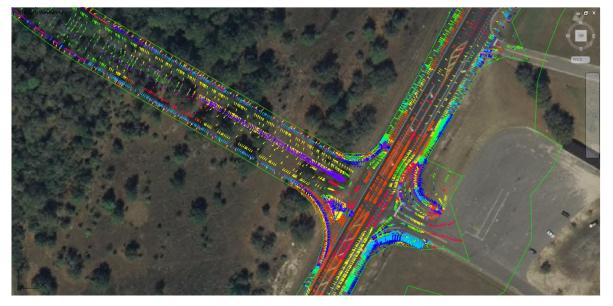
1. From the Surface Properties – SR61\_Final dialog, set the *Analysis type:* to Watersheds and *Legend* to FDOT Watershed from the drop down list.

| Ţ  |              |  |
|----|--------------|--|
| J. | Run analysis |  |
|    |              |  |

2. Click the down **arrow** to *Run analysis*.

|  |  |             | Preview  |  |              |          |
|--|--|-------------|--|--|--------------|----------|
| /atersheds   |  |             | <ul> <li>Image: Image: Ima</li></ul> |  |              |          |
| .egend   |  |             |  |  |              |          |
| E FDOT V   | Vatershed  | - 🏹 🕻       |  |  |              |          |
| Watershed P  | arameters  |             |  |  |              |          |
| Merge depre  | ssions into single drain targets   |             |  |  |              |          |
|  | m Average Depth is less than:  |             |  |  |              |          |
| -  |  |             |  |  |              |          |
| 0  |  |             |  |  |              |          |
| 0  | <u>A</u>   | <b>₽</b>    |  |  |              |          |
| _  |  | Ō           |  |  |              |          |
| _  | acent boundary watersheds  | ē           |  |  |              |          |
| Merge adj  | acent boundary watersheds  | ē           |  |  |              |          |
| _  | acent boundary watersheds  | 5           |  |  |              | <b>?</b> |
| Merge adj  | acent boundary watersheds  | Drains Into | Description  | Segment Display  | Area Display | <b>?</b> |
| Merge adj  | acent boundary watersheds  | Drains Into | Description<br>Description 1   | 2  | Area Display |          |
| Merge adj<br>Range Details                           | acent boundary watersheds  | Drains Into |  | 2  |              |          |
| Merge adj<br>Range Details<br>ID<br>1                | acent boundary watersheds  | Drains Into | Description 1  | Continuous   |              |          |
| Merge adj<br>Range Details<br>ID<br>1<br>2           | Type<br>Boundary point<br>Boundary point   | Drains Into | Description 1<br>Description 2   | Continuous Continuous Continuous   |              |          |
| Merge adj<br>Range Details<br>ID<br>1<br>2<br>3      | Type<br>Boundary point<br>Boundary point<br>Boundary point<br>Boundary point                                     | Drains Into | Description 1<br>Description 2<br>Description 3  | Continuous Continuous Continuous   |              |          |
| Merge adj<br>Range Details<br>ID<br>1<br>2<br>3<br>4 | Type<br>Boundary point<br>Boundary point<br>Boundary point<br>Boundary point<br>Boundary point<br>Boundary point | Drains Into | Description 1<br>Description 2<br>Description 3<br>Description 4   | Continuous Continuous Continuous Continuous Continuous Continuous Continuous |              |          |

- 3. Review the Range Details at the bottom that are populated with *calculated values* from the surface.
- 4. Click the **Help** button at the bottom right to learn more about *Watershed types*.
- 5. Click Apply then OK to close the Surface Properties SR61\_Final dialog box.



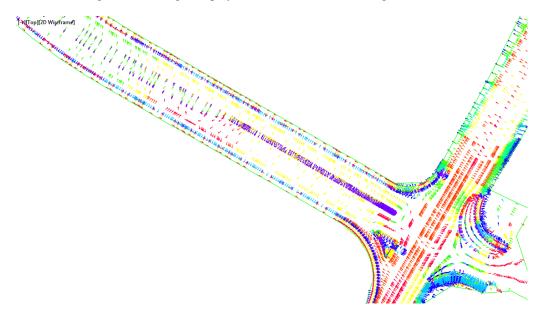
6. Review the surface SR61\_Final display of the slope arrows and watershed boundaries in the drawing editor.

#### **Exercise 4.3** XREF'S Files

#### > Unload Attached Xrefs From DRMPRD01

The next steps will show you how to Unload attached Xrefs from the DRMPRD01.dwg.

- 1. On the *command line* Type **Xref** to open Xref Manager.
- 2. In the list, right-click on **5136L-08** and select **Unload**. By unloading the external reference 5136-08 the drawing editor no longer displays the 5136-08.sid aerial image.



3. Save your file before continuing.

#### > Attach DSGNRD01 as Xref

The next steps will show you how to attach the DSGNRD01.dwg as an Xref file so it displays in your file at the correct coordinates.



From the Home tab on the Ribbon > Layers Properties panel > Layer list drop down list, use the scroll bar <OR> Type the letter X to quickly scroll and select Xreference03\_dp layer within the list of Layer Names.

*Note* Keep your cursor on the list or it will disappear and you must start the process over.

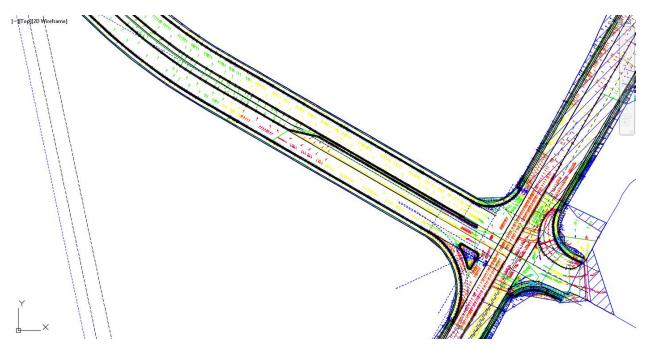
2. From the Insert tab > Reference panel, click Attach to open the Select Reference File dialog box.

| C3D Home Insert            | Annotate Modify Ar   |               | utput Survey Autodesk 36 | 50 Help Add-ins  |
|----------------------------|--|---------------|--------------------------|--|
| Import<br>Points from File | Storm Sewers<br>Import Survey Data<br>Import Subassemblies | Insert Create | Attach Clip Adjust       | Underlay Layers<br>*Frames vary*  ▼<br>Snap to Underlays ON  ▼ |
| Impo                       | nt 👻   | Block 👻       | Reference                | <del>ب</del> ک   |

- 3. From Select Reference File dialog box, use the *Look in:* drop down list to navigate to the *C:\Civil 3D Projects\22049555201\roadway* folder and select **DSGNRD01.dwg** in the *Name* column.
- 4. Click **Open** to close the **Select Reference File** dialog box and the Attach External Reference dialog box displays.

| Attach External Reference   |   | ×  |
|---|---|--|
| Name: DSGNRD01  | ▼ Brows   | e  |
| Preview   | Scale Specify On-screen X: 1.00 Y: 1.00 Z: 1.00 Uniform Scale Insertion point Specify On-screen | Path type<br>Relative path   Rotation  Specify On-screen  Angle: 0 |
| Reference Type<br>Attachment  Overlay<br>Locate using Geographic Data | X: 0.00<br>Y: 0.00<br>Z: 0.00   | Block Unit<br>Unit: Unitless<br>Factor: 1                          |
| Show Details  | ОК  | Cancel Help  |

- 5. From the Attach External Reference dialog box, clear all check boxes if any are checked.
- 6. Set the *Reference Type* to **Overlay** using the radio button and click **OK** to close the Attach External Reference dialog box.



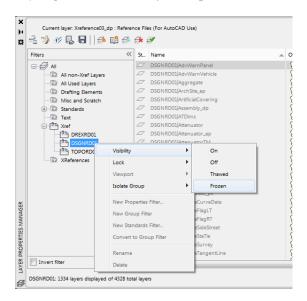
7. Review the external reference *DSGNRD01.dwg* file that displays in the drawing editor.

#### > Freeze layers in the Xref

1. **Freeze** any layers in the Xref that are obscuring your view of the pavement layers you wish to display from this file.

| Bridge Modeler | Geolocation FDOT   |           | V C C Yreference03_dp  |   |
|----------------|--|-----------|--|---|
|                | ● C C C C Xeelenencell.dp ・<br>一 C C C C C Melenencell.dp ・<br>一 C C C C C C Melenencell.dp ・<br>一 C C C C C C C C C C C C C C C C C C C |           | Layer     0     2     0     2     0     2       Properties     20     20     20     2     4     4       Layer     Properties     Manages layers and layer properties |   |
|                | Layer Properties<br>Manages layers and layer properties  | Clipboard | Press F1 for more help   | _ |

2. From the *Home tab* > *Layers panel*, click the **Layer Properties** button.



3. In the *Filters area* expand the **Xref** collection by clicking the plus sign, right-click on **DSGNRD01** and hover over *Visibility*, then select **Frozen**.

| ×          | Current layer: Xreference03_dp : Referer    | nce Fil  | es (For AutoCAD Use)           |            |                  |      |       |           |
|------------|---|----------|--------------------------------|------------|------------------|------|-------|-----------|
| **         | 4 🎲 🛷 🖫 🖶 🗐 🥵 🍕                             | <b>5</b> | Ø                              |            |                  |      |       |           |
|            | Filters <                                   | St       | Name                           | . 0        | n Freeze         | Lock | Color | Linetype  |
|            |   |          | DSGNRD01 sr61_final_Breaklines | 8          |                  | ď    | white | Continuou |
|            | All non-Xref Layers                         |          | DSGNRD01 Stairs_ep             | 8          |                  | ď    | white | DSGNRD0   |
|            | All Used Layers                             |          | DSGNRD01 StakingArea           | 0000000000 | } ∰              | ď    | 176,  | Continuou |
|            | Drafting Elements                           |          | DSGNRD01 StationTicL_dp        | 8          | 1 🕀              | ď    | white | Continuou |
|            | Misc and Scratch                            |          | DSGNRD01 StationTicS_dp        | 8          | 1 🕀              | ď    | white | Continuou |
|            | 😥 🐨 Standards                               |          | DSGNRD01 Steam                 | 8          | 2 🔅              | đ    | blue  | DSGNRD0   |
|            | Text  |          | DSGNRD01 Steam_ep              | 8          |                  | ď    | yell  | DSGNRD0   |
|            | 🖃 🏝 Xref                                    |          | DSGNRD01 SteamB_ep             | 8          |                  | ď    | yell  | DSGNRD0   |
|            | DREXRD01                                    |          | DSGNRD01 SteamC_ep             | 8          | 2 🔂              | ď    | yell  | DSGNRD0   |
|            | DSGNRD01                                    |          | DSGNRD01 SteamD_ep             | 8          |                  | đ    | yell  | DSGNRD0   |
|            | TOPORD01                                    |          | DSGNRD01 SteamPipe             | 8          | 2 😚              | ď    | blue  | DSGNRD0   |
|            | XReferences                                 |          | DSGNRD01 StormSewer            | 8          |                  | đ    |       | Continuou |
| MANAGER    |   |          | DSGNRD01 StormSewer_ep         | 8          |                  | ď    | 200,  | DSGNRD0   |
| NAG        |   |          | DSGNRD01 Stream_ep             | 8          | 2 🔅              | đ    | blue  | DSGNRD0   |
| MA         |   |          | DSGNRD01 StreamMisc_ep         | 8          | 2 🔅              | ď    | = 1   | Continuou |
| PROPERTIES |   |          | DSGNRD01 StreetFurniture       | 6          | \$\$\$\$\$\$\$\$ | ď    | = 1   | Continuou |
| ERI        |   |          | DSGNRD01 StreetLights          | 8          | 2 🔆              | ď    | green | Continuou |
| ğ          |   |          | DSGNRD01 StreetLights_px       | 8          |                  | ď    | red   | Continuou |
| 5 D        |   |          | DSGNRD01 StructuralCourse      | 8          |                  | £    | 255,  | Continuou |
| LAYER      | Invert filter 兴                             | •        |                                | _          | 1                | 11   |       |           |
|            | DSGNRD01: 1334 layers displayed of 4328 tot | al laye  | rs                             |            |                  |      |       |           |

4. Notice that the Layer Properties Manager tool palette shows all the *Light Bulb* icons in the *Freeze* column are set to **Frozen**.

*Note* There are no Apply or OK buttons. Changes take effect as soon as they are selected.

5. While DSGNRD01 is still highlighted in the *Filters area*, use the *Search* field in the <u>upper right</u> to display only layers containing "**pavt**" by typing \*pavt\* in the field.

HINT The \* character is a wildcard.

| Name DSGNRD01]PavtMessage_ep DSGNRD01]PavtMiling(Construction) DSGNRD01PavtMiling_pm DSGNRD01PavtMiling_px DSGNRD01PavtMiling_px DSGNRD01PavtMiling_px DSGNRD01PavtMiling_px DSGNRD01PavtMiling_px DSGNRD01PavtMiling_px DSGNRD01PavtMiling_pm DS |   |  | 23 23 23 23 23 23 23 23 23   |   | white<br>blue<br>blue<br>cyan<br>cyan<br>blue<br>cyan   | Linetype<br>DSGNRD01/DGN2<br>Continuous<br>Continuous<br>Continuous<br>Continuous<br>DSGNRD01/DGN3<br>DSGNRD01/DGN3   | Lineweight<br>   | 0<br>0<br>0<br>0   | 255<br>255<br>Normal<br>255<br>255<br>255   | 0000  |                        | Desc<br>Pave<br>Millin<br>Millin<br>Asph   |
|---|---|--|--|---|---|---|--|--|---|---|------------------------|--|
| DSGNRD01]PavtMilling<br>DSGNRD01]PavtMilling(construction)<br>DSGNRD01]PavtMilling_pm<br>DSGNRD01]PavtMilling_px<br>DSGNRD01]PavtMilsc_pp<br>DSGNRD01]PavtMilsc_pp<br>DSGNRD01]PavtMilsc_pm<br>DSGNRD01]PavtMilsc_px  |   |  | 13 13 13 13 13 13 13 13 13   |   | blue<br>blue<br>cyan<br>cyan<br>blue<br>cyan  | Continuous<br>Continuous<br>Continuous<br>Continuous<br>Continuous<br>DSGNRD01]DGN3   | 0.09<br>0.20<br>0.30<br>0.15<br>0.15<br>0.09   |  | 255<br>255<br>Normal<br>255<br>255<br>255   | 0000  |                        | Milli<br>Milli   |
| DSGNRD01]PavtMilling<br>DSGNRD01]PavtMilling(construction)<br>DSGNRD01]PavtMilling_pm<br>DSGNRD01]PavtMilling_px<br>DSGNRD01]PavtMilsc_pp<br>DSGNRD01]PavtMilsc_pp<br>DSGNRD01]PavtMilsc_pm<br>DSGNRD01]PavtMilsc_px  |   |  | 13 13 13 13 13 13 13 13 13   |   | blue<br>blue<br>cyan<br>cyan<br>blue<br>cyan  | Continuous<br>Continuous<br>Continuous<br>Continuous<br>Continuous<br>DSGNRD01]DGN3   |  | 0<br>0<br>0<br>0   | Normal<br>255<br>255<br>255   | 0000  |                        | Mill<br>Mill   |
| DSGNRD01]PavtMilling(Construction)<br>DSGNRD01]PavtMilling_pm<br>DSGNRD01]PavtMilling_px<br>DSGNRD01]PavtMillis_pp<br>DSGNRD01]PavtMillis_pp<br>DSGNRD01]PavtMillis_px  |   |  | S2 53 53 53 53 53  |   | blue<br>cyan<br>cyan<br>blue<br>cyan  | Continuous<br>Continuous<br>Continuous<br>Continuous<br>DSGNRD01 DGN3   |  | 0<br>0<br>0  | Normal<br>255<br>255<br>255   | 0<br>0<br>0<br>0  |                        | Mil  |
| DSGNRD01]PavtMilling_pm<br>DSGNRD01]PavtMilling_px<br>DSGNRD01]PavtMilsc<br>DSGNRD01PavtMilsc_pp<br>DSGNRD01]PavtMilsc_pm<br>DSGNRD01]PavtMilsc_px  |   |  | ***  |   | cyan<br>cyan<br>blue<br>cyan  | Continuous<br>Continuous<br>Continuous<br>DSGNRD01/DGN3   |  | 0<br>0<br>0  | 255<br>255<br>255   | ₽   | Ę,                     |  |
| DSGNRD01PavtMiling_px<br>DSGNRD01PavtMisc<br>DSGNRD01PavtMisc_ep<br>DSGNRD01PavtMisc_pm<br>DSGNRD01PavtMisc_px  |   |  | ***  |   | cyan<br>blue<br>cyan  | Continuous<br>Continuous<br>DSGNRD01 DGN3   |  | 0<br>0   | 255<br>255  | ¢   | r,                     |  |
| DSGNRD01[PavtMisc<br>DSGNRD01[PavtMisc_ep<br>DSGNRD01[PavtMisc_pm<br>DSGNRD01[PavtMisc_px   |   |  | **   |   | blue  | Continuous<br>DSGNRD01 DGN3   | 0.15<br>0.09   | 0  | 255   |   |                        | Asc  |
| DSGNRD01 PavtMisc_ep<br>DSGNRD01 PavtMisc_pm<br>DSGNRD01 PavtMisc_px  |   | · ·  | \$}<br>\$}   |   | 📘 cyan  | DSGNRD01 DGN3   | 0.09   |  |   |   | <b>P</b> , ,           | Asc  |
| DSGNRD01 PavtMisc_pm<br>DSGNRD01 PavtMisc_px  |   | <u>}</u>   | **   | dî l  | = ^   | the second se   |  |  | 255   | ĕ   | ~ `                    | Pa   |
| DSGNRD01 PavtMisc_px  | 4   |  |  |   |   |   | 0.15   | 0  | 255   |   | <u> </u>               | Pav  |
|   |   |  | **   | f I   | blue  | Continuous  | 0.20   |  | 255   |   | <u> </u>               | Pav  |
|   | (   |  |  | ř   |   | Continuous  | 0.15   |  | 255   | ĕ   | ~                      | Pav  |
| DSGNRD01/PavtOverbuild_px   | 0   |  |  | ď I   | =   | Continuous  | 0.20   |  | 255   |   | <u> </u>               | Pav  |
| DSGNRD01 PavtOverlay_pm   |   |  |  | 6   | <u> </u>  | Continuous  | 0.15   |  | 255   |   | ~                      | Pav  |
|   | 6   |  | ñ  | <b>.</b>  |   |   |  |  |   |   | ~                      | Pav  |
|   | - C   |  | 55   |   | _   |   |  |  |   |   | <u> </u>               | Pav  |
|   |   |  |  |   | _   |   |  |  |   |   | _                      | Pav  |
|   | 3   |  |  | <b>.</b>  |   |   |  |  | 255   |   | ~                      | Sta  |
|   | 3   |  |  | j.  |   |   |  |  | 255   |   | <u> </u>               | Sta  |
|   | - C   |  |  |   | _   |   |  |  |   |   |                        | Tra  |
|   | 3   |  |  | <b>.</b>  | _   |   |  |  | 255   |   |                        | Cro  |
|   |   |  |  |   |   |   |  |  |   | -   | ~                      | _  |
|   | DSGNRDD1JPavtOverlay_px<br>DSGNRDD1JPavtOverlay_px<br>DSGNRDD1JPavtOverlay2_px<br>DSGNRDD1JPavtStabilization<br>DSGNRDD1JPavtStabilization_px<br>DSGNRDD1JPavtTractorXing_ep<br>DSGNRDD1JPavtXover_ep | DSGNRDD1/PavtOverlay1_px<br>DSGNRDD1/PavtStabilization<br>DSGNRDD1/PavtStabilization<br>DSGNRDD1/PavtStabilization_px<br>DSGNRDD1/PavtTractorXing_ep | DSGNRDQIIPavrOverlay_px         Q           DSGNRDQIIPavrOverlay_px         Q           DSGNRDQIIPavrSballication         Q           DSGNRDQIIPavrSballication_px         Q           DSGNRDQIIPavrSballication_px         Q           DSGNRDQIIPavrSballication_px         Q | DSGNRDDIJPanOverlay_px Q 20<br>DSGNRDDIJPanOverlay_px Q 20<br>SSGNRDDIPanOverlay2_px Q 20<br>DSGNRDDIJPanStabilization Q 20<br>DSGNRDDIJPanStabilization_px Q 20<br>DSGNRDDIJPanStabilization_px Q 20 | DSGNRDD1PavrOverlay_px 9 49 mm<br>DSGNRDD1PavrOverlay_px 9 49 mm<br>DSGNRDD1PavrOverlay_px 9 49 mm<br>DSGNRDD1PavrStabilization 9 49 mm<br>DSGNRDD1PavrStabilization_px 9 49 mm | DSGNRDD1PavtOverlay_px<br>SGNRDD1PavtOverlay_px<br>SGNRDD1PavtOverlay_px<br>SGNRDD1PavtOverlay_px<br>SGNRDD1PavtStabilization<br>DSGNRDD1PavtStabilization_px<br>SGNRDD1PavtStabilization_px<br>SGNRDD1PavtStabilization_px<br>SGNRDD1PavtStabilization_px<br>SGNRDD1PavtStabilization_px<br>SGNRDD1PavtStabilization_px<br>SGNRDD1PavtStabilization_px<br>SGNRDD1PavtStabilization_px<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRDD1PavtStover_ap<br>SGNRD1PavtStover_ap<br>SG | DSGNRDD1PavrOverlay_px 양 값 값 blue Continuous<br>DSGNRDD1PavrOverlay_px 양 값 고 Continuous<br>DSGNRDD1PavrOverlay_px 양 값 고 Continuous<br>DSGNRDD1PavrStabilization 양 값 고 Continuous<br>DSGNRDD1PavrStabilization_px 양 값 고 Extension px<br>DSGNRDD1PavrStabilization_px 양 값 고 Extension px<br>DSGNRDD1PavrStover_pp | DSGNRDD1PavtOverlay_px Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q Q | DSGNRDD1PavrOverlay_px       Ŷ       Ŷ       P <td>DSGNRDD1PavRoverlay_px       Q       Q       D       D       D       D       D       D       255         DSGNRDD1PavRoverlay_px       Q       Q       D       176       Continuous       —       0.20       0       255         DSGNRDD1PavRoverlay_px       Q       Q       D       176       Continuous       —       0.20       0       255         DSGNRDD1PavRoverlay_px       Q       Q       D       D       Continuous       —       0.20       0       255         DSGNRDD1PavRstabilization       Q       Q       D       Ima       DSGNRDD1DGN2       —       0.20       0       255         DSGNRDD1PavRstabilization_px       Q       Q       D       Ima       DSGNRDD1DGN2       —       0.20       0       255         DSGNRDD1PavRstabilization_px       Q       Q       D       Ima       DSGNRDD1DGN3       —       0.15       0       255         DSGNRDD1PavRstabilization       Q       Q       Ima       DSGNRDD1DGN3       —       0.15       0       255         DSGNRDD1PavRstaversep       Q       Q       Ima       DSGNRDD1DGN3       …       0.15       0</td> <td>DSGNRDD1PartOverlay_px</td> <td>DSGNRDD1PavrOverlay_px       Ŷ       Ŷ       P</td> | DSGNRDD1PavRoverlay_px       Q       Q       D       D       D       D       D       D       255         DSGNRDD1PavRoverlay_px       Q       Q       D       176       Continuous       —       0.20       0       255         DSGNRDD1PavRoverlay_px       Q       Q       D       176       Continuous       —       0.20       0       255         DSGNRDD1PavRoverlay_px       Q       Q       D       D       Continuous       —       0.20       0       255         DSGNRDD1PavRstabilization       Q       Q       D       Ima       DSGNRDD1DGN2       —       0.20       0       255         DSGNRDD1PavRstabilization_px       Q       Q       D       Ima       DSGNRDD1DGN2       —       0.20       0       255         DSGNRDD1PavRstabilization_px       Q       Q       D       Ima       DSGNRDD1DGN3       —       0.15       0       255         DSGNRDD1PavRstabilization       Q       Q       Ima       DSGNRDD1DGN3       —       0.15       0       255         DSGNRDD1PavRstaversep       Q       Q       Ima       DSGNRDD1DGN3       …       0.15       0 | DSGNRDD1PartOverlay_px | DSGNRDD1PavrOverlay_px       Ŷ       Ŷ       P |

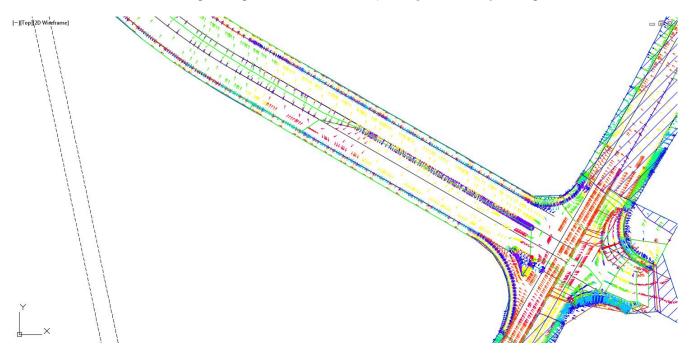
6. Notice the bottom left indicates how many layers are being displayed of the total number of layers: DSGNRD01: 47 layers displayed of 4328 total layers.

|        | Current layer: Xreference03_dp : | Referer | ce Fil   | es (For AutoCAD Use)       |    |  |      |       |               |            |          | *pav       | *        |    |        |
|--------|----------------------------------|---------|----------|----------------------------|----|--|------|-------|---------------|------------|----------|------------|----------|----|--------|
| ÷.     | 🦻 🛷 🖳 🖶 🛛 🎼 🌮 📫                  | )<br>S  | <b>s</b> | <b>I</b>                   |    |  |      |       |               |            |          |            |          |    | 0 ☆    |
| Filter | s                                | ~       | St       | Name                       | On | Freeze                                 | Lock | Color | Linetype      | Lineweight | Transpar | Plot Style | PL       | N  | Descri |
|        | planrd                           |         |          | DSGNRD01 BikeLaneColorPavt | 8  |  | d    | green | Continuous    | 0.20       | 0        | 255        | ٢        |    | Green  |
|        | plprrd                           |         |          | DSGNRD01 DirArrowsPavt     | 8  | ÷                                      | ď    | white | Continuous    | 0.15       | 0        | 255        | Ð        |    | Paven  |
|        | m qtdsrd                         |         |          | DSGNRD01 DitchPavt         | 8  |  | £    | red   | Continuous    | 0.15       | 0        | 255        | ¢        | Р, | Ditch  |
|        | rdxsrd                           |         |          | DSGNRD01 DitchPavt_ep      | 8  |  | £    | white | DSGNRD01 DGN1 | 0.09       | 0        | 255        | ¢        | Г, | Ditch  |
|        | rdxssp                           |         |          | DSGNRD01 DitchPavt_pm      | 8  |  | ď    | red   | Continuous    | 0.15       | 0        | 255        | e        | Г, | Ditch  |
|        | - mwdtrd                         |         |          | DSGNRD01 DitchPavt_px      | 8  | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | ď    | red   | Continuous    | 0.30       | 0        | 255        | ⇔        |    | Ditch  |
|        | meng10                           |         | -        | DSGNRD01 PavtAsph_ep       | 8  | ÷Ŏ.                                    | ď    | white | DSGNRD01 DGN3 |            |          |            | 0        |    |        |
|        | survrd                           |         | -        | DSGNRD01 PavtAsphalt       | 8  | ×.                                     | ď    | white | Continuous    | —— 0.20    | 0        | 255        | 0        |    | Asph   |
|        | tcdsrd                           |         |          | DSGNRD01 PavtAsphalt_ep    | 8  | ÷                                      | Ŀ    | white | DSGNRD01 DGN3 | 0.15       | 0        | 255        | ¢        |    | Asph   |
|        | typdrd                           |         |          | DSGNRD01 PavtAsphalt_pm    | 8  |  | Ē    | white | Continuous    | 0.15       | 0        | 255        | ¢        |    | Asph   |
|        | ···· 🕅 utadrd                    |         |          | DSGNRD01 PavtAsphalt_px    | 8  | **                                     | ď    | blue  | Continuous    | 0.20       | 0        | 255        | ¢        | Р, | Asph   |
|        | utprrd                           |         |          | DSGN RD01 PavtBase         | 8  |  | F    | red   | Continuous    | 0.20       | 0        | 255        | ¢        |    | Base   |
|        | Text                             |         |          | DSGNRD01 PavtBase_ex       | 8  | ÷                                      | Ē    | red   | DSGNRD01 DGN3 | 0.15       | 0        | 255        | Ð        | Г, | Base   |
|        | 🗄 🖓 Xref                         |         |          | DSGNRD01 PavtBase_pm       | 8  | ÷                                      | ď    | red   | Continuous    | 0.15       | 0        | 255        | e        |    | Pave   |
|        | DREXRD01                         | =       |          | DSGNRD01 PavtBase_px       | 8  | ÷                                      | £    | red   | Continuous    | 0.20       | 0        | 255        | ¢        |    | Base   |
|        | DSGNRD01                         |         |          | DSGNRD01 PavtBreak_dp      | 8  | ÷                                      | Ē    | white | Continuous    | 0.15       | 0        | 255        | <b>6</b> |    | Line   |
|        | TOPORDO1                         |         |          | DSGNRD01 PavtBreak_pm      | 8  | ÷                                      | ď    | white | Continuous    | 0.15       | 0        | 255        | ¢        |    | Break  |
|        | XReferences                      |         |          | DSGNRD01 PavtConcJoints_ep | 8  | ÷                                      | £    | blue  | DSGNRD01 DGN5 | 0.15       | 0        | 255        | ¢        |    | Cond   |
| _      |                                  |         |          | DSGNRD01 PavtConcrete      | 8  | ÷                                      | ď    | 200,  | Continuous    | 0.20       | 0        | 255        | Ð        | Г, | Conc   |
| 1 📃 Iı | nvert filter                     | ~<      | •        |                            |    | 1                                      | 11   |       |               |            |          |            |          |    | •      |

- 7. Highlight both the **DSGNRD01**|**PavtAsph\_ep** and **DSGNRD01**|**PavtAsphalt** *layers*, then click the **Snowflake** icon to *toggle* it to a **Sunshine** icon.
- *Note* This action is referred to as "thawing the layer". Thawing the layer changes the not visible status to visible.

| X                  | Current layer: Xreference03_dp : Referer        | nce Fik      | es (For AutoCAD Use)           |    |                        |      |        |                                  |      |         |           | Searc      | h for la | ayer | Q        |
|--------------------|---|--------------|--------------------------------|----|------------------------|------|--------|----------------------------------|------|---------|-----------|------------|----------|------|----------|
| ×                  | 4 🎲 🛷 📴 🖶 🗌 🎒 🍻 🍜                               | <b>5</b> × 1 | 3                              |    |                        |      |        |                                  |      |         |           |            |          |      | C ☆      |
|                    | Filters 《                                       | St           | Name                           | On | Freeze                 | Lock | Color  | Linetype                         | Line | eweight | Transpar_ | Plot Style | PL.      | N    | Descri 🔺 |
|                    | E AI  |              | DREXRD01 RWandLA_Text          | 8  | -Ò                     | ഫ്   | red    | Continuous                       |      | - 0.20  | 0         | 255        | Ð        | ₽.   | Annot    |
|                    | All non-Xref Layers                             |              | DREXRD01 RWandLA_Text_ep       | Ŷ  | ×                      | 6    | 📃 cyan | Continuous                       |      | - 0.09  | 0         | 255        | ¢        | Р,   | Annot    |
|                    | All Used Layers                                 |              | DREXRD01 RWandLA_WidthArrow    | 8  | -Ò                     | ď    | red    | Continuous                       |      | - 0.20  | 0         | 255        | e        | П.   | Annot    |
|                    | Drafting Elements                               |              | DREXRD01 RWandLA_WidthArrow_ep | 8  | ×                      | ď    |        | Continuous                       |      | - 0.09  | 0         | 255        | e        | г.   | Annot    |
|                    | Misc and Scratch                                |              | DREXRD01 RWLine                | 8  | -Ŏ                     | ď    | yell   | DREXRD01 RW-Proposed             |      | - 0.20  | 0         | 255        | e        | П.   | Right    |
|                    | + Standards                                     |              | DREXRD01 RWLine_ep             | 8  | ×                      | 6    | red    | DREXRD01 RW-Existing             |      | - 0.15  | 0         | 255        | e        | г.   | Right    |
|                    | Text  |              | DREXRD01 RWLine_ex             | 8  | -XX-                   | ď    | red    | DREXRD01 RW-Existing             |      | - 0.15  | 0         | 255        | e        | Г,   | Right    |
|                    | - Tref  |              | DREXRD01 RWLine_px             | 8  | ×                      | ď    | 📃 yell | DREXRD01 RW-Proposed             |      | - 0.20  | 0         | 255        | e        | г.   | Right    |
|                    | DREXRD01  |              | DREXRD01 Sanitary_ep           | 8  | -X                     | ď    | green  | DREXRD01 UT-Sanitary-Existing    |      | - 0.15  | 0         | 255        | e        | Г,   | Sanita   |
|                    | DSGNRD01  |              | DREXRD01 SanitaryB_ep          | 8  | -××                    | 6    | green  | DREXRD01 UT-Sanitary-Existing(B) |      | - 0.15  | 0         | 255        | ⇔        | г.   | Sanita   |
|                    | TOPORD01  |              | DREXRD01 SanitaryC_ep          | 8  | -X                     | ď    | green  | DREXRD01 UT-Sanitary-Existing(C) |      | - 0.15  | 0         | 255        | e        | Г,   | Sanita   |
|                    | XReferences                                     |              | DREXRD01 SanitaryD_ep          | 8  | -Ŏ-                    | 6    | green  | DREXRD01 UT-Sanitary-Existing(D) |      | - 0.15  | 0         | 255        | ⇔        | г.   | Sanita   |
| Щ.                 |   |              | DREXRD01 SanitaryDumpSta_ep    | 8  | -X                     | ď    | green  | DREXRD01 DGN2                    |      | - 0.15  | 0         | 255        | e        | Г,   | Dump     |
| NAG                |   |              | DREXRD01 SanitaryFM            | 8  | -××-                   | 6    | green  | DREXRD01 UT-Sanitary-Proposed    |      | - 0.20  | 0         | 255        | ⇔        | г.   | Force    |
| MAI                |   |              | DREXRD01 SanitaryFM_B_ep       | 8  | X                      | ď    | green  | DREXRD01 UT-Sanitary-Existing(B) |      | - 0.15  | 0         | 255        | e        | Г.   | Force    |
| S I                |   |              | DREXRD01 SanitaryFM_C_ep       | 8  | -××-                   | 6    | green  | DREXRD01 UT-Sanitary-Existing(C) |      | - 0.15  | 0         | 255        | θ        | г.   | Force    |
| PROPERTIES MANAGER |   |              | DREXRD01 SanitaryFM_D_ep       | 8  | ×                      | ď    | green  | DREXRD01 UT-Sanitary-Existing(D) |      | - 0.15  | 0         | 255        | e        | г,   | Force    |
| 6                  |   |              | DREXRD01 SanitaryFM_ex         | 8  | ŎŎŎĊĊĊŎŎĊĊĊĊĊĊĊĊĊĊĊĊĊĊ | 6    | green  | DREXRD01/DGN2                    |      | - 0.15  | 0         | 255        | θ        | Г,   | Force    |
| B                  |   |              | DREXRD01 SanitaryFM_px         | 8  | ×                      | ď    | green  | Continuous                       |      | - 0.15  | 0         | 255        | ⇔        | P.   | Force 🔻  |
| AYER               | Invert filter 🔣                                 | •            |                                |    |                        |      |        |                                  |      |         |           |            |          |      | +        |
| T<br>D             | All: 4328 layers displayed of 4328 total layers |              |                                |    |                        |      |        |                                  |      |         |           |            |          |      |          |

- 8. In the *Filters area* scroll up the list, click on **All** to display all *layers*.
- 9. Click the X at the top of the panel title to close the *Layer Properties Manager* tool palette.

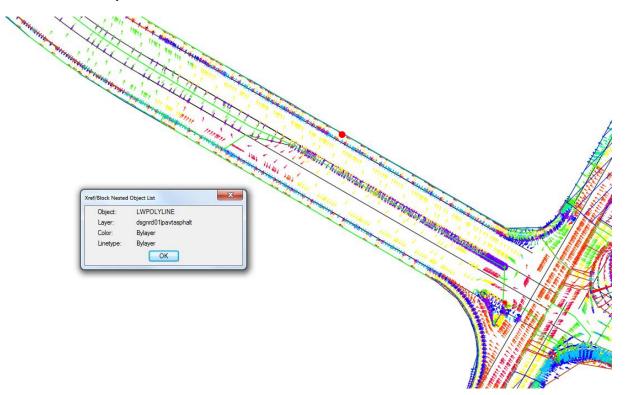


10. Note in the *Model* space, the thawed pavement *layers* **DSGNRD01**|**PavtAsph\_ep** and **DSGNRD01**|**PavtAsphalt** from the DSGNRD01 Xref are displayed.

#### **Exercise 4.4** Using the Xlist Command

The next steps will show you how to use the Xlist command. The Xlist command allows you to list objects that are in Xref files, such as layers, colors, line types, etc.

1. On the *command line*, type **XLIST**, select **ENTER**, then **data point** on the pavement line as shown below by the red circle.



2. The Xref/Block Nested Object List dialog box is displays. Notice the *Object* and *Layer* are listed within this dialog box.

| ock Nested Object List |  |  |  |  |  |
|------------------------|--|--|--|--|--|
| LWPOLYLINE             |  |  |  |  |  |
| dsgnrd01 pavtasphalt   |  |  |  |  |  |
| Bylayer                |  |  |  |  |  |
| Bylayer                |  |  |  |  |  |
| ОК                     |  |  |  |  |  |
|                        | LWPOLYLINE<br>dsgnrd01lpavtasphalt<br>Bylayer<br>Bylayer |  |  |  |  |

- *LWPOLYLINE* indicates a **Polyline** is displayed.
- *Layer: dsgnrd01/pavtasphalt* is the *Xref layer name* prefixed with the *Xref file name* separated by a vertical bar.
- 3. Click **OK** to close the Xref/Block Nested Object List dialog box.
- 4. Save the *DRMPRD01.dwg* file before continuing.

#### **Exercise 4.5** Define Catchments Using Surface & Water Drop

The next steps will show you how to define catchments conceptually using a Surface and the Water Drop command.

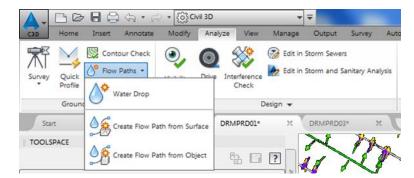
The Watershed Analysis displays the same boundaries you make with the Define Catchments from Surface command. It is a good starting point for delineating sub-basins which you will define later by creating polylines then use those polylines to create Catchments that will be assigned to inlets.

Use the Water Drop command to draw polylines. The polyline defines the path water takes as it goes from triangle to triangle along the surface. This command draws a 3D polyline from the high point you click to the corresponding low point on the surface. The opposite end of the polyline may be a good location for an inlet.

*HINT* We use a 2D Polyline as the Path Object Type, because 3D polylines do not display linetypes.

#### > Perform Water Drop

The next steps will show how to use the Water Drop command.



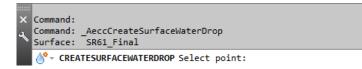
1. From the *Analyze tab* > *Ground Data panel* > *Flow Paths* drop down, select the **Water Drop** command. Press Enter to select a surface from a dialog box.

| Name            | Description            |
|-----------------|------------------------|
| SR61 - Existing | Triangles<br>Triangles |
|                 |                        |
|                 |                        |
|                 |                        |
|                 |                        |

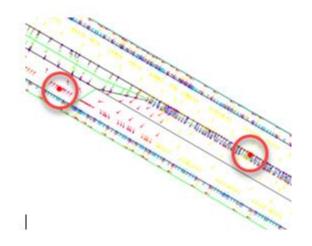
2. From the Select a Surface dialog box, select SR61\_Final, then click OK to close the Select a Surface dialog box.

| 🖃 🔣 Water Drop Path |               |
|---------------------|---------------|
| Path Layer          | DrainAlert_px |
| Path Object Type    | 2D Polyline   |

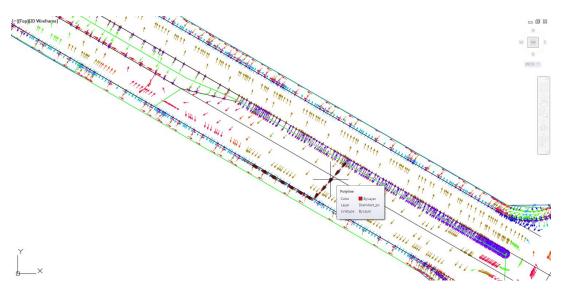
- 3. The Water Drop dialog displays. Make sure the *Path Layer value* is set to DrainAlert\_px.
- 4. The *Path Layer* is now set to **DrainAlert\_px**. Click **OK** to close the **Water Drop** dialog box.



5. Notice the *command line* prompts you for the next action to take: *Select point:* 



- 6. **Data Point** on the *pavement* near the south side of the median as shown by the red circle above. The *Water Drop* command will draw a polyline from the Point you set in a direction downslope until it reaches a low point.
- 7. **Data Point** on the *outside of the edge pavement* as shown by red circle above, then click **ENTER** to end command.



- 8. Hover over the polyline to display the **tooltip** showing the *Object Name (Polyline), Color, Layer* and *Linetype* properties.
- *Note* In practice you would use the *Water Drop* command to create Polylines in the areas of investigation where you wish to place drainage inlet structures.
  - 9. Save and Close the *DRMPRD01.dwg* file.

# **5** SURFACE ANALYSIS FOR INLET PLACEMENT

# DESCRIPTION

In this chapter, you will mark the location of low areas in a closed drainage system with circles. You will learn how to recognize high and low areas with the help of surface styles then apply best practices for choosing possible inlet placement. The marked locations are a preliminary step in choosing inlet placements and serve as a guide when laying out a pipe network using Civil 3D. Marking locations with circles is a simplified and quick way to visually indicate better choices for inlet placement without getting distracted by the steps required in pipe network creation.

# **OBJECTIVES**

In this chapter, you will learn about:

- Applying Common Sense Rules of Thumb
- A Technique Offering Speed and Flexibility for Inlet Placement

# **CHAPTER SETUP**

Run the Chapter 5 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

#### **Exercise 5.1** Insert the Water Drop.dwg File

The next steps will show you how to insert Water Drop.dwg file using the Insert command and change the current layer to DrainMisc.

In Chapter 4 you used the Water Drop command to create Polylines in the areas of investigation where you want to place drainage inlet structures. A file named Water Drop.dwg has been created for you. The Water Drop.dwg contains the completed Water Drop polylines from Chapter 4 which will be used for the Inlet Placement Technique's used in Chapter 5.

1. Start the FDOT Civil 3D State Kit and from the Select File dialog box, navigate to the C:\Civil 3D Projects\22049555201\Drainage folder and open the **DRMPRD01.dwg** file.

| 1 | //114.                            |                 | x  |
|---|-----------------------------------|-----------------|--|
| - | Name: ClosedBlank                 | ▼ Brow          | se   |
| 4 | Path:                             | _               | Opens the Select Drawing File dialog box (a standard file selection dialog box)  |
| 1 | Locate using Geographic           |                 | where you can select a block or drawing file to insert.  |
| - | Insertion point Specify On-screen | Scale           | Rotation Specify On-screen   |
|   | ×: 0                              | X: 1            | Angle: 0   |
| - | Y: O                              | Y: 1            | Block Unit   |
|   | Z: O                              | Z: 1            | Unit: Unitless   |
|   |                                   | ✓ Uniform Scale | Factor: 1  |
|   | Explode                           | ОК              | Cancel Help 1 111111   |
| l |                                   |                 | to the second states and the second states a |

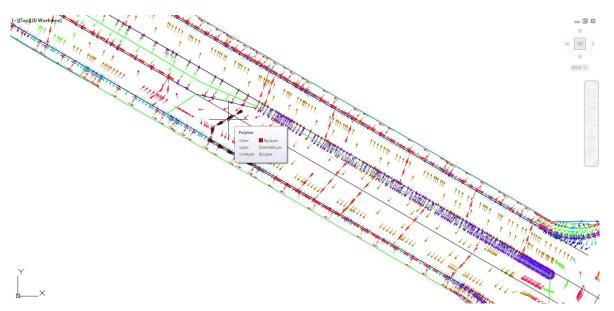
2. On the *command line* Type I for Insert to open the Insert dialog box as shown above. Click Browse.

| Select Drawing File | -                              | X  |
|---------------------|--------------------------------|--|
| Look in:            | Drainage 🔹                     | 🖛 🖳 🜊 🗶 🖳 🛛 Views 🔻 Tools 💌                  |
|                     | Name                           | Dati Preview                                 |
|                     | 🐌 c3d                          | 1/8/<br>1/8/<br>1/8/<br>1/8/<br>1/8/<br>1/8/ |
| Drainage            | 🌗 complete                     | 1/8/   |
|                     | 퉬 dem data                     | 1/8/   |
|                     | 퉬 dgn                          | 1/8/   |
| Roadway             | \mu eng_data                   | 1/8/   |
| =                   | 🔰 ssa                          | 1/8/   |
|                     | DRMPRD01.dwg                   | 1/5/   |
| Survey              | 🚰 Water Drop.dwg               | 1/8/   |
| 22049555201         |                                |  |
| 1                   |                                |  |
| Civil 3D Proj       |                                |  |
| <b>I</b>            | < <u> </u>                     | 4  |
| Downloads           |                                |  |
| 3                   | File name: Water Drop.dwg      | ▼ <u>Open</u> ▼                              |
| History 🚽           | Files of type: Drawing (*.dwg) | ✓ Cancel                                     |

3. From the Select Drawing File dialog box navigate to the *Drainage* folder and select Water **Drop.dwg.** Click **Open** to close the Select Drawing File dialog box.

| 🔥 Insert | 1  | >     | -                    |            |          | x            |
|----------|--|-------|----------------------|------------|----------|--------------|
| Name:    | Water Drop   |       | •                    | Browse     |          |              |
| Path:    | C:\Civil 3D Projects\220<br>cate using Geographic Da |       | 201\Drainage\        | Water Drop | )        |              |
|          | on point<br>ecify On-screen                          | Scale | e<br>pecify On-scree | en         | Rotation | fy On-screen |
| X:       | 0  | X:    | 1                    |            | Angle:   | 0            |
| Y:       | 0  | Y:    | 1                    |            | Block Ur | nit          |
| Z:       | 0  | Z:    | 1                    |            | Unit:    | Unitless     |
|          |  |       | Uniform So           | cale       | Factor:  | 1            |
| 📝 Explo  | ode  |       |                      | ок 🗌       | Cancel   | Help         |

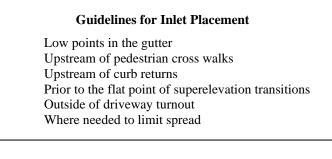
- 4. From the Insert dialog box, Uncheck Insertion Point, Scale, and Rotation boxes, then Check Explode box.
- 5. Click **OK** to close the **Insert** dialog box.
- 6. Set the current layer to **DrainMisc**, by typing DrainMisc on the command line or setting it using the Layer Properties dialog.

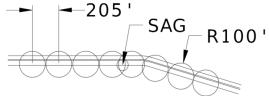


7. Review the results of inserting the *Water Drop.dwg* file into the *DRMPRD01.dwg* file.

#### **Exercise 5.2** Mark Locations of Proposed Drainage Inlet Structures

In this process, you will mark the locations of proposed drainage inlet structures using circles. This is a suggested procedure, not a requirement.





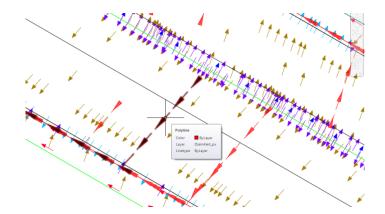
*Note* The diameter of the circles you use can help you graphically click the inlet placement at a desired separation between structures. The circles are simply guides to provide a sense of scale as you click inlet locations.

|       |             |           |                      | 0.0              |                 | -0                  |                         |                       |   |
|-------|-------------|-----------|----------------------|------------------|-----------------|---------------------|-------------------------|-----------------------|---|
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| S     | ≁           | 19 10     | 💭 Import Survey Data | Parcel 🔻         | 🕂 Alignment     | • 📲 Intersections • | Profile View 🔹          | 1-1-2                 | + Move 🕐 Rotate -/ Trim                                     |
| Too   | ്യ<br>space | 新 🖻       | 🍄 Points 🔹           | 党 Feature Line 🔻 | Profile 🔻       | Assembly 🔹          | - Sample Lines          | % • 🞯 • 🗖 •           | Copy A Mirror Fillet  |
|       |             |           | 🔗 Surfaces 🔹         | 💣 Grading 🔹      | Corridor        | Pipe Network        | Section Views 🔹         | U - Center, R         | adius etch Scale 🖶 Array                                    |
|       | Palette     | es 🔻      | Create Ground Data 👻 |                  | Create Design 🦷 | -                   | Profile & Section Views | -                     | Modify 👻  |
|       | Start       |           | Drawing1*            |                  | 201 X           | +                   |                         | ( * ) Center          | Center, Radius<br>Creates a circle using a specified radius |
| н то  | OLSPA       | ACE       |                      |                  |                 | [-][Top][20.00      | frame 🔨 🔀               |                       |   |
| a     |             |           |                      |                  | ta 🛛 ?          |                     |                         | 2-Point               | CIRCLE<br>Press F1 for more help                            |
| Activ | e Drav      | wing View |                      |                  | •               |                     |                         | 3-Point               |   |
|       | D           | RMPRD     | 01                   |                  |                 | 2                   |                         | S-Point               |   |
|       |             | ▷ Points  |                      |                  | 9               | L                   |                         |                       |   |
|       | ÷-[\$       | Point (   | Groups               |                  |                 | -                   |                         | Tan, Tan,             | Radius  |
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|       | <u>ا</u>    | Surface   | es                   |                  | 20              | 2n                  |                         |                       |   |
|       | ÷           | Alignm    | nents                |                  | attinne         |                     |                         |                       |   |

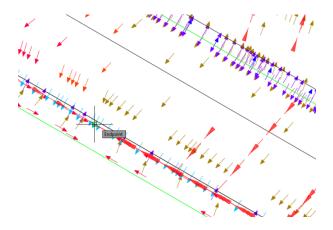
1. From the *Home tab > Draw* panel > *Circle command* drop down list, select **Center, Radius**.

| I | Command: _circle  |  |
|---|---|--|
|   | ♂ - CIRCLE Specify center point for circle or [3P 2P Ttr (tan tan radius)]: |  |

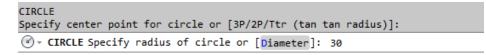
2. On the *command line* you are instructed to: *Specify center point for circle*.



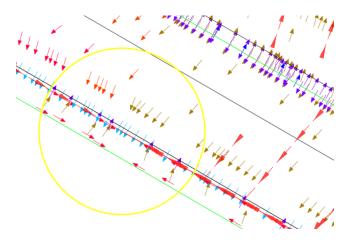
3. Hover over a **polyline** on the **DrainAlert\_px** layer (Created in a previous step.) to highlight it. Notice where the *downstream end* of the polyline is located.



4. Hover over the *end of the polyline* and the Endpoint tooltip displays. Left-click to place the center of the circle at the **endpoint** of the polyline.

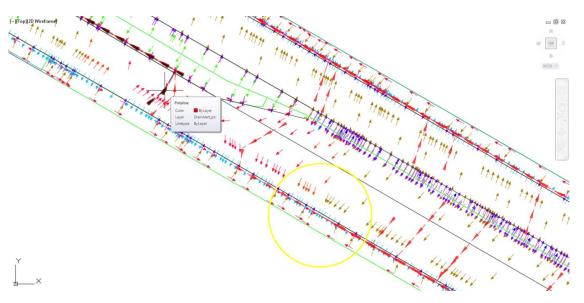


5. The *command line* now prompts you to: *Specify radius of circle*. Type **30** and press **ENTER**.



6. Observe a **Sag Inlet** *condition* where the flow direction arrows are pointing towards each other. This indicates a low point in the terrain model where water will accumulate.

- 7. **Draw** a *circle* with the center at the sag location on the pavement with a *radius* of **30**. The larger circles will help you quickly identify *sag conditions* –vs- *on grade shallow flow*.
- 8. Place another **Inlet** *location* of a proposed drainage inlet structures using a circle.



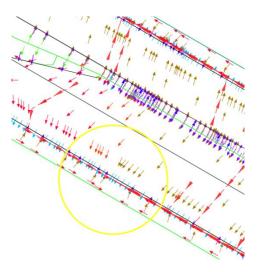
9. The green lines are Watershed Area boundaries. Notice the flow direction arrows are pointing toward the median on one side of the green line and away from the median on the other side. This represents the flat area of a transition on a super elevated road.



10. From the *Home tab* > *Draw* panel > *Circle command* drop down list, select **Center, Radius**.

| Command: _circle |        |       |     |        |    |      |        |      |     |          |   |
|------------------|--------|-------|-----|--------|----|------|--------|------|-----|----------|---|
| <pre></pre>      | center | point | for | circle | or | [ 3P | 2P Ttr | (tan | tan | radius)] | : |

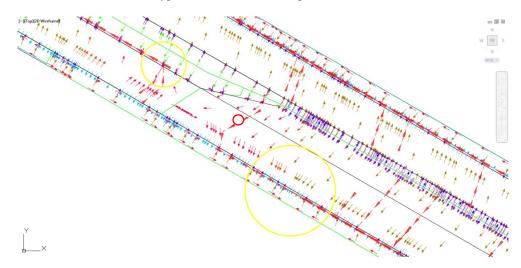
11. Specify *center point* for circle at the **edge of pavement** at the median.



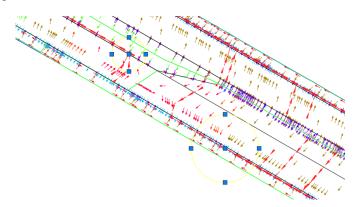
12. Select the edge of pavement along the flow direction polyline.

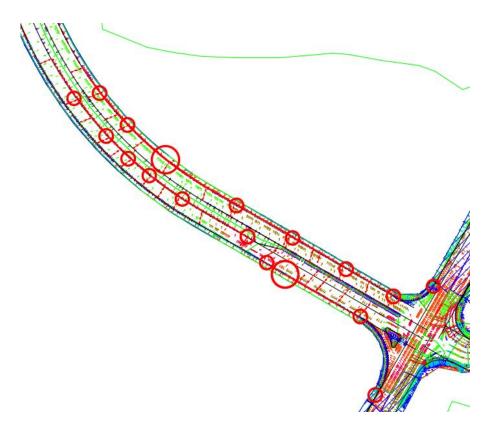
| Command: C CIRCLE  |
|--|
| Specify center point for circle or [3P/2P/Ttr (tan tan radius)]:                 |
| <pre>@ - CIRCLE Specify radius of circle or [Diameter] &lt;30.0000&gt;: 15</pre> |

13. On the *command line*, Type **15** for the *radius* and press **ENTER**.



14. Before moving on to the next process, click on the two Inlet placement circles created in the previous step, then press DELETE.





15. Review the sample displayed locations of circles representing the Inlet Placements as shown above by the red circles. In this example, the sag locations have larger radii. This example has been created for you and its use will be explained in the next process.

## **Exercise 5.3** Insert Inlet Placement.dwg

The next steps will show you how to insert the Inlet Placement.dwg file using Block Insert command.

A file named Inlet Placement.dwg has been created for you. The Inlet Placement.dwg contains the completed Inlet Placement circles. You'll use these Inlet Placement circles to aid in the placement of the Inlets using an AutoCAD Center Object Snap. This will help in making the chapter exercises results repeatable throughout the manual.

1. On the *command line*, Type I for insert. Browse to the file *Inlet Placement.dwg* located in the *Drainage* folder.

| A Insert |  |            |                          |          | ×                  |
|----------|--|------------|--------------------------|----------|--------------------|
| Name:    | Inlet Placement                                    |            | Browse                   |          |                    |
|          | C:\Civil 3D Projects\22<br>cate using Geographic D |            | 201\Drainage\Inlet Place | m        |                    |
|          | ion point<br>ecify On-screen                       | Scale      | e<br>pecify On-screen    | Rotation | i<br>ify On-screen |
| X:       | 0  | <b>X</b> : | 1                        | Angle:   | 0                  |
| Y:       | 0  | Y:         | 1                        | Block U  | nit                |
| Z:       | 0  | Z:         | 1                        | Unit:    | Unitless           |
|          |  |            | VIII Uniform Scale       | Factor:  | 1                  |
| 📝 Expl   | ode  |            | ОК                       | Cancel   | Help               |

2. On the Insert dialog box, keep options the same as the image above and click **OK** to insert file and close dialog box.



- 3. Zoom and Pan to display the results of inserting the Inlet Placement.dwg.
- 4. Save and Close the *DRMPRD01.dwg* file.

# **6** LAYOUT PIPE NETWORK

# DESCRIPTION

This chapter is where you create a pipe network using Civil 3D. Then place drainage structures using Structure Offset and Rotation Rule Set and connect pipes to the structures. Decisions about where to place the structures have been made in a previous chapter so you can focus on the details of the pipe network creation and layout processes.

# **OBJECTIVES**

In this chapter, you will learn about:

- Creating a Proposed Drainage Structures Drawing File
- Apply Structure Offset and Rotation Rule to FDOT Structures Rule Set
- Creating a Pipe Network in Civil 3D
- Laying Out Structures
- Connecting Pipes to Structures

# **CHAPTER SETUP**

Run the Chapter 6 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

#### **Exercise 6.1** Creating a Proposed Structures Drawing File

#### > Create the DRPRRD01 File

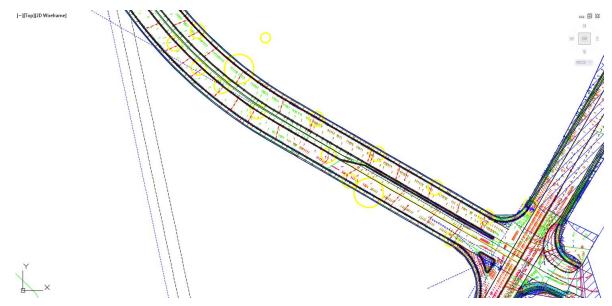
The next steps will show you how create the Proposed Drainage DRPRRD01.dwg project file.

- 1. Start the FDOT Civil 3D State Kit by clicking on the FDOT Civil 3D desktop icon.
- 2. On the FDOT Ribbon click the **Create File** icon to launch the application and create the *DRPRRD01.dwg* file.



| Create File (v201  | 5.0.3.5) Workspace: FDOT2016.C3D   |                |  |  |  |  |  |  |  |  |
|--|--|----------------|--|--|--|--|--|--|--|--|
|  |  |                |  |  |  |  |  |  |  |  |
| Project:   | C:\Civil 3D Projects\22049555201   | Select Project |  |  |  |  |  |  |  |  |
| Discipline:  | ROADWAY  |                |  |  |  |  |  |  |  |  |
| File Group:  | File Group: Drainage Design Files  |                |  |  |  |  |  |  |  |  |
| File Type:   |  |                |  |  |  |  |  |  |  |  |
| Bridge Hydra<br>Drainage De<br>Drainage Ro<br>Drainage Ma<br>Drainage Ma<br>Drainage Str<br>Drainage Str<br>Drainage Str<br>Drainage Str<br>Lateral Ditch<br>Lateral Ditch<br>Pond Cross<br>Pond Desigg<br>Storm Water | Box Culvert Wingwall Design and Special Details<br>Bridge Hydraulics Recommendation Sheet<br>Drainage Detail Sheet<br>Drainage Rood Data Form<br>Drainage Map<br>Drainage Optional Materials Tabulation<br>Drainage Structure Cross Sections<br>Drainage Structures - Existing<br>Drainage Structures - Existing<br>Drainage Structures - Existing<br>Drainage Structures - Existing<br>Drainage Structures - Roposed<br>Lateral Ditch Plan and Profile Sheet<br>Pond Cross Sections<br>Pond Design<br>Storm Water Pollution Prevention Plan<br>Summary of Drainage Structures |                |  |  |  |  |  |  |  |  |
| Output File:   | DRPRRD01.dwg   |                |  |  |  |  |  |  |  |  |
| Output Folde   | r; drainage\   | Browse         |  |  |  |  |  |  |  |  |
| Template:  | Prouvo   |                |  |  |  |  |  |  |  |  |
| Template Pa  | th: data/templates/  |                |  |  |  |  |  |  |  |  |
| Coordinate S   | iystem: FL North   |                |  |  |  |  |  |  |  |  |
| Cre  | ate/Open File  | Close          |  |  |  |  |  |  |  |  |

- 3. In the Create File dialog set the following:
  - a. Set the Project: to C:\Civil 3D Projects\22049555201.
  - b. Set the *Discipline*: to **ROADWAY**.
  - c. Set the *File Group:* to **Drainage Design Files**.
  - d. Set the *File Type*: to **Drainage Structures Proposed**.
  - e. Set the *Coordinate System:* to FL North.
- 4. Click the **Create/Open File** button. After the drawing opens in Civil 3D click the **Close** button to close the **Create File** dialog box.
- 5. Associate the DRPRRD01 drawing to the Project. Refer to Chapter 3 for the steps if you need a refresher.
- Attach External References Xrefs to the DRPRRD01 Drawing
- 1. Set the current *Layer* to **Xreference01\_DP** before continuing. You can set the Layer either through the *Layer Properties* <OR> type the Layer Name on the *command line*.
- 2. Using the same steps used in earlier exercises, insert the *DRMPRD01.dwg* file as an **Xreference**. Refer to Chapter 3 for the steps if you need a refresher.
- 3. Change *Layer* to **Xreference02\_DP** and insert the *DSGNRD01.dwg* as an **Xreference**.



- 4. **Zoom** and **Pan** to display the attached *DSGNRD01.dwg*.
- 5. **Freeze** any *Layers* in the Xref that are obscuring your view of the pavement layers you wish to display from this file.

| Ø.    |                 |    | _                | _ |    | ce02_dp      | • |  |  |
|-------|-----------------|----|------------------|---|----|--------------|---|--|--|
| Layer | -7 <sub>9</sub> | Ø, | 4                |   | ₿  | Make Current |   |  |  |
|       | E,              | Ø, | € <mark>¢</mark> |   | ₫, | Match Layer  |   |  |  |
|       | Layers 👻        |    |                  |   |    |              |   |  |  |

6. From the *Home tab* > *Layers panel*, click the **Layer Properties** button.

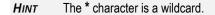
| X                        | Current Invest Vesteran | ce02_dp : Reference Files (   | (For AutoCAD  | Use)   |            |           |                         |  |   |            |          | Search   | for laye | r   | Q |
|--------------------------|-------------------------|---|---|--|------------|-----------|-------------------------|--|---|------------|----------|--|----------|---|---|
| ×                        | 🔁 🦻 🌮 🖳 🖯 🛛             | 🤣 📫 🔗 🏕 🔗   | *   |  |            |           |                         |  |   |            |          |  |          | 03  | 2 |
|                          | Filters                 |   | lame  |  | <u>م</u> د | On Freeze | Lock                    | Color  | Linetype  | Lineweight | Transpar | Plot Style   | PL. N    | Descri  | • |
| LAYER PROPERTIES MANAGER | DRMPRDC                 |   | 25GN RD01 Dr.<br>25GN RD01 Dr.<br>25GN RD01 Dr.<br>25GN RD01 Dr.<br>25GN RD01 Dr.<br>25GN RD01 Dr.<br>25GN RD01 Dr. | ain Divides06_ep<br>ain Divides07<br>ain Divides07_ep<br>ain Divides08<br>ain Divides08_ep<br>ain Divides09_ep<br>ain Divides09_ep<br>ain Misc |            |           | =<br>BBBBBBBBBBBBBBBBBB | 200,<br>140,<br>200,<br>140,<br>200,<br>140,<br>200,<br>140,<br>200,<br>200,<br>200,<br>200,<br>200,<br>200, | DSGNRD01[DGN2<br>DSGNRD01[DGN2<br>DSGNRD01[DGN2<br>DSGNRD01[DGN2<br>DSGNRD01[DGN2<br>DSGNRD01[DGN2<br>DSGNRD01[DGN2<br>DSGNRD01[DGN2<br>DSGNRD01[DGN2<br>DSGNRD01[DGN3<br>DSGNRD01[DGN3<br>DSGNRD01[DGN3<br>DSGNRD01[DGN3<br>Continuous<br>Continuous |            |          | 255<br>255<br>255<br>255<br>255<br>255<br>255<br>255<br>255<br>255 |          | Draina     Draina |   |
|                          | 5 DSGNRDD1: 1334 layer  | Isolate Group<br>New Properties Filter<br>New Group Filter<br>New Standards Filter<br>Convert to Group Filter<br>Rename<br>Delete | •   | Frozen   |            |           |                         |  |   |            |          |  |          |   |   |

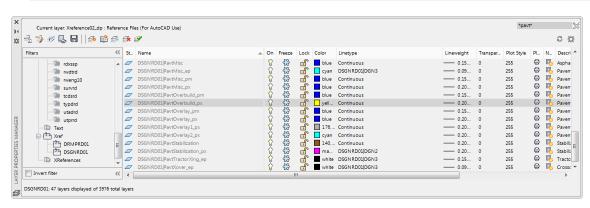
7. In the *Filters* area expand the **Xref** collection by clicking the plus sign, right click on **DSGNRD01**, hover over **Visibility**, then select **Frozen**.

*Note* There are no Apply or OK buttons. Changes take effect as soon as they are selected.

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|-----------------|-----|----------|-------------------------------|----|-----------------|----------|--------|---------------|------------|----------|------------|----|------------|------|
| ilters          | ~<  | St       | Name                          | On | Freeze          | Lock     | Color  | Linetype      | Lineweight | Transpar | Plot Style | PL | N          | Desc |
| rdxssp          |     |          | DSGNRD01 PavtMisc             | 8  | ₩               | ď        | blue   | Continuous    | 0.15       | 0        | 255        | Φ  | П.         | Aspl |
| rwdtrd          |     |          | DSGNRD01 PavtMisc_ep          | 8  | ₩               | £        | 📃 cyan | DSGNRD01 DGN3 | 0.09       | 0        | 255        | ÷  | П,         | Pav  |
| weng10          |     |          | DSGNRD01 PavtMisc_pm          | Ŷ  | ₩               | <u> </u> | blue   | Continuous    | 0.15       | 0        | 255        | ÷  | П.         | Pav  |
| Survrd          |     |          | DSGNRD01 PavtMisc_px          | 8  | ÷               | d        | blue   | Continuous    | 0.20       | 0        | 255        | Φ  | П.         | Pav  |
|                 |     |          | DSGNRD01 PavtOverbuild_pm     | Ŷ  | ₩               | <u> </u> | blue   | Continuous    | 0.15       | 0        | 255        | ÷  | П.         | Pav  |
| typdrd          |     |          | DSGNRD01 PavtOverbuild_px     | Ŷ  | ~ <del>}}</del> | -f       | yell   | Continuous    | 0.20       | 0        | 255        | ÷  | <b>P</b> . | Pav  |
| ····· 🕅 utadrd  |     |          | DSGNRD01 PavtOverlay_pm       | 8  |                 | -f       | blue   | Continuous    | 0.15       | 0        | 255        | ÷  | ₽.         | Pav  |
| utprrd          |     |          | DSGNRD01 PavtOverlay_px       | Ŷ  | ₩               | <u> </u> | blue   | Continuous    | 0.20       | 0        | 255        | ÷  | <b>P</b> . | Pav  |
| Text            |     |          | DSGNRD01 PavtOverlay1_px      | Ŷ  | ₩               | <u> </u> | 176,   | Continuous    | 0.20       | 0        | 255        | ¢  | <b>P</b> . | Pav  |
| - C Xref        |     |          | DSGNRD01 PavtOverlay2_px      | Ŷ  | ₩               | Ē        | 📃 cyan | Continuous    | 0.20       | 0        | 255        | ¢  | <b>P</b> . | Pav  |
| C DRMPRD01      | =   |          | DSGNRD01 PavtStabilization    | Ŷ  | ₩               | Ē        | 140,   | Continuous    | 0.20       | 0        | 255        | ¢  | R          | Stat |
| DSGNRD01        | -   |          | DSGNRD01 PavtStabilization_px | Ŷ. | ₩               | Ē        | ma     | DSGNRD01 DGN2 | 0.20       | 0        | 255        | ¢  | R          | Stat |
| XReferences     |     |          | DSGNRD01 PavtTractorXing_ep   | Ň. | ₩               | <u> </u> | white  | DSGNRD01 DGN3 | 0.15       | 0        | 255        | Φ  |            | Trac |
|                 | *   |          | DSGNRD01 PavtXover_ep         | Ň  | ₩               | Ē        | white  | DSGNRD01 DGN3 | 0.09       | 0        | 255        | Φ  |            | Cro  |
| Invert filter   | ~   | •        |                               |    |                 |          |        |               |            |          |            |    |            |      |

- 8. The Layer Properties Manager tool palette displays all the *Light Bulb* icons in the *Freeze column* are set to **Frozen**.
- 9. While *DSGNRD01* is still highlighted in the *Filters* area use the search field in the *upper right* to display only layers containing "**pavt**". Type \*pavt\* in the field.





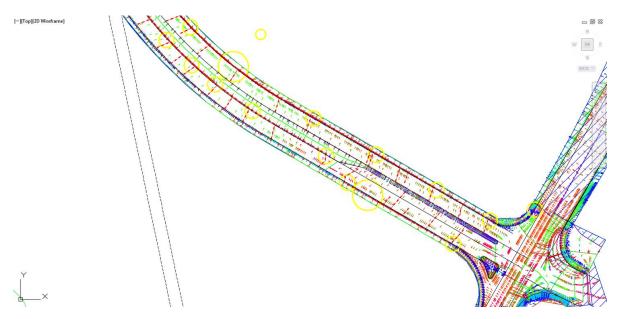
10. Notice the bottom left indicates how many layers are being displayed of the total number of layers: **DSGNRD01: 47 layers displayed of 3976 total layers** 

| Current layer: Xreference02_c |    |   |                            |    |            |  |       |               |            |          | *pav       |          |            | c   |
|-------------------------------|----|---|----------------------------|----|------------|--|-------|---------------|------------|----------|------------|----------|------------|-----|
| Filters                       |    |   | Name                       | On | Freeze     | Lock   | Color | Linetype      | Lineweight | Transpar | Plot Style | PL_      | N          | De  |
| pdxsrd                        |    |   | DSGNRD01 BikeLaneColorPavt | 8  |            | đ  | green | Continuous    | 0.20       | 0        | 255        |          | в,         | Gr  |
| pland                         |    |   | DSGNRD01 DirArrowsPavt     | Ŷ  |            | Ē  | white | Continuous    | 0.15       | 0        | 255        | e        | <b>R</b> . | Pa  |
| plprrd                        |    |   | DSGNRD01 DitchPavt         | Ŷ. | -          | <u> </u>   | red   | Continuous    | 0.15       | 0        | 255        | e        | <b>Q</b> . | Dit |
| atdsrd                        |    |   | DSGNRD01 DitchPavt_ep      | 8  |            | d  | white | DSGNRD01 DGN1 | 0.09       | 0        | 255        | e        | П.         | Dit |
| rdxsrd                        |    |   | DSGNRD01 DitchPavt_pm      | Ŷ  |            | <u> </u>   | red   | Continuous    | 0.15       | 0        | 255        | e        | П.         | Dit |
| rdxssp                        |    |   | DSGNRD01 DitchPavt_px      | 8  |            | đ  | red 📕 | Continuous    | 0.30       | 0        | 255        | e        | П.         | Dit |
| - mwdtrd                      |    |   | DSGNRD01 PavtAsph_ep       | 8  | 3<br>Ö-Ö-S | <b>_</b>   | white | DSGNRD01 DGN3 | 0.13       | 0        | Normal     | e        | <b>P</b> _ | As  |
| weng10                        |    |   | DSGNRD01 PavtAsphalt       | Ŷ  | ×          | đ  | white | Continuous    | 0.20       | 0        | 255        |          | Π.         | As  |
| survrd                        |    |   | DSGNRD01 PavtAsphalt_ep    | 8  |            | di la constante da la constant | white | DSGNRD01 DGN3 | 0.15       | 0        | 255        | 0        | П,         | As  |
| tcdsrd                        |    |   | DSGNRD01 PavtAsphalt_pm    | 8  |            | đ  | white | Continuous    | 0.15       | 0        | 255        | e        | П.         | As  |
| - Tim typdrd                  |    |   | DSGNRD01 PavtAsphalt_px    | 8  | -          | ď  | blue  | Continuous    | 0.20       | 0        | 255        | e        | Ц,         | As  |
| Utadrd                        |    |   | DSGNRD01 PavtBase          | Ŷ  |            | đ  | E red | Continuous    | 0.20       | 0        | 255        | ¢        | Π.         | Ba  |
| utprrd                        |    |   | DSGNRD01 PavtBase_ex       | 8  | 쇖          | đ  | red   | DSGNRD01 DGN3 | 0.15       | 0        | 255        | e        | ц,         | Ba  |
| Text                          |    |   | DSGNRD01 PavtBase_pm       | Ŷ  | *          | <u> </u>   | red   | Continuous    | 0.15       | 0        | 255        | e        | П.         | Pa  |
| E (Th Xref                    | E  |   | DSGNRD01 PavtBase_px       | 8  |            | đ  | red   | Continuous    | 0.20       | 0        | 255        | ⇔        | П,         | Ba  |
| DRMPRD01                      |    |   | DSGNRD01 PavtBreak_dp      | 8  |            | <u> </u>   | white | Continuous    | 0.15       | 0        | 255        | <b>6</b> |            | Lin |
| DSGNRD01                      |    |   | D5GNRD01 PavtBreak_pm      | 8  | ÷          | đ  | white | Continuous    | 0.15       | 0        | 255        | e        |            | Bre |
| XReferences                   | _  |   | DSGNRD01 PavtConcJoints_ep | 8  |            | <u> </u>   | blue  | DSGNRD01 DGN5 | 0.15       | 0        | 255        | e        |            | Co  |
|                               |    |   | DSGNRD01 PavtConcrete      | 8  |            | đ  | 200,  | Continuous    | 0.20       | 0        | 255        | e        | П.         | Co  |
| Invert filter                 | ~< | • |                            |    |            | "  |       |               |            |          |            |          |            |     |

11. Highlight both the **DSGNRD01**|**PavtAsph\_ep** and **DSGNRD01**|**PavtAshpalt** *layers*, then click the **Snowflake** icon to *toggle* to a **Sunshine** icon. This action is referred to as *"thawing the layer"*. Thawing the layer changes its status from **Not Visible** to **Visible**.

| ** |                     |      | Files (For AutoCAD Use) |    |        |          |       |                       |            |          |            |     |            | c 🛱     |
|----|---------------------|------|-------------------------|----|--------|----------|-------|-----------------------|------------|----------|------------|-----|------------|---------|
|    | Fiters 🔇            | < 5  | Name                    | On | Freeze | Lock     | Color | Linetype              | Lineweight | Transpar | Plot Style | PL_ | N          | Descri  |
|    | e 😌 All             | . 4  | ConcSlabs_ep            | 8  | ×      | đ        | white | DGN1                  | 0.15       | 0        | 255        |     | <b>G</b> , | Concr   |
|    | All non-Xref Layers | 14   | Conduit                 | 8  | ×      | đ        | red 📕 | SG-Conduit            | 0.20       | 0        | 255        |     |            | Condu   |
|    | All Used Layers     | 4    | Conduit_ep              | Ŷ  | ×.     | Ē        | red   | UT-Casing-Existing    | 0.09       | 0        | 255        | e   | R.         | Utility |
|    | Drafting Elements   | 4    | Conduit_ex              | Ŷ  | ×      | đ        | red   | DGN2                  | 0.15       | 0        | 255        |     |            | Condu   |
|    | Misc and Scratch    | "  4 | Conduit_px              | Ŷ  | ÷Ò.    | <b>F</b> | red   | Continuous            | 0.15       | 0        | 255        |     | R          | Condu   |
|    | Standards           | 4    | ConduitAG               | Ŷ  | -××    | Ē.       | yell  | SG-ConduitAG-Proposed | 0.15       | 0        | 255        | ÷   | <b>C</b> . | Condu   |
|    | algnrd              | 4    | ConduitB_ep             | Ŷ  | ×ģ.    | <u> </u> | red   | UT-Casing-Existing(B) | 0.15       | 0        | 255        | e   | <b>R</b>   | Utility |
|    | autosp              | 4    | 7 ConduitBM             | Ň  | ****** | Ē        | ma    | SG-ConduitBM-Proposed | 0.15       | 0        | 255        | ÷   | P.         | Condu   |
|    | Cliprd              | 4    | ConduitC_ep             | Ŷ  | ×      | Ē.       | red   | UT-Casing-Existing(C) | 0.15       | 0        | 255        | e   | <b>R</b>   | Utility |
|    | drdtrd              | 4    | ConduitD_ep             | Ň  | -ò     | Ē        | red   | UT-Casing-Existing(D) | 0.15       | 0        | 255        | ⇔   | R          | Utility |
|    | drmprd              |      | ConduitDB               | Ň  | ÷×     | đ        | green | SG-ConduitDB-Proposed | 0.15       | 0        | 255        | e   | <b>C</b>   | Condu   |
|    | drprrd              | 4    | Conduit/B               | Ŷ. | ×.     | <u> </u> | red   | SG-Conduit/B-Proposed | 0.15       | 0        | 255        | e   | R.         | Condu   |
|    | dosrd               |      | 7 ConduitOT             | Ň  | -0-    | Ē.       | blue  | SG-ConduitOT-Proposed | 0.15       | 0        | 255        | 0   | C.         | Condu   |
|    |                     | -⊿   | Cone_px                 | Ň. | ÷Ö.    | Ē.       | 255   | Continuous            | 0.20       | 0        | 255        | 0   | <b></b>    | Cone    |
|    | Invert filter 🔇     | <    |                         |    |        |          |       |                       |            |          |            |     |            |         |

- 12. In the *Filters* area scroll up the list of filters, click **All** to display all the Layers.
- 13. Click the X at the top of the panel title to close the Layer Properties Manager tool palette.



- 14. In Model Space the Layers from *DRMPRD01* and the **Thawed Pavement Layers** *DSGNRD01/PavtAsph\_ep* and *DSGNRD01/PavtAsphalt* from *DSGNRD01 Xrefs* display.
- 15. Save the *DRPRRD01.dwg* file

## **Exercise 6.2** Create Data Reference to Surface SR61\_Final Surface

In the next steps create a Data Reference to the Surface SR61\_Final Surface.

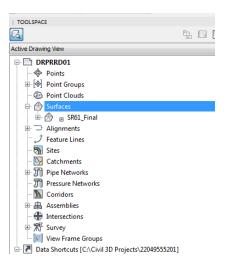
- TOOLSPACE Q Active Drawing View B DRPRRD01 Points 🔄 🔄 Point Groups Point Clouds Surfaces Alignments Sites Catchments Pipe Networks Pressure Networks Corridors Assemblies Intersections ⊕ 🛣 Survey 🔄 🔟 View Frame Groups 🗄 🗷 Data Shortcuts [C:\Civil 3D Projects\22049555201] Burfaces 💮 SR61 - Existing - 🕞 SR61 - Alignments Pipe Networks Open Source Drawing. Pressure Networks Promote 🔄 View Frame Group Re<u>m</u>ove
- 1. From *TOOLSPACE* > *Prospector tab* > *Data Shortcuts [C:\Civil 3D Projects\22049555201]*, expand **Surfaces**, right click on **SR61\_Final**, and select **Create Reference**.

| ource surface:                  | Surface layer: |
|---------------------------------|----------------|
| R61_Final                       | MTO            |
| Properties                      | Value          |
| Information                     |                |
| Name                            | SR61_Final     |
| Description                     | Triangles      |
| Style                           | _No Display    |
| Render Material                 | Global         |
| The second second second second |                |
|                                 |                |

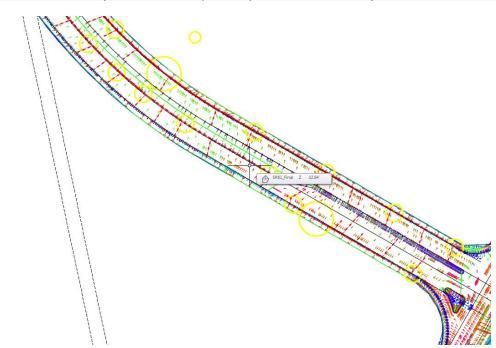
2. From the Create Surface Reference dialog box, under *Properties > Information*, select the Style Value column,

| A Select Surface Style | ×       |
|------------------------|---------|
| No Display             | • 💽 • 💽 |
| OK Cancel              | Help    |

- 3. From the Select Surface Style dialog box, under the *Style drop down list*, select \_No Display.
- 4. Click **OK** to close the **Select Surface Style** dialog box.
- 5. Click **OK** to close the **Create Surface Reference** dialog box.



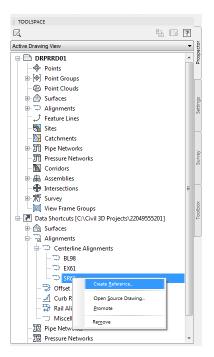
1. From the *TOOLSPACE* > *Prospector tab*, expand the **Surfaces** collection to confirm the **SR61\_Final** *Surface* has been added as a reference surface.



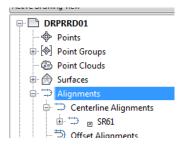
*HINT* Reference objects are indicated by the *B* symbol to the left of the object name.

2. In Model Space hover your cursor in a blank area to display a tool tip showing the *Surface* Name and *Elevation* where the cursor is located.

# **Exercise 6.3** Create Data Reference to Alignment SR61



- 1. Using the steps just used, create a *Data Reference* to the **Alignment SR61**. Use the default settings in the dialog box and select **OK**.
- 2. The SR61 alignment is displayed with Station labels.



3. To see the Data Reference in the Alignments collection, expand the Centerline Alignments.

#### **Exercise 6.4** Create Surface Profile for SR61 Alignment and SR61\_Final Surface

The next steps will show you how to create a Surface Profile for SR61 Alignment and SR61\_Final Surface.

- 🗅 🕞 🖥 😂 🐄 r ri + {63 Civil 3D - -😥 🕅 💭 Import Survey Data 🛛 🖏 Parcel 🔹 🕂 Alignment 🔹 👭 Intersections 👫 🖶 🖑 Points 🔹 🞐 Feature Line 🔹 📔 Profile 🔹 🕌 Assembly 🔹 F 🖳 🖉 Surfaces 🔹 🗳 Grading 🔹 Create Surface Profile Create Ground Data Start Drawing1\* × DRPRRDO Profile Creation Tool TOOLSPACE G, 87 Active Drawing View DRPRRD01 Points **Quick Profile** Point Groups Point Clouds Surfaces Alignments te Profile from Co J Feature Lines
- 1. From the *Home tab > Create Design panel > Profile* drop down list, select **Create Surface Profile**.

| 🛕 Create Profi | le from Surfa | ce 👘   | 1 m.,       | ~~       | 2         | $\sim$      |          |           |           | x     |
|----------------|---------------|--------|-------------|----------|-----------|-------------|----------|-----------|-----------|-------|
| Alignment:     |               |        |             |          | Select su | irfaces:    |          |           |           |       |
| "_> SR61       |               |        |             | - 🗐 🗐    |           | 51_Final    |          |           |           |       |
| Station ran    | ige           |        |             |          |           |             |          |           |           |       |
| Alignment      |               |        |             |          |           |             |          |           |           |       |
| Start:         |               | End    | d:          |          |           |             |          |           |           |       |
| 698+           | -53.79'       | 7      | 26+41.49'   |          |           |             |          |           |           |       |
| To sample      | :             |        |             |          | Samo      | le offsets: |          |           |           |       |
| 698+           | -53.79'       |        | 726+41.49'  | -12      |           | ie onsets.  |          |           | Add>:     |       |
|                |               |        |             |          |           |             |          |           | Add >     |       |
| Profile list:  |               |        |             |          |           |             |          |           |           |       |
| Name           | Description   | Type   | Data Sou    | Offset   | Update    | Laver       | Style    | Station   |           | Elevi |
|                |               | . //   |             |          | -,        |             |          | Start     | End       | м     |
| SR61_Final     |               | $\sim$ | SR61_Final  | 0.00'    | Dynamic   |             | FDOT Pro | 698+53.79 | 726+41.49 | 31.7  |
|                |               |        |             |          |           |             |          |           |           |       |
|                |               |        |             |          |           |             |          |           |           |       |
|                |               |        |             |          |           |             |          |           |           |       |
| •              |               |        |             |          |           |             |          |           |           | Þ     |
| Remove         |               |        | Draw in pro | fla viau |           |             | ж        | Cancel    | Help      |       |
| Remove         |               |        | Draw in pro | THE VIEW |           |             |          | Cancel    | Пер       |       |

- 2. From the Create Profile from Surface dialog box, set the following:
  - a. Under Alignment: from the drop down list select SR61.
  - b. Under Select surfaces: highlight SR61\_Final.
- 3. Click the **Add** button (found on the right side). The *Profile list*: area populates with the newly defined surface profile content.
- 4. Click the **Draw in profile view** button at the bottom of dialog box. This will launch the **Create** Profile View wizard.
- 5. The blue links on the left side display an arrow next to the current panel title being displayed. Visit each panel in the **Create Profile View** wizard setting the values as instructed, then click the **Next** button at the bottom to continue to the next panel in the wizard.

| General                 | Select alignment:   |  |
|-------------------------|---|--|
| Station Range           | *⇒ SR61 👻 💽   |  |
| <u>Station Range</u>    | Profile view name:  |  |
| Profile View Height     | <[Parent Alignment]><[Profile View Station Range]>        |  |
| Profile Display Options | Description:  |  |
| Pipe/Pressure Network   |   |  |
|                         | Profile view style:                                       |  |
| <u>Data Bands</u>       | FDOT 40 Horz x 4 Vert Scale 10x GRID ON                   |  |
| Profile Hatch Options   | Profile view layer:                                       |  |
|                         | Tables 🛃  |  |
|                         |   |  |
|                         | Show offset profiles by vertically stacking profile views |  |
|                         |   |  |
|                         |   |  |
|                         |   |  |
|                         |   |  |
|                         |   |  |

6. In the *General* panel, from the *Profile view style:* drop down list select **FDOT 40 Horz x Vert Scale 10x GRID ON**, then click the **Next** > button.

| Create Profile View - Station Range | 1 C 2 C 4            |                      | <b></b>            |
|-------------------------------------|----------------------|----------------------|--------------------|
| General                             | Station range        |                      |                    |
| Station Range                       | Automatic            | Start:<br>698+53.79' | End:<br>726+41.49' |
| Profile View Height                 |                      |                      |                    |
| Profile Display Options             | User specified range | 698+53.79'           | 726+41.49'         |
| Pipe/Pressure Network               |                      |                      |                    |
| <u>Data Bands</u>                   |                      |                      |                    |
| Profile Hatch Options               |                      |                      |                    |
|                                     |                      |                      |                    |
|                                     | < Bac                | Create Profile       | e View Cancel Help |

7. In the *Station Range* panel, do not change anything, then click the **Next** > button.

| General                 | Profile view height       | Minimum:             | Maximum:        |   |
|-------------------------|---------------------------|----------------------|-----------------|---|
| Station Range           | Automatic                 | 31.78'               | 38.09'          |   |
| Profile View Height     | O User specified          | 28.00'               | 40.00'          |   |
| Profile Display Options | Split profile view        |                      |                 |   |
| Pipe/Pressure Network   | First split view style:   |                      | Split station:  |   |
| Data Bands              | FDOT 40 Horz x 4          | /ert Scale 10x 👻 🌄 💌 | Exact station   | - |
| Profile Hatch Options   | Intermediate split view s |                      | Datum option:   |   |
|                         | Last split view style:    |                      | Exact elevation | T |
|                         |                           |                      |                 |   |

8. In the *Profile View Height* panel, do not change anything, then click the **Next** > button.

| Create Profile View - Profile Display | Options      | ~~            | 2         |          |             |               |            |        |         | x |
|---------------------------------------|--------------|---------------|-----------|----------|-------------|---------------|------------|--------|---------|---|
| General                               | Specify prof | île display o | ptions:   |          |             |               |            |        |         | _ |
| Station Range                         | Name         | Draw          | Clip Grid | Split At | Description | Туре          | Data Sou   | Offset | Update  | L |
| Profile View Height                   | SR61_Final   |               | ۲         | ۲        |             | M             | SR61_Final | 0.00'  | Dynamic |   |
| Profile Display Options               |              |               |           |          |             |               |            |        |         |   |
| Pipe/Pressure Network                 |              |               |           |          |             |               |            |        |         |   |
| Data Bands                            |              |               |           |          |             |               |            |        |         |   |
| Profile Hatch Options                 |              |               |           |          |             |               |            |        |         |   |
|                                       |              |               |           |          |             |               |            |        |         |   |
|                                       |              |               |           |          |             |               |            |        |         |   |
|                                       |              |               |           |          |             |               |            |        |         |   |
|                                       |              |               |           |          |             |               |            |        |         |   |
|                                       | •            |               |           |          |             |               |            |        |         | Þ |
|                                       |              |               |           |          |             |               |            |        |         |   |
|                                       |              |               | < Back    | Next     | > Cre       | ate Profile \ | /iew       | Cancel | Help    |   |

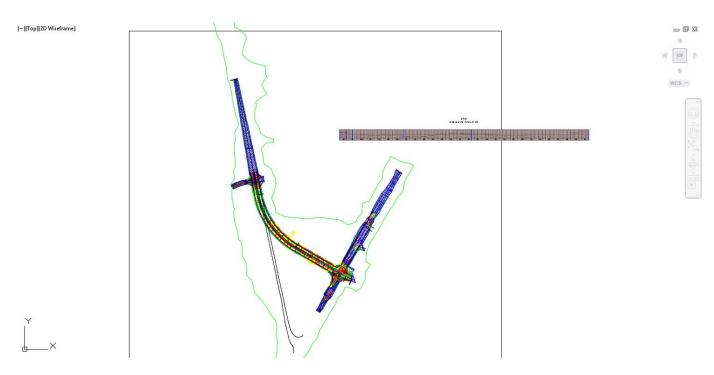
9. In the *Profile Display Options* panel, do not change anything, then click the **Next** > button.

|  | 1  |  |           |          |                   |                     |
|--|--|--|-----------|----------|-------------------|---------------------|
| General                                    | Select band set:                                     |  |           |          |                   |                     |
| Station Range                              | FDOT 10x VExa  | agg Stations                               |           | - 🏹 -    |                   |                     |
| Profile View Height                        |  | data bands need to<br>or materials). Pleas |           |          | ata sources (such | as profiles, sample |
| Profile Display Options                    | List of bands  |  |           |          |                   |                     |
| Pipe/Pressure Network                      | Location:  |  |           | 10 20    | 18 15 17          |                     |
|  | Location   |  |           |          |                   |                     |
| Data Bands                                 | Bottom of profile                                    | view                                       | -         | 2        |                   |                     |
|  |  | view                                       | •         | 1+0 2+0  | 3+0 4+0 5+0       |                     |
|  |  |  | •         | 11+0 2+0 | 3+8 449 5+8       |                     |
|  | Bottom of profile                                    |  | Profile 1 | Profile2 | Alignment         | Geometry Points     |
| <u>Data Bands</u><br>Profile Hatch Options | Bottom of profile                                    | es:  |           |          |                   | Geometry Points     |
|  | Bottom of profile<br>Set band propertie<br>Band Type | es:<br>Style                               |           | Profile2 | Alignment         |                     |
|  | Bottom of profile<br>Set band propertie<br>Band Type | es:<br>Style                               |           | Profile2 | Alignment         |                     |
|  | Bottom of profile<br>Set band propertie<br>Band Type | es:<br>Style                               |           | Profile2 | Alignment         |                     |

10. In the *Data Bands* panel, from the *Select band set:* drop down list select **FDOT 10x VExagg Stations** style, then click the **Next** > button.

| Create Profile View - Profile Hatch | Options              |                          |          | X           |
|-------------------------------------|----------------------|--------------------------|----------|-------------|
| General                             | Cut Area:            |                          | 3        |             |
| Station Range                       |                      | Hatch Area               | Profile  | Shape Style |
| Profile View Height                 |                      |                          |          |             |
| Profile Display Options             | Fill Area:           |                          |          |             |
| Pipe/Pressure Network               |                      |                          |          |             |
| Data Bands                          |                      |                          |          |             |
| Profile Hatch Options               | Multiple boundaries: |                          |          |             |
|                                     |                      |                          |          |             |
|                                     | From criteria:       |                          |          |             |
|                                     | Import               |                          |          |             |
|                                     |                      |                          |          |             |
|                                     | < Back               | Vext > Create Profile Vi | ew Cance | I Help      |

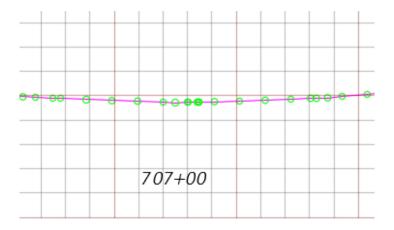
11. In the *Profile Hatch Options* panel do not change anything, then click the **Create Profile View** > button.



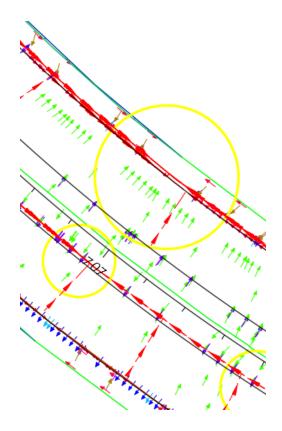
12. In model space pick the insertion point to the right of the plan view of the project for the Profile View. The profile's insertion point is the lower left of the grid.



13. Zoom in to see the *Profile View, the grid, the labels, the surface profile* of **SR61\_Final**, and the *title* containing the alignment name and station range.



14. Locate the **low point** in the Profile View near *station* 707+00.



15. The image above shows the matching **low point** in Plan View near *station* 707+00.

# **Exercise 6.5** Set Xref Fading

The next steps will show you how to set Xref Fading for all attached Xrefs. The higher the number the lighter the Xref line work will appear.

|                | 😂 🔄 • 🖄 • 🔯 CMI 30   | •                  | ₹              |                  |  | Autode                   |
|----------------|----------------------|--------------------|----------------|------------------|--|--------------------------|
| Cap Home Inser | t Annotate Modify Ar | iałyze View Manage | Output Surve   | y Autodesk 360 H | Help Add-ins                                 | Featured Apps E          |
| Import         | Import Survey Data   | Insert Create      | Attach Clip    | Adjust C(x)      | ay Layers<br>s vary*  •<br>o Underlays ON  • | Autodesk Attach<br>ReCap |
| Start          | Drawing1* X          | DRPRRD01* ×        | + 🛃 Edit Refer |                  |  | Point Cloud              |
| TOOLSPACE      |                      |                    | Kref fadi      | ng               | 0  | No.                      |
| G.             |                      | ta 🖬 🏹             |                | Reference        | N  | b. W                     |

1. From the *Insert tab* > *Reference panel*, select the title to display the commands hidden behind the panel title.

| Attach Clip Adjust | Underlay Layers |
|--------------------|-----------------|
| Edit Reference     |                 |
| Kref fading        | 60              |
| -[🎞 Refe           | rence s         |

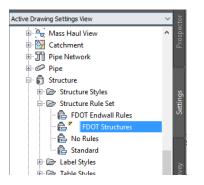
2. Set the *Xref Fading* value to **60**.



3. Notice in the drawing editor the Xrefs appear lighter and alignment's display remains at full intensity.

## **Exercise 6.6** Apply Structure Offset and Rotation Rule to FDOT Structures Rule Set

The next steps show you how to apply Structure Offset and Rotation Rule Set to structures as you place them in the drawing. The rule set simply provides a way for you to create a set of custom rules. You can add or exclude certain rules, or edit certain rule values, and save the, in a named rule set designed to control the behavior for a specific pipe network or project. The FDOT Civil 3D State kit has rules already defined for you.



1. From the *TOOLSPACE* > *Settings tab*, expand the *Structure* collection, expand the *Structure Rule Set* collection, right click on *FDOT Structures* and select **Edit**.

| A Structure Rule Set - FDOT Endwall Rules    |     |  | —   |      | × |
|--|-----|--|---|------|---|
| Information Rules                            |     |  |   |      |   |
| Name:<br>[FDOT Endwall Rules<br>Description: | ~ ~ | Created by:<br>RD964LM<br>Last modified by:<br>RD964LM | Date created:<br>7/19/2013 12:<br>Date modified:<br>7/19/2013 12: |      |   |
|  |     | OK Cancel  | Apply   | Help |   |

2. The Structure Rule Set dialog box appears:

| Structure Rule Set - FDOT Endwall I | ules  |  |  |
|-------------------------------------|-------|--|--|
| ormation Rules                      |       |  |  |
| Add Rule Delete Rule                |       |  |  |
| Parameter                           | Value |  |  |
| 🕀 Maximum pipe size check           |       |  |  |
| Pipe Drop Across Structure          |       |  |  |
|                                     |       |  |  |
|                                     |       |  |  |
|                                     |       |  |  |
|                                     |       |  |  |
|                                     |       |  |  |
|                                     |       |  |  |
|                                     |       |  |  |
|                                     |       |  |  |
|                                     |       |  |  |
|                                     |       |  |  |
|                                     |       |  |  |
|                                     |       |  |  |

3. Select the Rules tab then select Add Rule.

| Category:  |   | Macro project:                      |
|--|---|-------------------------------------|
| Storm Sewer  | ~ | C:\ProgramData\Autodesk\C3D 2017\en |
| Rule name:   |   | Macro name:                         |
| Pipe Drop Across Structure   | ~ | PipeNetworkRule.StructureDrop       |
| Maximum pipe size check<br>Maximum Structure Depth<br>Pipe Drop Across Structure |   |                                     |
| Pipe to Pipe Clearance<br>Set Sump Depth   |   | Value                               |
| Side Clearance Rule  |   | 20                                  |
| Slab Clearance Rule<br>Structure Offset and Rotation                             |   | 0.10'                               |
| Maximum Drop Value   |   | 3.00'                               |
|  |   |                                     |
|  |   |                                     |
|  |   |                                     |
|  |   |                                     |
|  |   |                                     |
|  |   |                                     |

4. Click on the drop down list under Rule Name and select **Structure Offset and Rotation** then click **OK.** 

| Structure Rule Set - FDOT Endwall | ules  |     |         |      |   |   |     |
|-----------------------------------|-------|-----|---------|------|---|---|-----|
| ormation Rules                    |       |     |         |      |   |   |     |
| Add Rule Delete Rule              |       |     |         |      |   |   |     |
| Add Rule Delete Rule              |       |     |         |      |   |   | _   |
| Parameter                         | Value |     |         |      |   |   |     |
| 🕀 Maximum pipe size check         |       |     |         |      |   |   | ]   |
| Pipe Drop Across Structure        |       |     |         |      |   |   |     |
| E Structure Offset and Rotation   |       |     |         |      |   |   |     |
|                                   |       |     |         |      |   | _ |     |
|                                   |       |     |         |      |   |   |     |
|                                   |       |     |         |      |   |   |     |
|                                   |       |     |         |      |   |   |     |
|                                   |       |     |         |      |   |   |     |
|                                   |       |     |         |      |   |   |     |
|                                   |       |     |         |      |   |   |     |
|                                   |       |     |         |      |   |   |     |
|                                   |       |     |         |      |   |   |     |
|                                   |       |     |         |      |   |   |     |
|                                   |       |     |         |      |   |   |     |
|                                   |       |     |         |      |   |   |     |
|                                   |       |     |         |      |   |   | 1   |
|                                   |       | 01/ | Carrant | 1    |   |   | -1- |
|                                   | L     | OK  | Cancel  | Appl | y | н | elp |

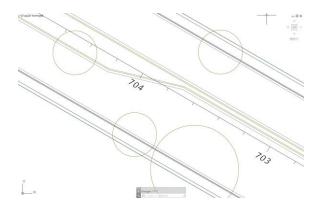
5. The Structure Offset and Rotation rule has now been added to the Structure Rule Set. Click **OK** to apply and close out of the dialog box.

# **Exercise 6.7** Copy and Define Line Work from which to Rotate and Offset Structures

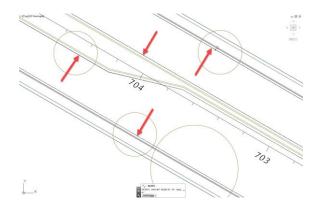
The Structure Offset and Rotation rule only works with an Alignment, Corridor Feature Line, Feature Line, and 3D Polyline. In the following steps, we will copy Pavement Asphalt polylines from the Xref DSGNRD01 drawing using the NCOPY command This will set us up to Convert them to Feature Lines.

| TOOLSPACE                    |                 |
|------------------------------|-----------------|
|                              | ?               |
| Active Drawing Settings View | -               |
| 🗄 🛧 Section                  |                 |
| 🗈 🕋 Section View             |                 |
| 🗄 🚭 Mass Haul Line           |                 |
| 🗄 🦳 Mass Haul View           |                 |
| 🗄 📴 Catchment                |                 |
| Pipe Network                 |                 |
| 🖻 🗁 Parts Lists              |                 |
| FDOT Buried Fiber Op         | otic            |
| FDOT Buried Tele             |                 |
| FDOT CATV                    |                 |
| FDOT Drainag                 | Edit            |
| FDOT Drainage Ex             |                 |
| FDOT Ex Buried El            | Сору            |
| FDOT Ex Buried Fi            | Find references |
| FDOT Ex Buried To            | Replace with    |
| FDOT Ex CATV                 | Refresh         |
| FDOT Ex Conduit              | The result      |
| - C FDOT Fy Gas              |                 |

1. Zoom in to Station 704. Notice how the center of each circle lands on edge of pavement geometry. Use the LAYOFF option to turn off the Flow Arrows to for clarity.



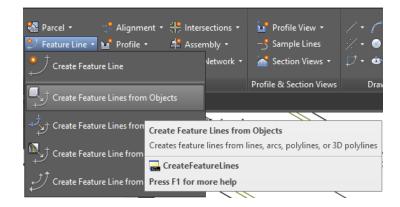
2. Type NCOPY at the command line. You are then prompted to select nested object to copy.



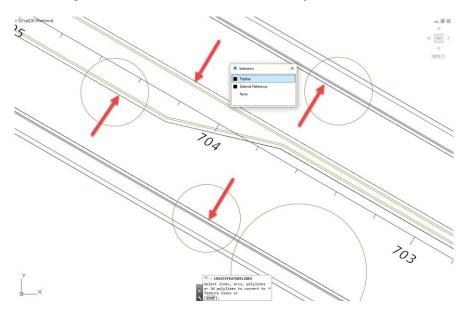
3. Select the four lines as shown in the image above. Press Enter three times to accept the default base point and displacement values. You now have successfully copied Nested object from the Xref drawing into your current drawing.

# **Exercise 6.8** Create Feature Lines from Polylines

Next we convert the copied polylines to Feature Lines



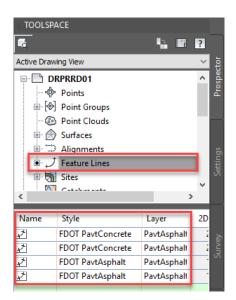
1. On the Home Ribbon on the Create Design panel, click on the Feature Line icon to expose the pull down menu options. Select Create Feature Line from Objects.



2. Select the four copied Polylines. If you are using the Selection tool, make sure that you select the Polyline option for each one. After the fourth polyline line selected, press enter to bring up the Create Feature Lines dialog box.

| A Create Feature Lines        | × |
|-------------------------------|---|
| Site:                         |   |
| None>                         |   |
| Name                          |   |
| Feature <[Next Counter(CP)] > |   |
| ⊠ Style                       |   |
| + B FDOT PavtAsphalt V        |   |
| Layer                         |   |
| O BreakLine_dp                |   |
| O Use current layer           |   |
| Use selected entity layer     |   |
| Conversion options            |   |
| Erase existing entities       |   |
| Assign elevations             |   |
| Weed points                   |   |
| OK Cancel Help                |   |

- 3. From the Create Feature Lines dialog box
  - a. Set Site to <None>
  - b. From Style drop down list select FDOT PavtAsphalt
  - c. Select Use selected entity layer option for layer.
  - d. Check Erase existing entities for Conversion options
  - e. Click OK.



4. Select the **Feature Lines** category on the Toolspace/Prospector tab. You will see four Feature lines defined in the bottom preview.

# **Exercise 6.9** Review the Parts List Contents

The next steps will show you how to review the parts list FDOT Drainage.

| TOOLSPACE                    |                 |  |  |  |  |
|------------------------------|-----------------|--|--|--|--|
|                              | ÷ [] ?          |  |  |  |  |
| Active Drawing Settings View |                 |  |  |  |  |
| 🗄 🛧 Section                  |                 |  |  |  |  |
| 🗉 🕋 Section View             |                 |  |  |  |  |
| 🗉 🚭 Mass Haul Line           |                 |  |  |  |  |
| 🕀 🍋 Mass Haul View           |                 |  |  |  |  |
| 🖅 📴 Catchment                |                 |  |  |  |  |
| 🖃 📆 Pipe Network             |                 |  |  |  |  |
| 🖻 🗁 Parts Lists              |                 |  |  |  |  |
| - 📹 FDOT Buried Fiber Op     | otic            |  |  |  |  |
| - FDOT Buried Tele           |                 |  |  |  |  |
| FDOT CATV                    |                 |  |  |  |  |
| 📬 📕 FDOT Drainag             | Edit            |  |  |  |  |
| FDOT Drainage Ex             |                 |  |  |  |  |
| 😭 FDOT Ex Buried El          | Copy            |  |  |  |  |
| - 😭 FDOT Ex Buried Fi        | Find references |  |  |  |  |
| - G FDOT Ex Buried Te        | Replace with    |  |  |  |  |
| FDOT Ex CATV                 | Refresh         |  |  |  |  |
| - 😭 FDOT Ex Conduit          | Ketresn         |  |  |  |  |
| FDOT Fy Gas                  |                 |  |  |  |  |

1. From the *TOOLSPACE* > *Settings tab*, expand the *Pipe Network* collection, expand the *Parts List* collection, right click on *FDOT Drainage* and select **Edit**.

| formation Pipes Structures Summary                 |   |                   |                      |
|--|---|-------------------|----------------------|
| Name:  |   | Created by:       | Date created:        |
| FDOT Drainage                                      |   | RD964RR           | 3/19/2015 9:20:44 AM |
| Description:                                       |   | Last modified by: | Date modified:       |
| Proposed Drainage Parts for FDOT Drainage Projects | * | RD964RR           | 1/25/2016 5:35:47 PM |
|  |   |                   |                      |
|  | - |                   |                      |
|  |   |                   |                      |
|  |   |                   |                      |
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|  |   |                   |                      |
|  |   |                   |                      |
|  |   |                   |                      |

- 2. From the Network Parts List dialog box:
  - a. Information tab, the *Name:* field contains the name of the Parts List, **FDOT Drainage**.

| formation Pipes Structures Summary      |       |       |              |          |
|---|-------|-------|--------------|----------|
| Name                                    | Style | Rules | Render Mater | Pay Item |
| E-C                                     |       |       |              |          |
| 🖶 🦻 Box Culvert Concrete Pipe           | Ę     | E,    | Ę            |          |
| 🕀 📂 Vertical Elliptical Concrete Pipe   | Ę     | Ę     | Ę            |          |
| 🖶 🗁 Horizontal Elliptical Concrete Pipe | e C,  | Ę     | Ę            |          |
| 🕀 📂 Utility Duct                        | Ę     | Ę     | Ę            |          |
| 🕀 📂 Pipe Culvert S/CD                   | Ę     | Ę     | Ę            |          |
| 🕀 📂 Pipe Culvert SD                     | Ę     | Ę     | Ę            |          |
| 🕀 🗁 Pipe Culvert Gutter Drain           | Ę     | Ę     | Ę            |          |
|   |       |       |              |          |
| <                                       |       |       |              |          |

b. *Pipes tab*, expand **FDOT Drainage** to display the pipe families.

| Name   |  | Style |   |
|--------|--|-------|---|
|        | FDOT Drainage  |       | , |
| ÷ 🕞    | Null Structure   |       |   |
| _<br>ا | Index No. 425-010 (200) - Junction Box   |       |   |
| • D    | Index No. 425-001 (201) - Type 7 Manhole (1 or 2-Piece Cover (Center), Round Botto |       |   |
| • D    | Index No. 425-001 (201) - Type 7 Manhole (1 or 2-Piece Cover (Center), Rectangular |       |   |
| ± 🖻    | Index No. 425-001 (201) - Type 7 Manhole (1 or 2-Piece Cover (Edge), Round Bottom) |       |   |
| ± 🖻    | Index No. 425-001 (201) - Type 7 Manhole (1 or 2-Piece Cover (Edge), Rectangular B |       |   |
| ± 🖻    | Index No. 425-001 (201) - Type 8 Manhole (Concentric Cone with 1 or 2-Piece Cover  |       |   |
| 🗄 🗁    | Index No. 425-001 (201) - Type 8 Manhole (Concentric Cone with 1 or 2-Piece Cover  |       |   |
| • 🖻    | Index No. 425-001 (201) - Type 8 Manhole (Concentric Cone with 1 or 2-Piece Cover  |       |   |
| 🗉 🗁    | Index No. 425-001 (201) - Type 8 Manhole (Concentric Cone with 1 or 2-Piece Cover  |       |   |
| 🗄 · 🗁  | Index No. 425-001 (201) - Type 8 Manhole (Eccentric Cone with 1 or 2-Piece Cover,  |       |   |
| 🗄 · 🗁  | Index No. 425-001 (201) - Type 8 Manhole (Eccentric Cone with 1 or 2-Piece Cover,  |       |   |
| 🖻 🖻    | Index No. 425-020 (210) - Curb Inlet Type 1 (Left) with Round Bottom               |       |   |
| ÷- 🕞   | Index No. 425-020 (210) - Curb Inlet Type 1 (Left) with Rectangular Bottom         |       |   |

- c. *Structures tab*, expand **FDOT Drainage** to display the structures families.
- 3. Click **OK** to close the Network Parts List dialog box.
- 4. Save the *DRPRRD01.dwg* file

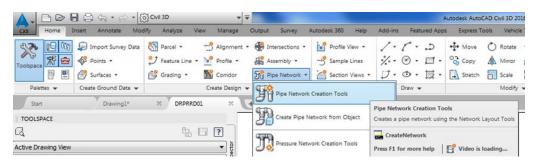
#### **Exercise 6.10** Create Pipe Network

The next steps will show you how to create a Pipe Network

#### > Pipe Network Creation Tools

The next steps will show you how to lay out a Pipe Network using the Pipe Network Creation Tools

1. From the *Home tab > Create Design panel >* Pipe Network drop down list, select **Pipe Network Creation Tools**.



- 2. From the Create Pipe Network dialog box set the following:
  - a. *Network name*: type **Proposed Drainage SR61** which replaces the existing text in the field.
  - b. Network parts list: from drop down list select FDOT Drainage.
  - c. *Surface name:* from drop down list select **SR61\_Final**.
  - d. Alignment name: from drop down list select SR61.
  - e. Structure label style: from drop down list select FDOT Structure-Plan.
  - f. Pipe label style: from drop down list select FDOT Drainage.

| Create Pipe Network         |
|-----------------------------|
| Network name:               |
| Proposed Drainage - SR61    |
| Network description:        |
|                             |
| Network parts list:         |
| 🖙 FDOT Drainage 🔹 📝 🔽       |
| Layers                      |
| Surface name:               |
| 🖉 SR61_Final 🔹 🕠            |
| Alignment name:             |
| 🗁 SR61 👻 💽                  |
| Structure label style:      |
| 🏹 FDOT Structure-Plan 🔹 🌄 🔍 |
| Pipe label style:           |
| 🐔 FDOT Drainage 🔹 🔽         |
| OK Cancel Help              |

3. Click **OK** to close the **Create Pipe Network** dialog box.

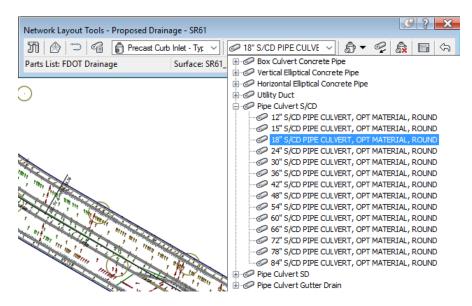
#### > Network Layout Tools

The Network Layout Tools toolbar displays after closing the Create Pipe Network dialog box.

**HINT** If you have difficulty finding it look at the upper left corner of Civil 3D. You can click and drag on the title bar of this toolbar to move it to a different position on your screen.

| Network Layout Tools - DRAIN - (2)   |
|--|
| Network Eayout Tools - Dicking - (2)   |
| 🕅 🗁 🖆 Null Structure 🗸 🧀 3'x 3' Box Culvert 🗸 🎒 🔻 🤗 🎰 🖽 🕤  |
| Parts List: FDOT Drainad : 10 Index No. 425-020 (210) - Curb Inlet Type 2 with Round Bottom  |
| Precast Curb Inlet - Type 2 (Edge ) with 42 in. Dia. Riser and 42 in. Dia. P Bottom 10 ft. or Less   |
| Precast Curb Inlet - Type 2 (Edge ) with 42 in. Dia. Riser and 48 in. Dia. P Bottom 10 ft. or Less   |
| Precast Curb Inlet - Type 2 (Edge ) with 42 in. Dia. Riser and 48 in. Dia. P Bottom 10 ft. or Less Precast Curb Inlet - Type 2 (Edge ) with 48 in. Dia. Riser and 48 in. Dia. P Bottom 10 ft. or Less    |
|  |
| Precast Curb Inlet - Type 2 (Edge ) with 42 in. Dia. Riser and 48 in. Dia. P Bottom Over 10 ft.  |
| Precast Curb Inlet - Type 2 (Edge ) with 42 in. Dia. Riser and 48 in. Dia. P Bottom Over 10 ft.<br>Precast Curb Inlet - Type 2 (Edge ) with 48 in. Dia. Riser and 48 in. Dia. P Bottom Over 10 ft.       |
|  |
| 👸 Precast Curb Inlet - Type 2 ( Edge ) with 48 in. Dia. Riser and 60 in. Dia. J Bottom 10 ft. or Less  |
| Precast Curb Inlet - Type 2 (Edge ) with 42 in. Dia. Riser and 72 in. Dia. J Bottom 10 ft. or Less   |
| Precast Curb Inlet - Type 2 (Edge ) with 48 in. Dia. Riser and 72 in. Dia. J Bottom 10 ft. or Less   |
| Precast Curb Inlet - Type 2 (Edge ) with 48 in. Dia. Riser and 72 in. Dia. J Bottom 10 ft. or Less Precast Curb Inlet - Type 2 (Edge ) with 42 in. Dia. Riser and 84 in. Dia. J Bottom 10 ft. or Less    |
| Precast Curb Inlet - Type 2 (Edge ) with 48 in. Dia. Riser and 84 in. Dia. J Bottom 10 ft. or Less   |
| Frecast Curb Inlet - Type 2 (Edge ) with 42 in. Dia. Riser and 96 in. Dia. J Bottom 10 ft. or Less   |
| Precast Curb Inlet - Type 2 (Edge ) with 42 in. Dia. Riser and 96 in. Dia. J Bottom 10 ft. or Less<br>Precast Curb Inlet - Type 2 (Edge ) with 48 in. Dia. Riser and 96 in. Dia. J Bottom 10 ft. or Less |
| Precast Curb Inlet - Type 2 (Edge ) with 42 in. Dia. Riser and 120 in. Dia. J Bottom 10 ft. or Less  |
| Precast Curb Inlet - Type 2 (Edge ) with 48 in. Dia. Riser and 120 in. Dia. J Bottom 10 ft. or Less  |
| Precast Curb Inlet - Type 2 (Edge ) with 42 in. Dia. Riser and 120 in. Dia. J Bottom 10 ft. or Less  |
| i i i i i i i i i i i i i i i i i i i  |

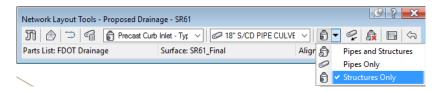
The Network Layout Tools toolbar drop down list for structures is set to *Null Structure*. From the drop down list display the structure part families. Expand the *Index No. 425-020 (210) – Curb Inlet Type 2 with Round Bottom* family and select Precast Curb Inlet – Type 2 (Edge) with 48 in. Dia. Riser and 48 in. Dia. P Bottom 10 ft. or Less.



2. The Network Layout Tools toolbar drop down list for Pipes, expand *Pipe Culvert S/CD* and choose *18"S/CD PIPE CULVERT, OPT MATERIAL ROUND*.

#### > Adding Structures Only

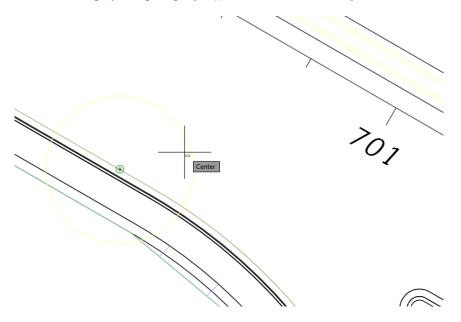
The next steps will show you how to place *Structures Only* using the FDOT Structures Rule Set.



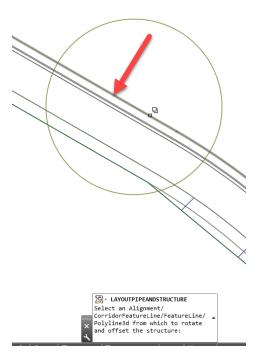
1. From the Network Layout Tools toolbar > *Pipes and Structures* drop down list, select **Structures Only**. When laying out structures the direction of flow does matter. Flow direction will be set when the pipes are added to connect the structures.

💯 - LAYOUTPIPEANDSTRUCTURE Specify the structure insertion point:

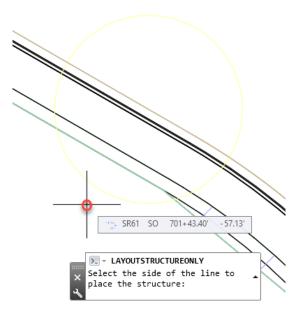
- 2. Zoom in to the Circle South West of station 701.
- 3. Command line displays the prompt *Specify the structure insertion point*.



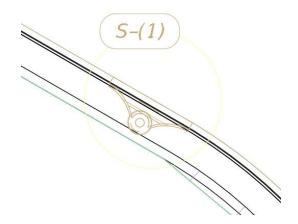
4. In the drawing as displayed above, use a **Center Object Snap** to snap to the center of the circle representing the position of the first inlet. These circles were inserted into the DRMPRD01 file as an aid when you were deciding where the inlets should be placed.



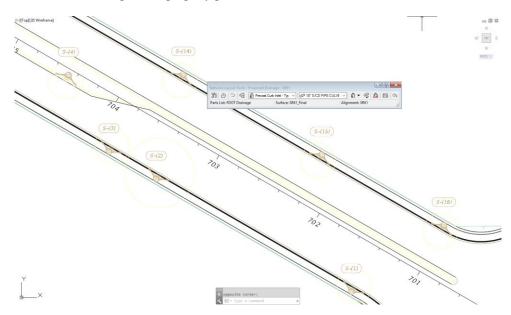
5. When prompted to *Select an Alignment/CorridorFeatureline/Featureline/Polyline3D from which to rotate and offset the structure*, select the Pavement Asphalt feature line.



6. When prompted to *Select the side of the line to place the structure:* click south of the feature line. This is the side you want the structure to offset to.

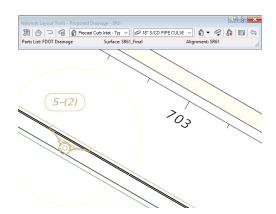


7. You should end up with a property placed structure Offset and Rotated to the feature line.

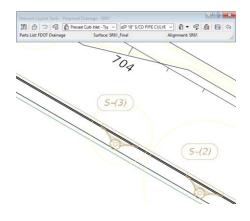


8. Continue placing structures at each circle. Place the new structures going in order starting after the S-(1) structure: going up the left side below the SR61 centerline, then going down the right side above the SR61 centerline ending with the new S-(16) structure placement.

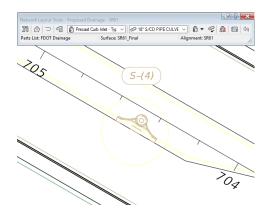
Notice the structure labels containing the name of the structure (i.e. S-(1)) are created as each structure is placed.



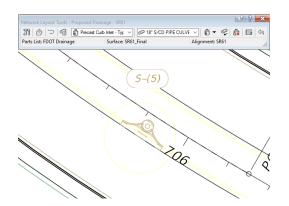
9. Zoom and Pan to display the location of the next *structure* S-(2). Use a Center Object Snap to snap to the center of the circle representing the new position of structure S-(2) then select the feature line finally click on the side to offset the structure to.



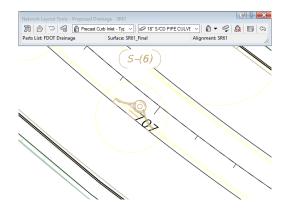
10. **Zoom** and **Pan** to display the location of the next *structure* **S**-(3). Use a Center Object Snap to snap to the center of the circle representing the new position of structure S-(3) then select the feature line finally click on the side to offset the structure to.



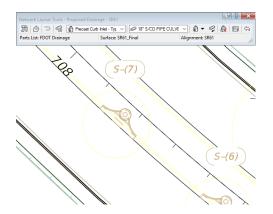
11. **Zoom** and **Pan** to display the location of the next *structure* **S**-(**4**). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(**4**) then select the feature line finally click on the side to offset the structure to.



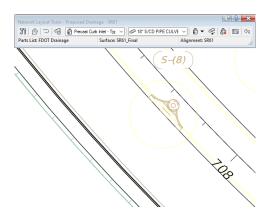
12. Zoom and Pan to display the location of the next *structure* **S**-(**5**). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(**5**) then select the feature line finally click on the side to offset the structure to.



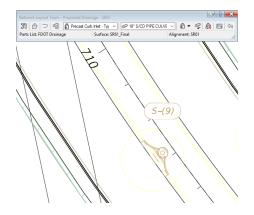
13. **Zoom** and **Pan** to display the location of the next *structure* **S**-(**6**). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(**6**) then select the feature line finally click on the side to offset the structure to.



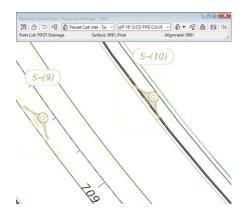
14. **Zoom** and **Pan** to display the location of the next *structure* **S**-(7). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(7) then select the feature line finally click on the side to offset the structure to.



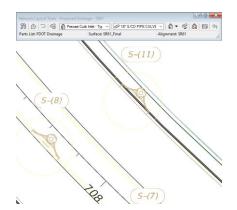
15. **Zoom** and **Pan** to display the location of the next *structure* **S**-(8). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(8) then select the feature line finally click on the side to offset the structure to.



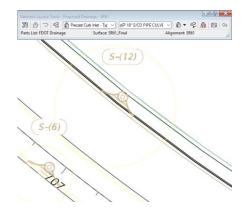
16. **Zoom** and **Pan** to display the location of the next *structure* **S**-(9). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(9) then select the feature line finally click on the side to offset the structure to.



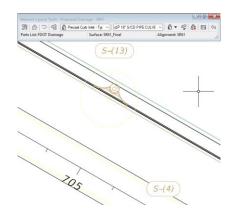
17. **Zoom** and **Pan** to display the location of the next *structure* **S**-(10). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(10) then select the feature line finally click on the side to offset the structure to.



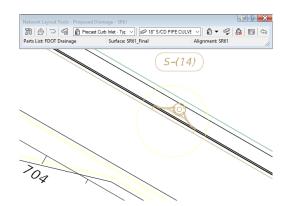
18. **Zoom** and **Pan** to display the location of the next *structure* **S**-(11). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(11) then select the feature line finally click on the side to offset the structure to.



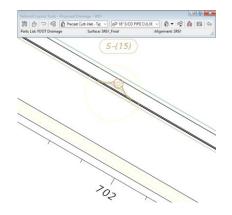
19. **Zoom** and **Pan** to display the location of the next *structure* **S**-(12). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(12) then select the feature line finally click on the side to offset the structure to.



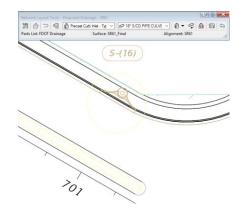
20. **Zoom** and **Pan** to display the location of the next *structure* **S**-(13). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(13) then select the feature line finally click on the side to offset the structure to.



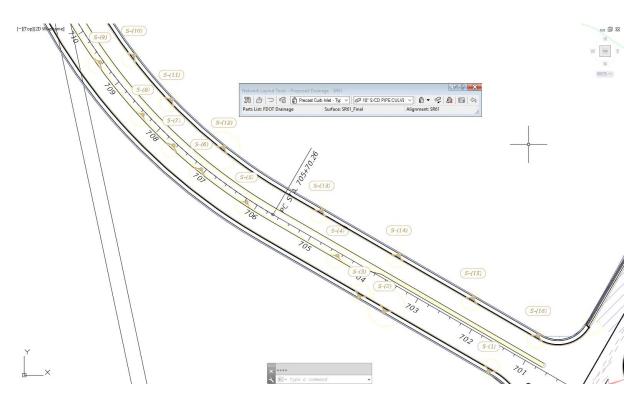
21. **Zoom** and **Pan** to display the location of the next *structure* **S**-(14). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(14) then select the feature line finally click on the side to offset the structure to.



22. **Zoom** and **Pan** to display the location of the next *structure* **S**-(15). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(15) then select the feature line finally click on the side to offset the structure to.



- 23. **Zoom** and **Pan** to display the location of the next *structure* **S**-(16). Use a Center Object Snap to snap to the center of the circle representing the new position of *structure* **S**-(16) then select the feature line finally click on the side to offset the structure to.
- 24. Press the **ENTER** key when done to end the command.



- 25. Zoom and Pan to display the newly placed structure inlets for the Proposed Drainage SR61 Pipe Network.
- 26. Save the DRPRRD01.dwg file before continuing.

#### **Exercise 6.11** Add Pipes Only to Structures

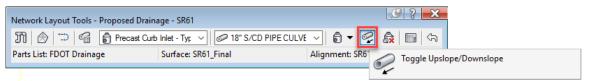
The next steps will show you how to add only Pipes to Structures.

The next steps you will create pipes that connect to structures. The table below can be used to assign the Pipe name as it relates to the starting Structure name. You will see how the order affects flow direction.

|     | PIPE TABLE |           |            |                         |                |                    |  |
|-----|------------|-----------|------------|-------------------------|----------------|--------------------|--|
| QTY | STRT<br>#  | NAME#     | SIDE       | DESCRIPTION             | SIZE<br>INCHES | LENGTH             |  |
| 1   | S-(1)      | PIPE-(1)  | -37.83 Lt. | 18" Round Concrete Pipe | 18.0"          | 194.35             |  |
| 1   | S-(2)      | PIPE-(2)  | -39.51 Lt. | 18" Round Concrete Pipe | 18.0"          | 47.17              |  |
| 1   | S-(3)      | PIPE-(3)  | -37.99 Lt. | 18" Round Concrete Pipe | 18.0"          | 67.75              |  |
| 1   | S-(4)      | PIPE-(4)  | -13.34 Lt. | 18" Round Concrete Pipe | 18.0"          | 77.97'             |  |
| 1   | S-(13)     | PIPE-(5)  | 38.23 Rt.  | 18" Round Concrete Pipe | 18.0"          | 188.61'            |  |
| 1   | S-(12)     | PIPE-(6)  | 38.66 Rt.  | 18" Round Concrete Pipe | 18.0"          | 97.28 <sup>,</sup> |  |
| 1   | S-(5)      | PIPE-(7)  | -10.68 Lt. | 18" Round Concrete Pipe | 18.0"          | 87.53'             |  |
| 1   | S-(6)      | PIPE-(8)  | -11.47 Lt. | 18" Round Concrete Pipe | 18.0"          | 50.65              |  |
| 1   | S-(10)     | PIPE-(9)  | 37.60 Rt.  | 18" Round Concrete Pipe | 18.0"          | 94.15              |  |
| 1   | S-(11)     | PIPE-(10) | 38.49 Rt.  | 18" Round Concrete Pipe | 18.0"          | 115.21'            |  |
| 1   | S-(9)      | PIPE-(11) | -15.37 Lt. | 18" Round Concrete Pipe | 18.0"          | 110.26'            |  |
| 1   | S-(8)      | PIPE-(12) | -13.33 Lt. | 18" Round Concrete Pipe | 18.0"          | 70.76'             |  |
| 1   | S-(7)      | PIPE-(13) | -13.55 Lt. | 18" Round Concrete Pipe | 18.0"          | 59.58              |  |
| 1   | S-(16)     | PIPE-(14) | 38.18 Rt.  | 18" Round Concrete Pipe | 18.0"          | 121.55             |  |
| 1   | S-(15)     | PIPE-(15) | 37.87 Rt.  | 18" Round Concrete Pipe | 18.0"          | 138.01'            |  |
| 1   | S-(14)     | PIPE-(16) | 38.47 Rt.  | 18" Round Concrete Pipe | 18.0"          | 144.03             |  |

#### > Setting Pipe Flow Direction

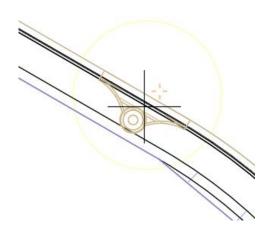
The next steps will show you how to set the Pipe Flow Direction



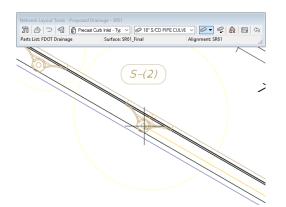
- 1. From the Network Layout Tools Proposed Drainage SR61 toolbar click on the Toggle Upslope/Downslope button until the arrow points down.
- > Add pipes to structures S-(1), S-(2), S-(3), S-(4), S-(13), S-(12) & the Pond area



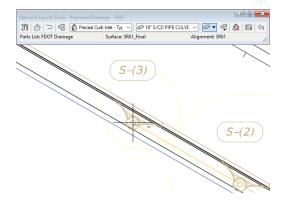
- 1. From the Network Layout Tools Proposed Drainage SR61 toolbar> *Pipes and Structures* drop down list, select the **Pipes Only** command.
- 2. Turn OSNAP **Off** (Use the F3 key).
- 3. On the command line you are prompted to *Specify first pipe point:* Add pipes to the following *structures* S-(1), S-(2), S-(3), S-(4), S-(13), S-(12) and the Pond area in that order.



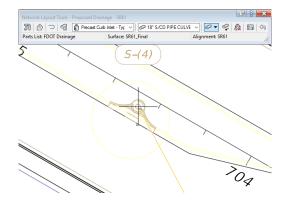
- 4. Zoom and Pan to display *structure* S-(1). Hovering over *structure* S-(1) you see a glyph indicating the pipe will connect with that structure. Click the *structure* S-(1) while the glyph displays.
- 5. The command line now prompts you to: Specify next pipe point.



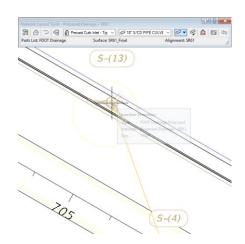
6. **Zoom** and **Pan** to display structure S-(2). Continue by clicking the structure S-(2) when the glyph appears as you hover over structure S-(2).



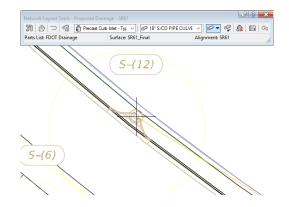
7. Zoom and Pan to display *structure* S-(3). Continue by clicking the *structure* S-(3) when the glyph appears as you hover over *structure* S-(3).



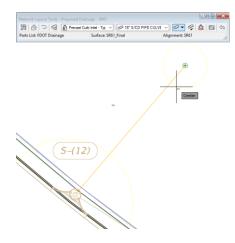
8. Zoom and Pan to display *structure* S-(4). Continue by clicking the *structure* S-(4) when the glyph appears as you hover over *structure* S-(4).



9. Zoom and Pan to display *structure* S-(13). Continue by clicking the *structure* S-(13) when the glyph appears as you hover over *structure* S-(13).



10. Zoom and Pan to display *structure* S-(12). Continue by clicking the *structure* S-(12) when the glyph appears as you hover over *structure* S-(12).



- 11. Continue by clicking in the **Pond** area where there is no structure. Use a **Center Object Snap** to snap to the center of the circle to locate the end of the Outfall pipe.
- 12. Press the **ENTER** key to end the command.



13. Pipe labels display between *structures* S-(1), S-(2), S-(3), S-(4), S-(13), S-(12) and the proposed *Pond Area*.

### > Add pipes to the following structures S-(5), S-(6), and S-(12)

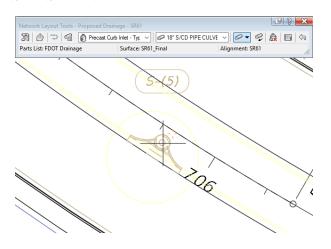
The next steps will show you how to add pipes to the following structures S-(5), S-(6), and S-(12)



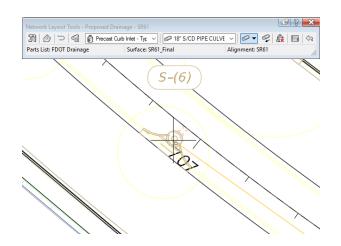
1. From the Network Layout Tools - Proposed Drainage - SR61 toolbar select the Pipes Only command.

```
E - LAYOUTPIPEONLY Specify first pipe point:
```

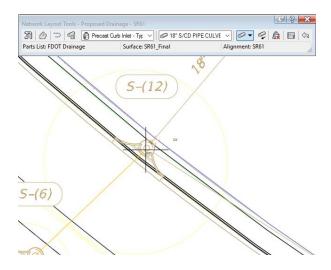
2. On the *command line* you are prompted to: *Specify first pipe point:* Add pipes to the following *structures* **S**-(**5**), **S**-(**6**), and **S**-(**12**) in that order.



3. **Zoom** and **Pan** to display **structure S-(5)**. Continue by clicking the structure S-(5) when the glyph appears as you hover over structure S-(5).



4. **Zoom** and **Pan** to display **structure S-(6)**. Continue by clicking the structure S-(6) when the glyph appears as you hover over structure S-(6).



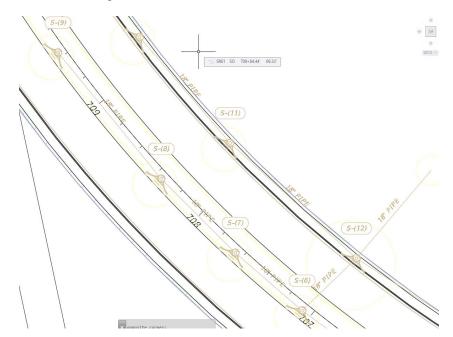
5. Zoom and Pan to display structure S-(12). Continue by clicking the structure S-(12) when the glyph appears as you hover over structure S-(12).





*Note* Press the ENTER key to end the command. Pipe labels display between *structures* S-(5), S-(6), and S-(12).

6. Add **Pipes** to the following *structures* **S**-(10), **S**-(11), and **S**-(12). Press **ENTER** key to end the command when complete.



7. Using the above process add pipes to the following *structures* **S-(9)**, **S-(8)**, **S-(7)**, and **S-(6)** in that order. Press **ENTER** key to end the command when complete.



- 8. )Using the above process add pipes to the following *structures* S-(16), S-(15), S-(14), and S-(13) in that order. Press ENTER key to end the command when complete.
- 9. Zoom and Pan to display the completed Proposed Drainage SR61 Pipe Network.



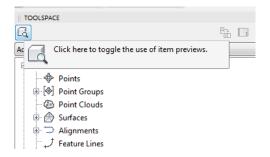
- 10. From the Network Layout Tools Proposed Drainage SR61 toolbar, click on the red X to close the toolbar.
- *HINT* You can also close the Network Layout Tools by pressing Enter twice. To bring back the Toolbar: select a placed part > Right Click > Edit Network.

### **Exercise 6.12** Display Pipe Network Preview

The next steps will show you how to display a Pipe Network Preview

### > Toggle on the use of item previews

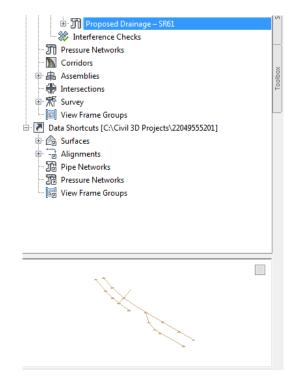
The next steps will show you how to toggle on the use of item previews



1. From the TOOLSPACE click the icon located in the upper left to toggle **On** the use of Item Previews.

| TOOLSPACE           |                                     |
|---------------------|-------------------------------------|
| G                   |                                     |
| Active Drawing View | •                                   |
| DRPRRD01            |                                     |
| Points              |                                     |
| 🖶 🔄 Point Groups    |                                     |
| - 🐵 Point Clouds    |                                     |
| 🖽 💮 Surfaces        |                                     |
| 🗄 🗇 Alignments      |                                     |
| ープ Feature Lines    |                                     |
| 🚮 Sites             |                                     |
| - 🚱 Catchments      |                                     |
| 🖃 🎢 Pipe Networks   |                                     |
| 🕀 🎢 Networ          | Create Pipe Network by Layout       |
| 🛛 😻 Interfere       | Create Pipe Network from Object     |
| - 🎢 Pressure Ne     | Create Pipe Network from Object     |
| Corridors           | Create Alignment from Network Parts |
|                     | Edit Pipe Network                   |
| Thtersection        |                                     |
| ⊞ 🛣 Survey          | <ul> <li>Show Preview</li> </ul>    |
| 🔤 View Frame        | Export to Storm Sewers              |

2. From the *TOOLSPACE* > *Prospector tab*, expand **Pipe Networks**, right-click on **Networks**, and select **Show Preview...** 



- 3. From the *TOOLSPACE > Prospector tab*, expand **Pipe Networks**, expand **Networks** then select **Proposed Drainage SR61** to display in the tool space Preview Window along the bottom.
- 4. Save and Close the *DRPRRD01.dwg* file.

# **7** ALIGNMENTS & PROFILE VIEWS OF NETWORK PARTS

# DESCRIPTION

In this chapter, you will create alignments using pipe network parts in Plan View, then display the pipe network parts in profile views, edit pipe invert elevations, and edit a pipe style

# **OBJECTIVES**

In this chapter, you will learn about:

- Creating Alignments from Network Parts
- Adding Pipe Network Parts to Profile Views
- Editing Pipe Invert Elevations
- Editing a Pipe Style

# **CHAPTER SETUP**

Run the Chapter 7 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

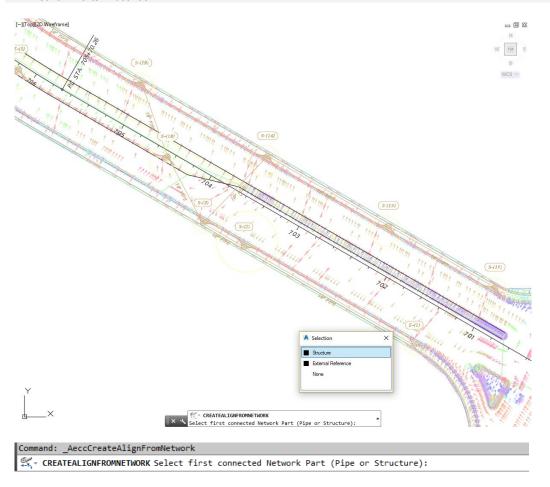
### **Exercise 7.1** Create an Alignment and Profile View from Network Parts

To generate profile views of the network parts you first create alignments. The next steps will show you how to do both from the wizards that are available.

1. Start the FDOT Civil 3D State Kit and open the *DRPRRD01.dwg* located in the Chapter 7 dataset drainage folder.

| ▲ - 🖻 🗁 🖥 🚔 <\-> + 🛱 CMI 3D  | <b>▼</b> /                          | -   | Autodesk AutoCAD Civil 3     |
|--|-------------------------------------|---|------------------------------|
| C3D Home Insert Annotate Modify Analyze Vi   | ew Manage Output Survey Au          | utodesk 360 Help Add-ins Featured App             | s Express Tools Vehic        |
| State of the second sec | 📑 Alignment 🔹 🏪 Intersections 🔹     | Profile View + 🗸 + 🌈 + 💭                          | + Move 🖒 Rotate              |
| Toolspace  | Alignment Creation Tools            | mple Lines 🕺 🗸 🐨 🖛 🖬 🔹                            | <sup>O</sup> ∂ Copy ⊿ Mirror |
| 📑 🗐 🖉 Surfaces 🔹 💕 Grading 👻   | -12 -                               | ction Views 🔹 💭 🔹 💿 🔹 🔜 🔹                         | 🗐 Stretch 📄 Scale            |
| Palettes 👻 Create Ground Data 👻  | Create Best Fit Alignment           | . Section Views Draw 🔫                            | Modify                       |
| Start DRPRRD01* × +  | 32                                  |   |                              |
| TOOLSPACE  | Create Alignment from Objects       | (S-(T))   | 5-(12)                       |
| ۲. Ca  | Create Alignment from Corridor      |   |                              |
| Active Drawing View  |                                     |   |                              |
| P DRPRRD01   | Create Alignment from Network Par   | rts   |                              |
| Points   |                                     | Create Alignment from Network Parts               |                              |
| ● [�] Point Groups   | Create Alignment from Pressure Ne   | Creates an alignment from connected pipe netwo    | ork parts                    |
| Point Clouds   | Create Alignment from Existing Alig | You can also automatically create a profile and/o | r profile view showing the   |
|  |                                     | parts when you create the alignment.              | prome view showing the       |
| Feature Lines  | Create Offset Alignment             | CreateAlignFromNetwork                            |                              |
|  |                                     | Press F1 for more help                            |                              |
| - 📴 Catchments   | Create Widening                     |   | ~                            |
| 🐵 🎢 Pipe Networks  | •                                   |   |                              |

2. From the *Home tab* > *Create Design panel* > *Alignment drop down list*, select **Create Alignment from Network Parts**.



*HINT* When using this command click the first and last Network Part and the command will connect all the Network Parts in between.

- 3. From the *command line* you are prompted to: *Select first connected Network Part (Pipe or Structure):* **Zoom** and **Pan** to the area of *structure* **S**-(1), and select *structure* **S**-(1).
- 4. With selection cycling toggled **On**, a Selection dialog box displays. From the Selection dialog box select **Structure**.

|                   | $\sum$ |
|-------------------|--------|
| 5-(12) 1.8 PIPE . | 7      |
|                   |        |
| Re Paper          |        |

From the *command line* you are now prompted to: Select next Network Part: Zoom and Pan to the area of structure S-(12), select Pipe-(6) the outgoing pipe which we refer to as the Outfall pipe. (Where the pipe empties into the proposed Drainage Pond.) Press ENTER.

*Note* Structures S-(1), S-(2), S-(3), S-(4), S-(13), S-(12), and the outfall pipe PIPE-(6) form the alignment geometry because they are connected.

| Create Alignment - From Pipe Network |
|--------------------------------------|
| Site:                                |
| None> 🔹 🚺                            |
| Name:                                |
| S-1 <[Pipe Network Name(CP)] >       |
| Type:                                |
| Till Miscellaneous 🔻                 |
| Description:                         |
| A                                    |
| <b>~</b>                             |
| Starting station: 0+00.00'           |
| Alignment style:                     |
| FDOT Proposed 🔹 💽 🗖                  |
| Alignment layer:                     |
| CLConst_dp                           |
| Alignment label set:                 |
|                                      |
| Create profile and profile view      |
| OK Cancel Help                       |

- 6. From the Create Alignment From Pipe Network dialog box:
  - a. Set *Name:* to S-1 <[Pipe Network Name(CP)]>
  - b. Set *Alignment style:* from drop down list select \_No Labels.
  - c. Check Create profile and profile view box to enable.
  - d. Leave all other settings unchanged.
  - e. Click OK to close the Create Alignment From Pipe Network dialog box.

| lignment:<br>S-1 Proposed                       | Drainage - SR | 61      | ~        |        | elect surfaces: |     |       |                  | 1            |
|---|---------------|---------|----------|--------|-----------------|-----|-------|------------------|--------------|
| Station range                                   |               |         |          |        |                 |     |       |                  |              |
| Alignment:                                      |               |         |          |        |                 |     |       |                  |              |
| Start:  |               | End:    |          |        |                 |     |       |                  |              |
| 0+00.00'  |               | 6+57.67 |          |        |                 |     |       |                  |              |
| To sample:                                      |               |         |          |        |                 |     |       |                  |              |
|   |               | 6+57.6  | 7        | -<br>2 |                 |     |       |                  |              |
| 0+00.00'  | -13           | 0+37.0  | /        | -h8    |                 |     |       |                  |              |
| 0+00.00   | -12           | 0+37.0  | /        |        | Sample offse    | te: |       |                  |              |
| 0+00.00   | [81           | 0+37.0  |          |        | Sample offse    | ts: |       |                  | 4.1.1. x     |
| 0+00.00   |               | 6+57.6  |          |        | ] Sample offse  | ts: |       |                  | Add>>        |
|   |               | 0+37.0  | <u> </u> |        | ] Sample offse  | ts: |       |                  | Add>>        |
| ofile list:                                     |               |         |          |        |                 |     | Style | Station          | Add>>        |
| ofile list:                                     | Description   |         | Data Sou |        | Sample offse    |     | Style |                  | Add>><br>End |
| ofile list:                                     |               |         |          | Offset |                 |     | Style | Station<br>Start |              |
| ofile list:                                     |               |         | Data Sou | Offset | Update          |     |       | Station<br>Start | End          |
| ofile list:                                     |               |         | Data Sou | Offset | Update          |     |       | Station<br>Start | End          |
| ofile list:                                     |               |         | Data Sou | Offset | Update          |     |       | Station<br>Start | End          |
| ofile list:                                     |               |         | Data Sou | Offset | Update          |     |       | Station<br>Start | End          |
| 0+00.00<br>ofile list:<br>lame<br>R61_Final (1) |               |         | Data Sou | Offset | Update          |     |       | Station<br>Start | End          |

- 7. The Create Profile from Surface dialog box opens. Set *Alignment:* from drop down list select S-1 **Proposed Drainage SR61**.
  - a. Select surfaces: highlight SR61\_Final.
  - b. Click the **Add** button (found on the middle right side). Profile list: populates with the newly defined surface profile content.
- 8. Click the **Draw in profile view** button at the bottom of this dialog box. This will launch the **Create** Profile View wizard.
- 9. In the **Create Profile View** wizard visit each panel in the Create Profile View wizard setting the values as instructed then click the **Next** button to continue to the next panel in the wizard. The blue links on the left side display an arrow next to the current panel title being displayed.

| Create Profile View - General |  | ×    |
|-------------------------------|--|------|
| General                       | Select alignment:  |      |
| Station Range                 | S-1 Proposed Drainage - SR61   |      |
| Profile View Height           | Profile view name:<br><[Parent Alignment]><[Profile View Station Range]> |      |
| Profile Display Options       | Description:   |      |
| Pipe/Pressure Network         |  |      |
| Data Bands                    | Profile view style:  |      |
| Profile Hatch Options         | kan FDOT 40 Horz x 4 Vert Scale 10x GRID ON ▼                            |      |
|                               | Tables   |      |
|                               | Show offset profiles by vertically stacking profile views                |      |
|                               | show onset profiles by vertically stacking profile views                 |      |
|                               | < Back Next > Create Profile View Cancel                                 | Help |

a. *General panel:* from the *Profile view style*: drop down list select **FDOT 40 Horz x Vert Scale 10x GRID ON**, then click the **Next** > button.

| Create Profile View - Station Rang | e                      |                      |                       |
|------------------------------------|------------------------|----------------------|-----------------------|
| General                            | Station range          |                      |                       |
| Station Range Profile View Height  | Automatic              | Start:<br>0+00.00'   | End:<br>6+59.11'      |
| Profile Display Options            | O User specified range | 0+00.00'             | 6+59.11'              |
| Pipe/Pressure Network Data Bands   |                        |                      |                       |
| Profile Hatch Options              |                        |                      |                       |
|                                    |                        |                      |                       |
|                                    |                        |                      |                       |
|                                    | < Bai                  | ck Next > Create Pro | file View Cancel Help |

b. *Station Range panel:* leave as default, then click the **Next** > button.

| General                     | Profile view height                        | Minimum:             | Maximum:        |   |
|-----------------------------|--|----------------------|-----------------|---|
| Station Range               | Automatic                                  | 29.56'               | 33.62'          |   |
| Profile View Height         | O User specified                           | 28.00'               | 36.00'          |   |
| Profile Display Options     | Split profile view                         |                      |                 |   |
| Pipe/Pressure Network       | First split view style:                    |                      | Split station:  |   |
| Data Bands                  | FDOT 40 Horz x 4                           | Vert Scale 10x 🔽 🏹 🗐 | Exact station   | - |
| and the state of the second | Intermediate split view s                  |                      | Datum option:   |   |
| Profile Hatch Options       | FDOT 40 Horz x 4                           | Vert Scale 10x 🔻 🌄 💌 | Exact elevation | Ψ |
|                             | Last split view style:<br>FDOT 40 Horz x 4 | Vert Scale 10x 💌 📝 🔻 | E,              |   |
|                             |  |                      |                 |   |

c. *Profile View Height panel:* leave as default, then click the **Next** > button.

| 🔥 Create Profile View - Profile Displa | y Options    | 1             |           |          |             |             |            |        |         | x |
|--|--------------|---------------|-----------|----------|-------------|-------------|------------|--------|---------|---|
| General                                | Specify prof | ile display ( | options:  |          |             |             |            |        |         |   |
| Station Range                          | Name         | Draw          | Clip Grid | Split At | Description | Туре        | Data Sou   | Offset | Update  | L |
| Profile View Height                    | SR61_Fi      |               | ۲         | ۲        |             | M           | SR61_Final | 0.00'  | Dynamic |   |
| Profile Display Options                |              |               |           |          |             |             |            |        |         |   |
| Pipe/Pressure Network                  |              |               |           |          |             |             |            |        |         |   |
| Data Bands                             |              |               |           |          |             |             |            |        |         |   |
| Profile Hatch Options                  |              |               |           |          |             |             |            |        |         |   |
|  |              |               |           |          |             |             |            |        |         |   |
|  |              |               |           |          |             |             |            |        |         |   |
|  |              |               |           |          |             |             |            |        |         |   |
|  |              |               |           |          |             |             |            |        |         |   |
|  | •            |               |           |          |             |             |            |        |         | • |
|  |              |               |           |          |             |             |            |        |         | _ |
|  |              |               | < Back    | Next     | > Cre       | ate Profile | View       | Cancel | Help    |   |

d. *Profile Display Options panel:* leave as default, click the **Next** > button.

| Create Profile View - Pipe/Pressur | e Network  |                                 | X |
|------------------------------------|--|---------------------------------|---|
| General                            | Select parts from screen                         |                                 |   |
| Station Range                      | Select networks to draw in profile view:         |                                 |   |
|                                    | Name   | Select                          | T |
| Profile View Height                | Proposed Drainage - SR61                         |                                 |   |
| Profile Display Options            |  | Ves Ves                         | 1 |
|                                    | • • • • • • • • • • • • • • • • • • •            | Ves Yes                         |   |
| Pipe/Pressure Network              | - PIPE-(3)                                       | Ves Yes                         |   |
| Data Bands                         | • • • • • • • • • • • • • • • • • • •            | Ves Yes                         |   |
|                                    | • • • • • • • • • • • • • • • • • • •            | Ves Yes                         |   |
| Profile Hatch Options              | PIPE-(6)   | Ves Yes                         |   |
|                                    | <b>S</b> -(1)                                    | Ves Yes                         |   |
|                                    | - 👸 S-(3)  | Ves Yes                         |   |
|                                    | <b>S</b> -(4)                                    | Ves Ves                         |   |
|                                    | <b>S</b> -(2)                                    | Ves Yes                         |   |
|                                    | 🖨 S-(13)   | Ves Ves                         |   |
|                                    | 🛱 S-(12)   | Ves Ves                         |   |
|                                    | Show only parts selected to draw in profile view | N                               | 1 |
|                                    | < Back Next >                                    | Create Profile View Cancel Help |   |

- e. *Pipe/Pressure Network panel*: lists the pipes and structures to be displayed in the profile view.
  - Select column keep all the checkbox's checked.
  - Keep checked the Show only parts selected to draw in profile view box.
  - Click the **Next** > button.

| A Create Profile View - Data Bands   |   |
|--|---|
| General<br>Station Range<br>Profile View Height<br>Profile Display Options<br>Pipe/Pressure Network<br>Data Bands<br>Profile Hatch Options | Select band set:<br>FDOT 10x VExagg Stations  |
|  | Band Type       Style       Profile 1       Profile 2       Alignment       Geometry Points         Profile Data       FDOT 10x VExce SR61_Final (1)       SR61_Final (1)       S-1 Proposed       •••          SR61_Final (1)       SR61_Final (1)       Sr61_Final (1)       S-1 Proposed       •••           SR61_Final (1)       Sr61_Final (1)       Sr61_Final (1)       S-1 Proposed       ••• |

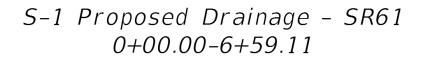
f. Data Bands panel: from the Select band set: drop down list, select FDOT 10x VExagg **Stations** style, then click the **Next** > button.

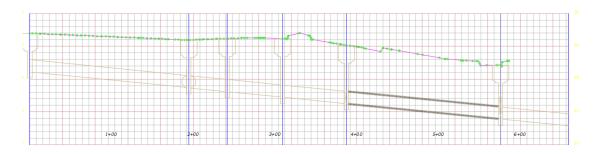
| General                 | Cut Area:            |            | 2 ×     |             |
|-------------------------|----------------------|------------|---------|-------------|
| Station Range           |                      | Hatch Area | Profile | Shape Style |
| Profile View Height     |                      |            |         |             |
| Profile view Height     |                      |            |         |             |
| Profile Display Options | Fill Area:           |            |         |             |
| Pipe/Pressure Network   |                      |            |         |             |
| Data Bands              |                      |            |         |             |
| Data banus              |                      |            |         |             |
| Profile Hatch Options   | Multiple boundaries: |            |         |             |
|                         |                      |            |         |             |
|                         |                      |            |         |             |
|                         | From criteria:       |            |         |             |
|                         | Troil chiena.        |            |         |             |
|                         | Import               |            |         |             |
|                         |                      |            |         |             |
|                         |                      |            |         |             |
|                         |                      |            |         |             |

- g. Profile Hatch Options panel: leave as default.
- 10. Click the Create Profile View button.



In Model space pick the *insertion point* for the S-1 Proposed Drainage - SR61 Profile View. The insertion point is the lower left corner of the Profile View grid. Place the S-1 Proposed Drainage - SR61 Profile View above the SR61 Profile View. Your drawing should look like the above image.





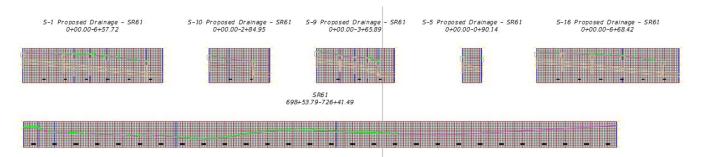
- 12. **Zoom** in to display **S-1 Proposed Drainage SR61 Profile View**. The SR61 Surface Profile and the Proposed Drainage SR61 Pipe Network objects for the S-1 Proposed Drainage SR61 alignment are displayed in the S-1 Proposed Drainage SR61 Profile View.
- 13. Save the file before continuing.

### > Create an Alignment & Profile View for the Following Network Parts

Using steps above, create an alignment along with a profile view and place them in model space for the following Network Parts. Save the file after each Profile View is placed.

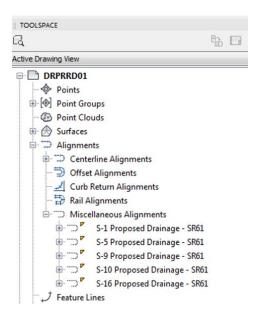
| Alignment Path                  | Parts Included                                       |
|---------------------------------|--|
| From S-(10) to Outfall Pipe (6) | S-(10), S-(11), S-(12), Outfall Pipe (6)             |
| From S-(9) to Outlet Pipe (6)   | S-(9), S-(8), S-(7), S-(6), S-(12), Outfall Pipe (6) |
| From S-(5) to S-(6)             | S-(5), S-(6)   |
| From S-(16) to Outfall Pipe (6) | S-(16), S-(15), S-(14), S-(12), Outlet Pipe (6)      |

The drawing should look like the image below:



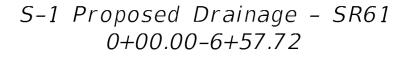
### > Review Miscellaneous Alignments

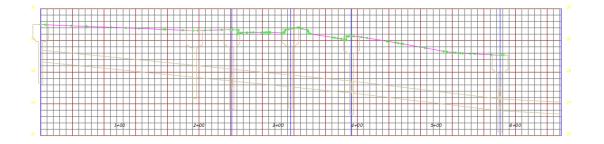
Looking in Prospector under the Misc. Alignments you can see the list of Alignments that were just created. You can also expand the list to see the profiles that you created.



### **Exercise 7.2** Modify the Pipe Style for FDOT the Drainage Style

The next steps will show you how to modify the Pipe Style for the FDOT Drainage style.





- 1. Zoom and Pan to display the S-1 Proposed Drainage SR61 Profile View.
- 2. The semi-circles that appear next to each structure in the Profile View can be turned **Off** in the Pipe style.
- 3. In the S-1 Proposed Drainage SR61 Profile View select PIPE-(1).
- 4. With *selection cycling* toggled **On**, a **Selection** dialog box displays. From the **Selection** dialog box select **Pipe or Structure Profile**. The context sensitive ribbon displays a **Pipe Network Proposed Drainage SR61** tab.

| Home Stuart                   | Annotate Modily | Araba           | View Marta                               | o Output S | Autorianik 1                                 | 160 Help Add-Ins                     | Featured   | Anne Ean                 | mess Tools : Ve       | Hick Trackle | ng Bridge Model | er Geoloca | ation Pice Netwo                   | rks: Proposed Drainage - 58 |
|-------------------------------|-----------------|-----------------|--|------------|--|--------------------------------------|------------|--------------------------|-----------------------|--------------|-----------------|------------|------------------------------------|-----------------------------|
| Add Add Reset<br>abels Tables | Properties      | Station Network | 6  | 52/21      | Connect Part<br>Connect Part<br>Connect Part | SB Spit Network<br>SB Marge Networks | Parts List | Draw Parts<br>in Profile | Siterference<br>Check |              | K               | K          | Storm Severs  Hydrographs  Sopress |                             |
| Labels & Tables               | General Tools 👻 |                 | Por Poper                                | Modity -   | *  |                                      | Netopr     | t Tools                  |                       | Analyze      |                 | Les        | unch Pad                           |                             |
| Start                         | Drawing1*       | 21 D            | C. C | +          |  |                                      |            |                          |                       |              |                 |            |                                    |                             |
| TOOLSPACE                     |                 | -               | Edit Pipe St                             |            |  |                                      |            |                          |                       |              |                 |            |                                    |                             |

5. From the *Modify panel* > *Pipe Properties* dropdown, select **Edit Pipe Style**.

| /iew Direction:<br>Plan    |        |              |         |           |          |            |            |  |
|----------------------------|--------|--------------|---------|-----------|----------|------------|------------|--|
| Plan<br>Plan               |        | _            |         |           |          |            |            |  |
| Model                      |        |              |         |           |          |            |            |  |
| Profile                    |        | Layer        | Color   | Linetype  | LT Scale | Lineweight | Plot Style |  |
| Section<br>Pipe Centerline | V      | PipeCulvert  | BYLAYER | R ByLayer | 1        | ByLayer    | ByBlock    |  |
| Inside Pipe Walls          | ő.     | PipeCulvert  | BYLAYER | R ByLayer | 1        | ByLayer    | ByBlock    |  |
| Outside Pipe Walls         | ő.     | PipeCulvert  | BYLAYER | R ByLayer | 1        | ByLayer    | ByBlock    |  |
| Pipe End Line              | N      | PipeCulvert  | BYLAYER | R ByLayer | 1        | ByLayer    | ByBlock    |  |
| Pipe Hatch                 | N      | PipeCulvert  | BYLAYER | R ByLayer | 1        | ByLayer    | ByBlock    |  |
| Pipe Solid                 | ,      | PipeCulvert  | BYLAYER | R ByLayer | 1        | ByLayer    | ByBlock    |  |
| Component hatch di         | splay: |              |         |           |          |            |            |  |
| Component Type             |        | Pattern      | A       | ngle      |          | Scale      |            |  |
| Pipe Hatch                 |        | Wuser single | 45      |           |          | 1          |            |  |

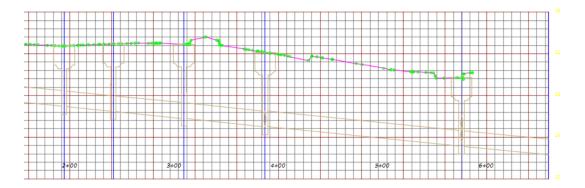
6. From the Pipe Style - FDOT Drainage dialog box > Display tab > View Direction: drop down list, select Profile.

| View Direction:      |          |                |       |            |            |            |            |   |  |  |  |
|----------------------|----------|----------------|-------|------------|------------|------------|------------|---|--|--|--|
| Profile              | •        |                |       |            |            |            |            |   |  |  |  |
| Component display:   |          | 1              |       |            |            |            |            |   |  |  |  |
| Component Type       | Visible  | Layer          | Color | Linetyp    | e LT Scale | Lineweight | Plot Style | Ī |  |  |  |
| Pipe Centerline      | 0        | PipeCulvert_pr | BYLA  | ER ByBlock | 1          | ByLayer    | ByBlock    | 1 |  |  |  |
| Inside Pipe Walls    | <u>ŏ</u> | PipeCulvert_pr | BYLA  | ER ByBlock | 1          | ByLayer    | ByBlock    |   |  |  |  |
| Outside Pipe Walls   | ý.       | PipeCulvert_pr | BYLA  | ER ByBlock | 1          | ByLayer    | ByBlock    |   |  |  |  |
| Pipe End Line        | ý.       | PipeCulvert_pr | BYLA  | ER ByBlock | 1          | ByLayer    | ByBlock    |   |  |  |  |
| Pipe Hatch           | Ŷ.       | PipeCulvert_pr | BYLA  | ER ByBlock | 1          | ByLayer    | ByBlock    |   |  |  |  |
| Crossing Pipe Inside | Ŵ        | PipeCulvert_pr | BYLA  | ER ByBlock | 1          | ByLayer    | ByBlock    |   |  |  |  |
| Crossing Pipe Outsic | 9        | PipeCulvert_pr | BYLA  | ER ByBlock | 1          | ByLayer    | ByBlock    | ł |  |  |  |
| Crossing Pipe Hatch  | 9        | PipeCulvert_pr | BYLA  | ER ByBlock | 1          | ByLayer    | ByBlock    |   |  |  |  |
| Hydraulic Grade Line | 9        | DrainMisc      | BYLA  | ER DGN3    | 1          | ByLayer    | ByLayer    |   |  |  |  |
| •                    |          |                |       |            |            |            | +          |   |  |  |  |
| Component hatch dis  | play:    |                |       |            |            |            |            |   |  |  |  |
| Component Type       | F        | Pattern        |       | Angle      |            | Scale      |            |   |  |  |  |
| Pipe Hatch           | Ø        | ⊠user single   |       | 45         |            | 1          | 1          |   |  |  |  |
| Crossing Pipe Hatch  | 2        | ⊠user single   |       | 45         |            | 1          |            |   |  |  |  |
|                      |          |                |       |            |            |            |            |   |  |  |  |

7. Toggle Off the Crossing Pipe Inside component. A dark light bulb indicates component status is off.

| formation Plan F     | rone sec | tion Display Summ | ary   |            |             |            |            |   |  |  |  |
|----------------------|----------|-------------------|-------|------------|-------------|------------|------------|---|--|--|--|
| View Direction:      |          | _                 |       |            |             |            |            |   |  |  |  |
| Profile              |          | •                 |       |            |             |            |            |   |  |  |  |
| Component display:   |          |                   |       |            |             |            |            |   |  |  |  |
| Component Type       | Visible  | Layer             | Color | Linety     | pe LT Scale | Lineweight | Plot Style | ^ |  |  |  |
| Pipe Centerline      | 9        | PipeCulvert_pr    | BYLA  | ER ByBlock | 1           | ByLayer    | ByBlock    |   |  |  |  |
| Inside Pipe Walls    | <b>O</b> | PipeCulvert_pr    | BYLA  | ER ByBlock | 1           | ByLayer    | ByBlock    |   |  |  |  |
| Outside Pipe Walls   | <b>9</b> | PipeCulvert_pr    | BYLA  | ER ByBlock | 1           | ByLayer    | ByBlock    |   |  |  |  |
| Pipe End Line        | Ő.       | PipeCulvert_pr    | BYLA  | ER ByBlock | 1           | ByLayer    | ByBlock    | = |  |  |  |
| Pipe Hatch           | Ő.       | PipeCulvert_pr    | BYLA  | ER ByBlock | 1           | ByLayer    | ByBlock    |   |  |  |  |
| Crossing Pipe Inside | <u>.</u> | PipeCulvert_pr    | BYLA  | ER ByBlock | 1           | ByLayer    | ByBlock    |   |  |  |  |
| Crossing Pipe Outsic | 9        | PipeCulvert_pr    | BYLA  | ER ByBlock | 1           | ByLayer    | ByBlock    | - |  |  |  |
| Crossing Pipe Hatch  | ý.       | PipeCulvert_pr    | BYLA  | ER ByBlock | 1           | ByLayer    | ByBlock    |   |  |  |  |
| Hydraulic Grade Line | Ő.       | DrainMisc         | BYLA  | ER DGN3    | 1           | ByLayer    | ByLayer    | - |  |  |  |
| •                    | ·        |                   |       |            |             |            |            |   |  |  |  |
| Component hatch dis  | play:    |                   |       |            |             |            |            |   |  |  |  |
| Component Type       |          | Pattern           |       | Angle      |             | Scale      | Scale      |   |  |  |  |
| Pipe Hatch           |          | illuser single    |       | 45         |             | 1          |            |   |  |  |  |
| Crossing Pipe Hatch  | 1        | ‱user single      |       | 45         |             | 1          | 1          |   |  |  |  |
|                      |          |                   |       |            |             |            |            | _ |  |  |  |

8. Click **Apply**, then click **OK** to close the **Pipe Style - FDOT Drainage** dialog box.



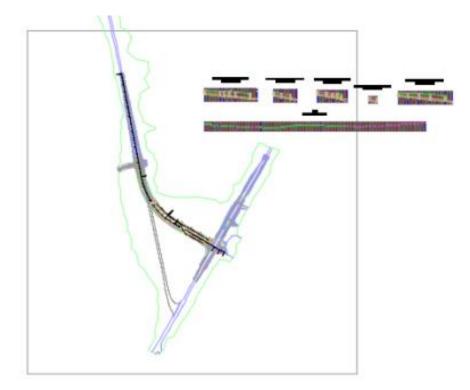
- 9. Press the **ESC** key to clear grips. The pipes now have a cleaner appearance where they intersect with the structures in the Profile View.
- 10. Zoom and Pan to display all the Proposed Drainage SR61 Profile Views.
- *Note* This change in the Pipe Style FDOT Drainage settings applies to all pipes using this style in all the Profile Views.

### **Exercise 7.3** Freeze the ImageAttachment\_dp Layer

The next steps will show you how to freeze the DRMPRD01|ImageAttachment\_dp layer.

There is an issue you need to address. When working in the *DRMPRD01.dwg* file, the *5136L-08.sid* image was unloaded and the *DRMPRD01.dwg* file was saved. Now you have attached the *DRMPRD01.dwg* as an XREF and a rectangle now displays in the *DRPRRD01.dwg* on the *DRMPRD01/ImageAttachment\_dp* layer.

| <b>≞ - 2</b> - ≞                                   | ~ (?)   |   |                                      |                               |                                      |  |   | ×<br>H<br>X         |
|--|---|---|--------------------------------------|-------------------------------|--------------------------------------|--|---|---------------------|
| File References                                    |   |   |                                      |                               |                                      |  | ie t  |                     |
| Reference Name                                     |   |   | Status                               | Size                          | Туре                                 | Date   | Saved Path  |                     |
| DRPRRD01*<br>DRMPRD01<br>DRMPRD01 5136<br>DSGNRD01 | L-08  | _ | Opened<br>Loaded<br>Unload<br>Loaded | 4.33 MB<br>4.05 MB<br>6.77 MB | Current<br>Overlay<br>SID<br>Overlay | 1/11/2017 10:40:32 A<br>1/10/2017 10:20:04 A<br>12/8/2016 2:54:26 PM | .\DRMPRD01.dwg<br>C\Civil 3D Projects\22049555201\Roadway\aerials\sid\5<br>.\Roadway\DSGNRD01.dwg | 13                  |
|  | DRMPRD01/5136L-08   |   |                                      |                               |                                      |  |   |                     |
|  | Reference Name: DRMPPDDUIS130-05  |   |                                      |                               |                                      |  |   |                     |
| •  | Status: Unloaded<br>Size:   |   |                                      |                               |                                      |  |   |                     |
| Details  | Type: SID   |   |                                      |                               |                                      |  | è 🖬 -   | •                   |
|  | Diae.<br>Found Ar. C\CMI 3D Projects\22049555201\Roadway\aerials\sid\5136L-08.sid<br>Saved Path: C\CVR 3D Projects\22049555201\Roadway\aerials\sid\5136L-08.sid |   |                                      |                               |                                      |  |   | EXTERNAL REFERENCES |



1. **Zoom** Extents to display project.



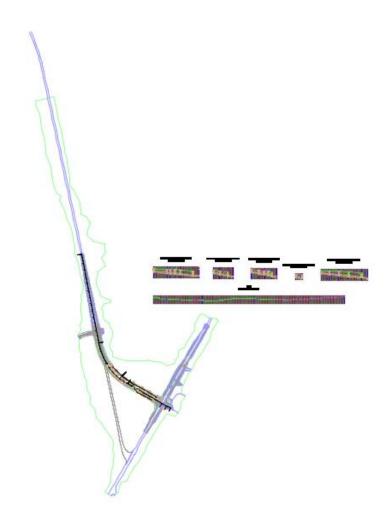
2. From the *Home tab* > *Layers panel*, select **Layer Properties** to open the Layer Properties Manager tool palette.

| 2 🦻 🛷 🖳 🖶 🛛 🌮 🛤     |       | A                           |    |        |      |       |               |            |          |            |      | C     | 5 10   |
|---------------------|-------|-----------------------------|----|--------|------|-------|---------------|------------|----------|------------|------|-------|--------|
|                     |       |                             |    |        |      |       |               |            |          |            |      | ~     |        |
| Filters             | << St | Name                        | On | Freeze | Lock | Color | Linetype      | Lineweight | Transpar | Plot Style | PL I | I De  | lescri |
| ⊡- <i>∰</i> All     |       | DRMPRD01 HubWireless        | 8  | X      | ď    | red   | Continuous    | 0.15       | 0        | 255        |      | 🇞 w   | /irele |
| All non-Xref Layers |       | DRMPRD01 ImageAttachment_dp | 8  | ×X.    | ď    | white | Continuous    | 0.09       | 0        | Normal     |      |       | nage   |
| All Used Layers     |       | DRMPRD01[Inlet_px           | 8  | ٠¤̈́·  | ď    | 200,  | Continuous    | 0.20       | 0        | 255        |      |       | lets   |
| Drafting Elements   |       | DRMPRD01[InletBottom_ep     | 8  | ٠×     | ď    | 200,  | DRMPRD01 DGN3 | 0.15       | 0        | 255        |      |       | rain   |
| Misc and Scratch    |       | DRMPRD01[InletBottom_px     | 8  | ŎŎŎŎŎ  | ď    |       | Continuous    | 0.20       | 0        | 255        |      |       | let i  |
| Standards           |       | DRMPRD01[InletBottomJ       | 8  | ÷Ŏ.    | ď    | 200,  | Continuous    | 0.15       | 0        | 255        |      | 👌 Inl | let i  |
| Text                |       | DRMPRD01[InletBottomP       | 8  | ×      | ď    | 200,  | Continuous    | 0.15       | 0        | 255        |      |       | ilet i |
| 😑 🚰 Xref            |       | DRMPRD01[InletClosedFlume   | 8  | ×      | ď    | 200,  | Continuous    | 0.20       | 0        | 255        |      |       | losed  |
| DRMPRD01            |       | DRMPRD01[InletCurb          | 8  |        | ď    | 200,  | Continuous    | 0.20       | 0        | 255        |      |       | urb    |
| DSGNRD01            |       | DRMPRD01[InletCurb_ep       | 8  | •¤•    | ď    |       | DRMPRD01 DGN3 | 0.15       | 0        | 255        |      |       | urb    |
| XReferences         |       | DRMPRD01[InletDBI           | 8  | -××-   | æ    | 200,  | Continuous    | 0.20       | 0        | 255        |      |       | itch   |
|                     |       | DRMPRD01[inletDBI_ep        | 8  | ŎŎŎŎŎ  | ď    |       | DRMPRD01 DGN3 | 0.15       | 0        | 255        |      |       | itch   |
|                     |       | DRMPRD01[inletGutter        | 8  | ٠¤٠    | ď    |       | Continuous    | 0.20       |          | 255        |      |       | utter  |
|                     |       | DRMPRD01[InletGutter_ep     | 8  |        | ď    | 200,  | DRMPRD01 DGN3 | 0.15       | 0        | 255        | 0    | 🇞 Gu  | utte   |
| Invert filter       | ≪ ∢   |                             |    |        | 11   |       |               |            |          |            |      |       | ÷.     |

3. From the Layer Properties Manager tool palette, use the scroll bar to find the **DRMPRD01**|ImageAttachment\_dp layer.

| a 🎲 🛷 🖳 🖯 🛛 🎼 🍻 📫   | 🔗 🚰  | <b>3</b>                    |    |                      |      |       |               |            |          |            |     |          | 0 X    |
|---------------------|------|-----------------------------|----|----------------------|------|-------|---------------|------------|----------|------------|-----|----------|--------|
| Fiters              | < St | Name                        | On | Freeze               | Lock | Color | Linetype      | Lineweight | Transpar | Plot Style | PL_ | N        | Descri |
| E AI                |      | DRMPRD01 HubWireless        | 8  | X                    | f    | red   | Continuous    | 0.15       | 0        | 255        | 0   | <b>R</b> | Wirele |
| All non-Xref Layers |      | DRMPRD01 ImageAttachment_dp | 8  | ÷                    | ď    | white | Continuous    | 0.09       | 0        | Normal     | 0   | <b>R</b> | Imag   |
| All Used Layers     |      | DRMPRD01[Inlet_px           | 8  | ÷Ŏ.<br>•Ŏ.           | 6    | 200,  | Continuous    | 0.20       | 0        | 255        | e   |          | Inlets |
| Drafting Elements   |      | DRMPRD01 In letBottom_ep    | Ŷ  | -××-                 | 6    | 200,  | DRMPRD01 DGN3 | 0.15       | 0        | 255        | ÷   |          | Drain  |
| Misc and Scratch    |      | DRMPRD01 [in letBottom_px   | Ŷ  | -××                  | - C  | 200,  | Continuous    | 0.20       | 0        | 255        | ÷   |          | Inlet  |
| Standards           |      | DRMPRD01 [in letBottomJ     | 8  | ××.                  | 6    | 200,  | Continuous    | 0.15       | 0        | 255        | ÷   |          | Inlet  |
| Text                |      | DRMPRD01[InletBottomP       | 8  | X                    | 6    | 200,  | Continuous    | 0.15       | 0        | 255        | e   |          | Inlet  |
| Kref                |      | DRMPRD01[InletClosedFlume   | 8  | ×                    | ď    | 200,  | Continuous    | 0.20       | 0        | 255        | θ   |          | Close  |
| DRMPRD01            |      | DRMPRD01[InletCurb          | 8  | ×                    | ď    | 200,  | Continuous    | 0.20       | 0        | 255        | θ   |          | Curb   |
| DSGNRD01            |      | DRMPRD01[InletCurb_ep       | 8  | -××-                 | ď    | 200,  | DRMPRD01/DGN3 | 0.15       | 0        | 255        | e   |          | Curb   |
| XReferences         |      | DRMPRD01 In letDBI          | 8  | ٠×                   | ď    | 200,  | Continuous    | 0.20       | 0        | 255        | e   |          | Ditch  |
|                     |      | DRMPRD01[InletDBI_ep        | 8  | <u>\$</u> \$\$\$\$\$ | £    | 200,  | DRMPRD01 DGN3 | 0.15       | 0        | 255        | ÷   |          | Ditch  |
|                     |      | DRMPRD01[InletGutter        | 8  |                      | £    |       | Continuous    | 0.20       | 0        | 255        | e   |          | Gutte  |
|                     |      | DRMPRD01[InletGutter_ep     | 8  | ×                    | ď    | 200,  | DRMPRD01[DGN3 | 0.15       | 0        | 255        | e   | R.       | Gutte  |
| Invert filter       | ≪ ∢  |                             |    |                      | 11   |       |               |            |          |            |     |          | •      |

- 4. From the *Freeze* column, click on yellow **Sun** icon to freeze the **DRMPRD01**|**ImageAttachment\_dp** layer changing the icon to a blue **Snowflake** icon.
- 5. Close the Layer Properties Manager tool palette.



- 6. The rectangle is no longer displayed and the Proposed Drainage SR61 pipe network is ready for review.
- 7. Save and Close the file.

# **8** EDITING PIPE NETWORK

## DESCRIPTION

Review and revision cycles are a normal part of any project. In this chapter, we have a list of comments from our drainage engineer requesting changes to your design. You will respond to those comments by making changes to your design. In this chapter, you will edit pipe network parts in Plan View by adding and deleting structures and pipes. You will also delete alignments that are no longer needed.

### **OBJECTIVES**

In this chapter, you will learn about:

- Pipe Network Editing Tools
- Deleting Structures and Pipes
- Adding Structures and Pipes
- Deleting and Editing Alignments

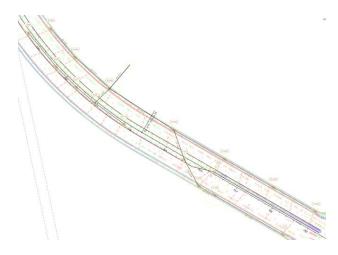
# **CHAPTER SETUP**

Run the Chapter 8 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

### **Exercise 8.1** Editing Inlet Placements

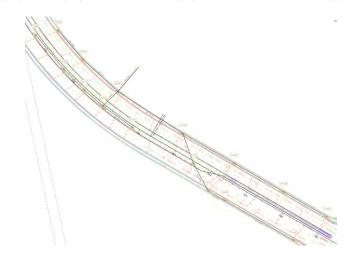
- 1. Start the FDOT Civil 3D State Kit and open the *DRPRRD01.dwg* located in the Chapter 8 dataset drainage folder.
- 2. With the drawing file open type in **Save as** re-name the new file *DRPRRD02.dwg* and save in the same *drainage* folder.
- 3. As shown in previous steps, associate the drawing file to the **22049555201 Project** by right clicking on the *Data Shortcut* working folder and selecting **Associate Project to Current Drawing.**



### **Exercise 8.2** Review Drainage Engineer's Comments

After the design review, the drainage engineer wants to make some design changes. These are the design comments from the engineer:

- "Do not run parallel trunk lines. Keep one trunk line on one side of the road and eliminate the other."
- "Shorten the overall length of pipe runs."
- "Eliminate S-(14) and S-(15) and move the S-(13) to the same station as S-(3)."



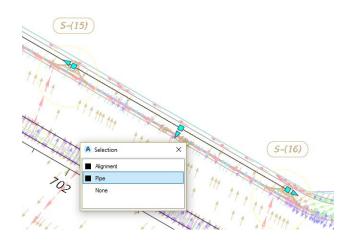
1. Zoom and Pan to display the area of the Proposed Drainage – SR61 Pipe Network.

### > Delete Pipes

The next steps will show you how to delete Pipes connected to Structures from the Proposed Drainage – SR61 pipe network.

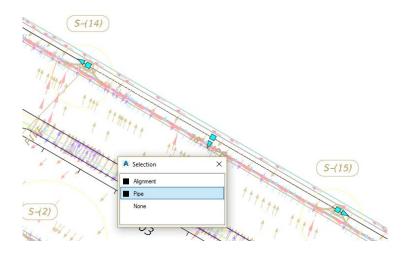
Note Turn on Selection Cycling to make sure that you are selecting Pipes and not Alignments.

1. Delete PIPE:

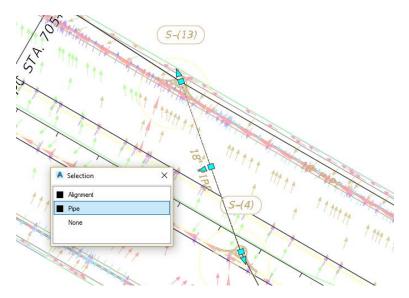


- a. Zoom and Pan to the area of *structure* S-(16).
- b. Select **18'' PIPE** between *structure S-(16)* and *structure S-(15)*.
- c. With *selection cycling* toggled *On*, a Selection dialog box displays. From the Selection dialog box select **Pipe**.
- d. Press DELETE.

2. Delete PIPE:

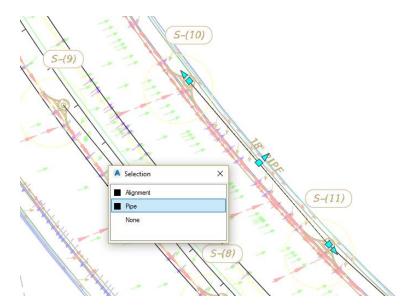


- a. Zoom and Pan to the area of *structure* S-(15).
- b. Select 18" PIPE between structure S-(15) and structure S-(14).
- c. With *selection cycling* toggled *On*, a Selection dialog box displays. From the Selection dialog box select **Pipe.** Press **DELETE**.
- 3. Delete PIPE:

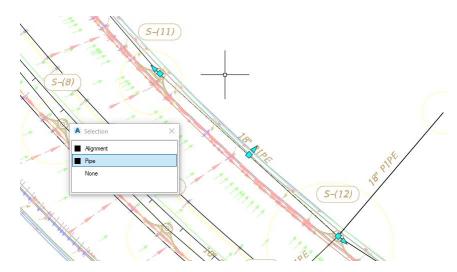


- a. Zoom and Pan to the area of *structure* S-(4).
- b. Select 18" PIPE between structure S-(4) and structure S-(13).
- c. With *selection cycling* toggled *On*, a Selection dialog box displays. From the Selection dialog box select **Pipe**.
- d. Press DELETE.

4. Delete PIPE:



- a. Zoom and Pan to the area of *structure* S-(10).
- b. Select **18'' PIPE** between *structure S*-(8) and *structure S*-(9).
- c. With *selection cycling* toggled *On*, a Selection dialog box displays. From the Selection dialog box select **Pipe**.
- d. Press DELETE.
- 5. Delete PIPE:

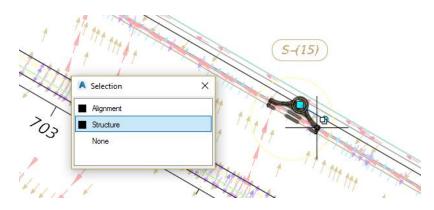


- a. Zoom and Pan to the area of structure S-(11).
- b. Select **18'' PIPE** between *structure S-(7)* and *structure S-8)*.
- c. With *selection cycling* toggled *On*, a Selection dialog box displays. From the Selection dialog box select **Pipe**.
- d. Press DELETE.

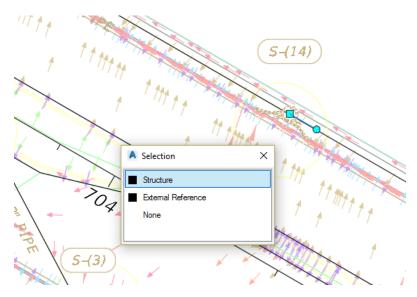
### > Delete Inlets

The next steps will show you how to delete Inlets structures from the Proposed Drainage - SR61 Pipe Network.

1. Delete S-(15) Inlet:



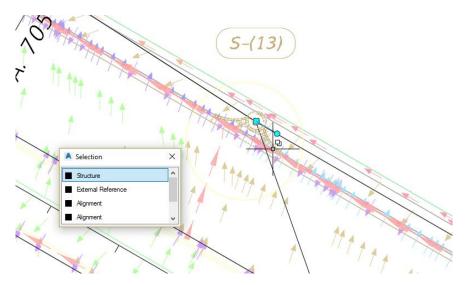
- a. Zoom and Pan to the area of *structure* S-(15).
- b. Select structure S-(15).
- c. With *selection cycling* toggled *On*, a Selection dialog box displays. From the Selection dialog box select **Structure**.
- d. Press **DELETE.**
- 2. Delete S-(14) Inlet:



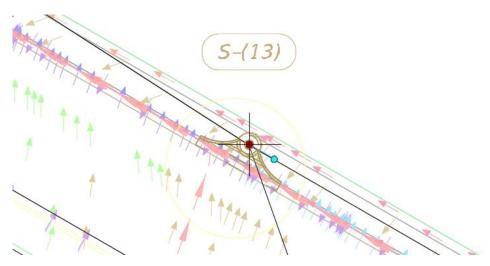
- a. Zoom and Pan to the area of structure S-(14).
- b. Select structure S-(14).
- c. With *selection cycling* toggled *On*, a Selection dialog box displays. From the Selection dialog box select **Structure**.
- d. Press DELETE.

### > Move Inlets

The next steps will show you how to move S-(13) Inlet structure from the Proposed Drainage – SR61 Pipe Network.



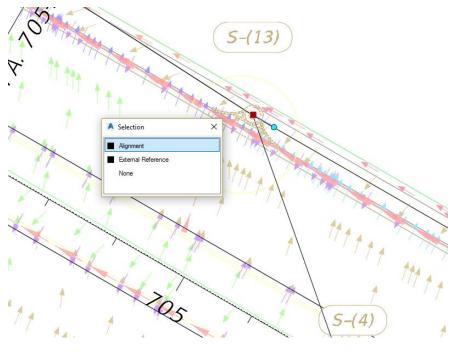
- 1. Zoom and Pan to the area of *structure* S-(13).
- 2. Select structure S-(13).
- 3. With *selection cycling* toggled *On*, a Selection dialog box displays. From the Selection dialog box select **Structure.**



4. Click the square **Location grip**.

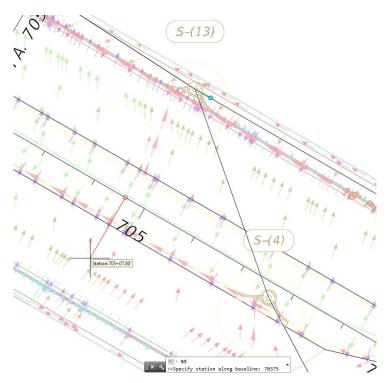
| ** STRETCH **    |   |  |
|------------------|---|--|
| >Specify stretch | point or [Base point Copy Undo eXit]: 'SO |  |

5. From the *command line* type 'SO, then press the ENTER key to start the *Transparent Station Offset* command.



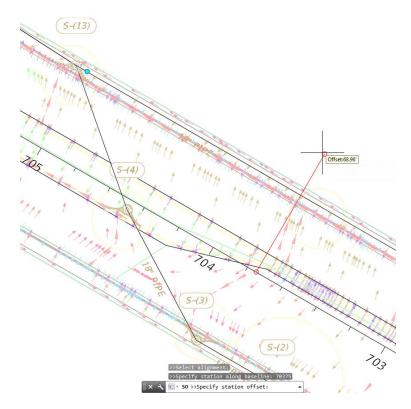
>- **SO** >>Select alignment:

- 6. The command line prompts: Select alignment: select the SR61 alignment.
- 7. With *selection cycling* toggled *On*, a Selection dialog box displays. From the Selection dialog box select Alignment.

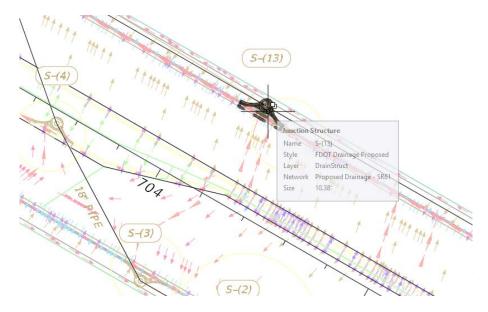


▶ • 50 >>Specify station along alignment: 70375

8. The *command line* prompts: *Specify station along alignment*: Type **70375** to move the structure S-(13) inlet to *Station 703+75*, then press **ENTER**.



- 9. Drag sliding red line above the *SR61 Alignment* as shown above.
- 10. The command line prompts: Specify station offset: Type 44.8, then press ENTER.



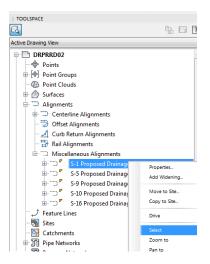
- 11. The S-(13) Inlet has been moved to Station 703+75.
- 12. Press the **ESC** key to clear the grips.
- 13. Save the *DRPRRD02.dwg* file.

### **Exercise 8.3** Delete Alignments

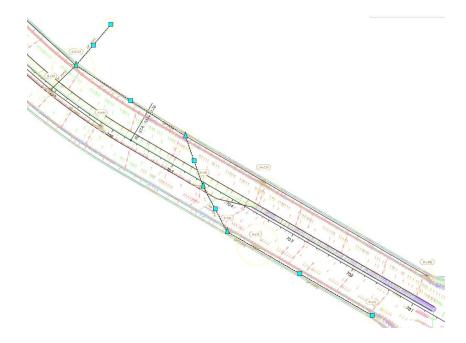
The next steps will show you how under the Miscellaneous Alignments collection to delete the Proposed Drainage - SR61 alignments that have been created.

With the review and comments from the Drainage Design Engineer, there are enough changes to the design where it will be easier to delete the alignments and create new alignments again from Network Parts.

> Delete the S-1 Proposed Drainage - SR61 Alignment



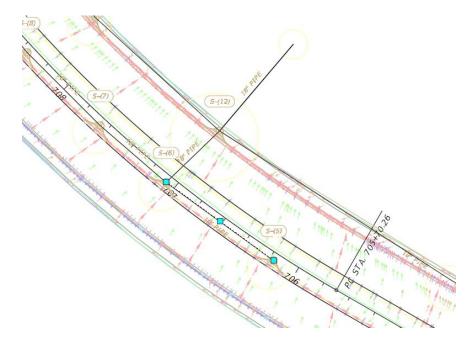
1. From the *TOOLSPACE > Prospector tab*, expand *Alignments*, expand **Miscellaneous Alignments**, right-click on **S-1 Proposed Drainage - SR61 Alignment**, then choose **Select**.



- 2. Zoom and Pan to display the S-1 Proposed Drainage SR61Alignment.
- 3. Press **DELETE**.

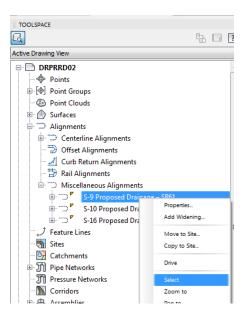
- TOOLSPACE Q Active Drawing View P DRPRRD02 Points ⊕ [�] Point Groups Point Clouds 🗄 🔗 Surfaces Alignments E Centerline Alignments Offset Alignments Lurb Return Alignments 🕆 Rail Alignments D Miscellaneous Alignments ÷------ P S-5 Properties... S-9 Prop Add Widening... S-10 Pro S-16 Pro Move to Site... ナ Feature Lines Copy to Site... Sites Drive Catchments Pipe Networks m Pressure Networks Zoom to Corridors Pan to
- > Delete the S-5 Proposed Drainage SR61 Alignment

1. Select S-5 Proposed Drainage - SR61alignment, right-click then choose Select.

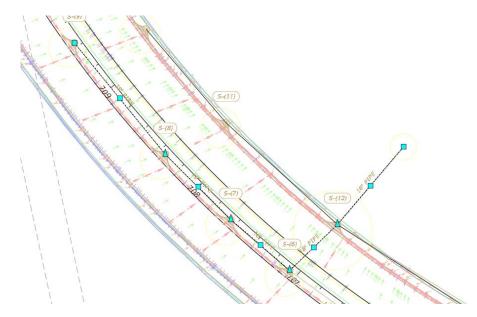


- 2. Zoom and Pan to display the S-5 Proposed Drainage SR61 Alignment.
- 3. Press **DELETE**.

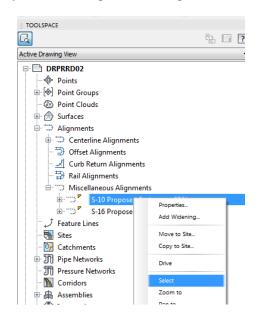
> Delete the S-9 Proposed Drainage - SR61 alignment



1. Select S-9 Proposed Drainage - SR61alignment, right-click then choose Select.

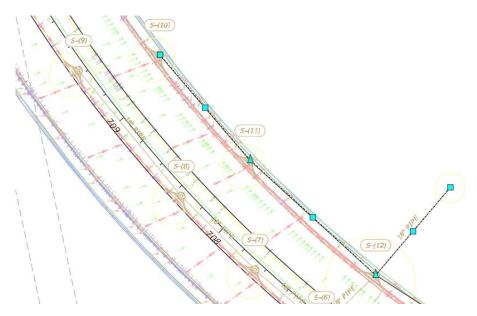


- 2. Zoom and Pan to display the S-9 Proposed Drainage SR61 Alignment.
- 3. Press DELETE.



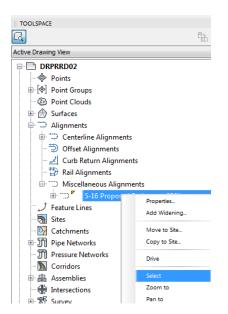
> Delete the S-10 Proposed Drainage - SR61 alignment

1. Select S-10 Proposed Drainage - SR61alignment, right-click then choose Select.

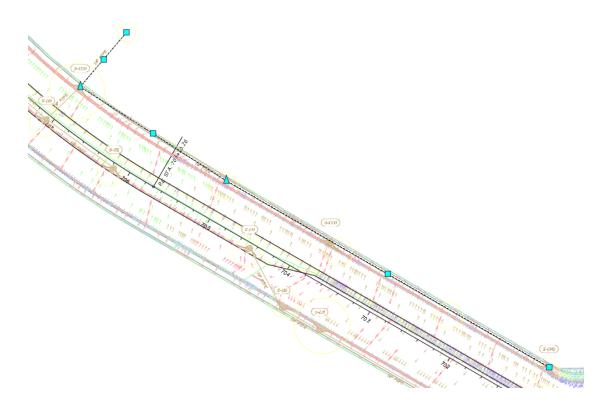


- 2. Zoom and Pan to display the S-10 Proposed Drainage SR61 Alignment
- 3. Press DELETE.

> Delete the S-16 Proposed Drainage - SR61 alignment



1. Select S-16 Proposed Drainage - SR61alignment, right-click then choose Select.



- 2. Zoom and Pan to display the S-16 Proposed Drainage SR61 Alignment.
- 3. Press DELETE.

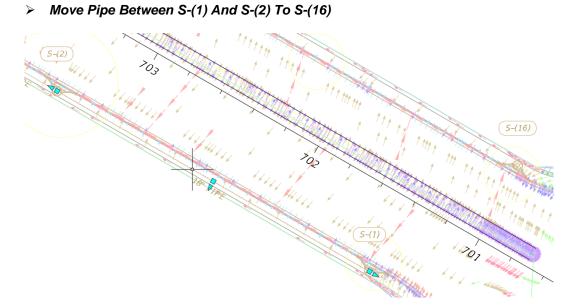
### > Review Miscellaneous Alignments

The next steps will show you how to review the Miscellaneous Alignments collection

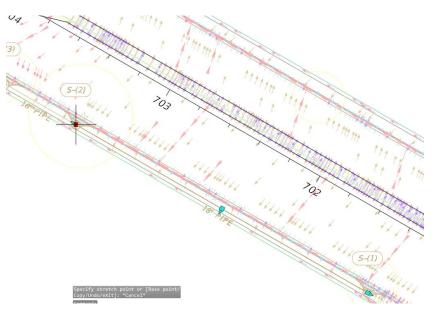
- TOOLSPACE B. 6 Active Drawing View DRPRRD02 Points 🕢 🔄 Point Groups Point Clouds 🗄 🄗 Surfaces Alignments Centerline Alignments 🗇 🗇 Offset Alignments Curb Return Alignments · D Miscella J Feature Lines Sites 🔄 📴 Catchments 🗉 🃆 Pipe Networks
- 1. From *TOOLSPACE* > *Prospector tab* > *Alignments* > *Miscellaneous Alignments*, review alignments. All of the *Proposed Drainage* - *SR61 alignments* have been deleted
- 2. Save the *DRPRRD02.dwg* file:

## **Exercise 8.4** Move Pipes

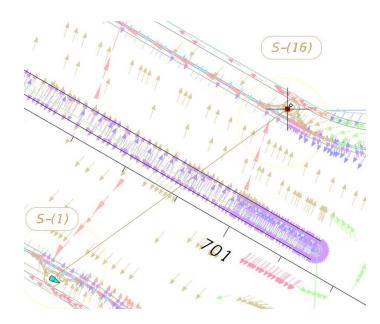
The next steps will show you how to instead of deleting some pipes reconnect them to different structures.



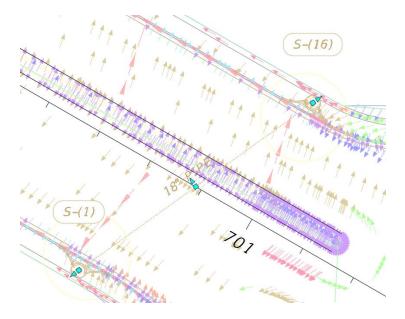
- 1. Zoom and Pan to display the *structures* S-(1), S-(2) and S-(16).
- 2. Select **PIPE** between *structures* **S**-(1) and **S**-(2).
- 3. With *selection cycling* toggled *On*, a Selection dialog box displays. From the Selection dialog box select **Pipe**.



4. Select the square grip at S-(2).



- 5. Hover over structure S-(16). When the glyph appears click the structure S-(16) to connect the **PIPE** to the *structure* S-(16).
- 6. Press **ESC** to clear grips.

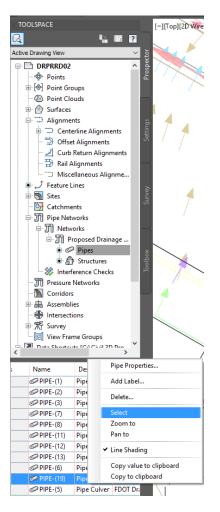


7. Review results of moving **PIPE** from *structure S-(2)* to *structure S-(16)*.

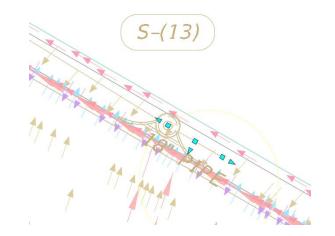
#### Reconnect Pipe-(16) Between S-(13) And S-(16)

The next steps will show you how to select the pipe left after deleting structure S-(14), reconnect from structures S-(13) to S-(16).

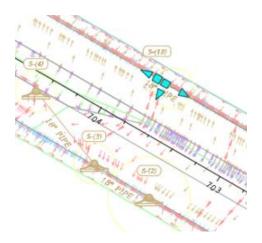
1. You may find it difficult to select the pipe PIPE-(19) in the drawing editor, so find and select **PIPE-**(19) in *Prospector tab*.



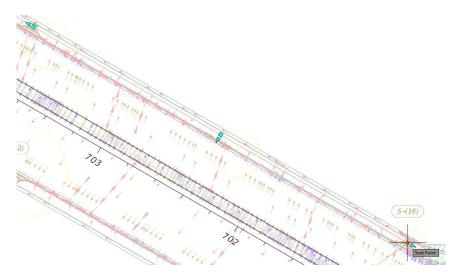
2. From the *TOOLSPACE* > *Prospector tab*, expand *Pipe Networks* > *Networks*, > *Proposed Drainage* - *SR61*, then left click on Pipes. From the preview list (Bottom window of TOOLSPACE), left click on **PIPE-(19)** then right-click and choose **Select.** 



- 3. Zoom and Pan to display the PIPE-(19).
- 4. Select the square grip on the PIPE-(19) not attached to structure S-(13).



5. Hover over structure S-(16). When the glyph appears click on the *structure* S-(16) to connect the PIPE-(16) to *structure* S-(16).



- 6. Review the results of moving the pipe PIPE-(16) to structure S-(16).
- 7. Press **ESC** to clear grips.

## **Exercise 8.5** Adding Pipes

The next steps will show you how to add a Pipe from structure S-(3) to structure S-(13).

> Add Pipe From S-(3) To S-(13)

| ▲, ▷ 健 🖁 😫  | ) <h th="" ·<="" •="" ☆=""><th>ivil 3D</th><th></th><th>•</th><th>-</th><th></th><th></th></h> | ivil 3D  |        | •        | -         |            |              |
|---|--|----------|--------|----------|-----------|------------|--------------|
| C3D Home Insert   | Annotate Modify  | Analyze  | View N | /lanage  | Output    | Survey     | Autodesk 36  |
| +<br>→<br>→ Survey Query<br>→ Surface<br>→ Surface<br>→ Doint Cloud | 📌 Feature Line 🎽   |          |        | v 🗎      | Pro       |            | Insert PI De |
| Ground Data   |  | Design 👻 |        | Pine     | Network   |            |              |
| Start   | DRPRRD02*  | × +      |        |          |           | Network co | ntextual tab |
| TOOLSPACE   |  |          |        | <b>-</b> | ihowTabPi | peNetwork  | NoSel        |

1. From the *Modify tab* > *Design panel*, select **Pipe Network**.

| C30 ~         | BØ            | 86              | <b>ふ</b> ・ふ   | Civil 3  | <b>)</b>    | * 3       | -      |                |                 | -                |               | Autodesk   | AutoCAD Civil         | 3D 2016 DR     | RRD02.dwg [220                        | 49555201]                 | sea the same                       |            |
|---------------|---------------|-----------------|---------------|----------|-------------|-----------|--------|----------------|-----------------|------------------|---------------|------------|-----------------------|----------------|---------------------------------------|---------------------------|------------------------------------|------------|
| CID           | Home          | Insert          | Annotate      | Modify A | nalyze View | Manage    | Output | Survey /       | Autodesk 360    | Help Add         | i-ins Feature | d Apps Exp | oress Tools V         | ehicle Trackin | g Bridge Mod                          | eler Externa              | I Reference Geolo                  | ocation Pr |
| Add<br>Labels | Add<br>Tables | Reset<br>Labels | Properties    | wer Netv | ork Pipe    | Structure |        | Edit Pipe Net  | onnect Part     | Split Network    |               | Draw Parts | Interference<br>Check |                | dit in Storm and<br>Sanitary Analysis | Alignment<br>from Network | Storm Sewers  Hydrographs  Express | Close      |
| Li            | abels & Tab   | oles            | General Tools | •        |             |           | Mor    | Edits a pipe n | network using t | the network layo | ut tools      |            |                       | Analyze        |                                       | La                        | unch Pad                           | Close      |
| St            | art           |                 | DRPRRD02*     | ж        | (+          |           |        | EditNets       | work            |                  |               |            |                       |                |                                       |                           |                                    |            |
| TOOL          | SPACE         |                 |               |          |             |           | . //   | Press F1 for   | more help       |                  |               |            |                       |                |                                       |                           |                                    |            |

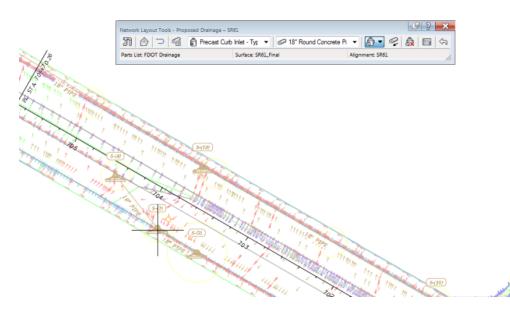
2. From the *Modify panel*, select Edit Pipe Network.

| Name                     | Description                 |
|--------------------------|-----------------------------|
| Proposed Drainage – SR61 | <description></description> |
|                          |                             |
|                          |                             |
|                          |                             |
|                          |                             |
|                          |                             |

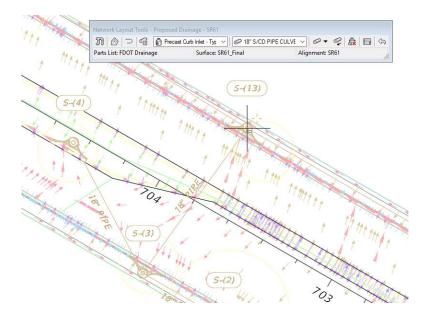
3. From the Select pipe network dialog box, select the Proposed Drainage – SR61 *pipe network*. Click OK.

| Network Layout Tools - Proposed | Drainage - SR61                   | 🥥 ? 🗙                        |
|---------------------------------|-----------------------------------|------------------------------|
| 🕅 🗇 笻 😭 🔓 Preca                 | st Curb Inlet - Tyr 🗸 🖉 18'' S/CD | PIPE CULVE 🗸 🥏 ଟ 🍕 🕞 🖓       |
| Parts List: FDOT Drainage       | Surface: SR61_Final               | Aligr 💮 Pipes and Structures |
|                                 |                                   | 🥏 🗸 Pipes Only               |
|                                 |                                   | Structures Only              |

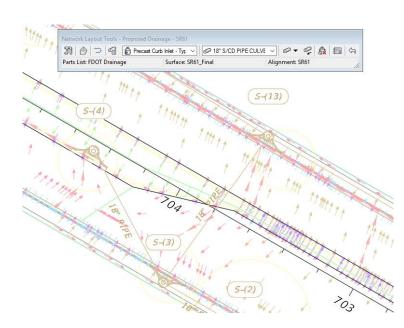
4. From the Network Layout Tools - Proposed Drainage - SR61 toolbar > Pipes and Structures drop down list, select the Pipes Only command.



- 5. Zoom and Pan to display the *structure* S-(3).
- 6. Hover over structure S-(3). When the glyph appears click on the **structure S-(3)** to connect the pipe to *structure S-(3)*.

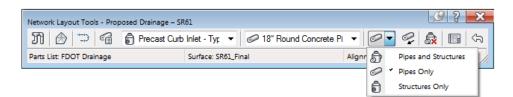


- 7. Zoom and Pan to display the *structure* S-(13).
- 8. Hover over structure S-(13). When the glyph appears click on the structure S-(13) to connect the pipe to *structure S-(13)*.
- 9. Press **ESC** to end command.

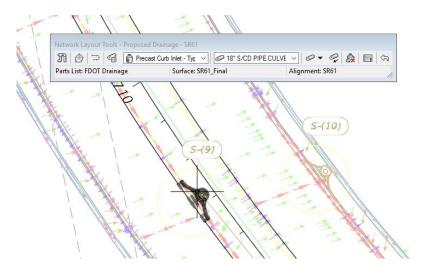


10. Review the results of adding pipe from structure S-(3) to structure S-(13).

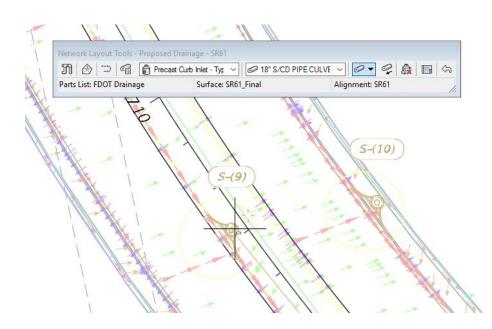
#### > Add Pipe From S-(9) To S-(10)



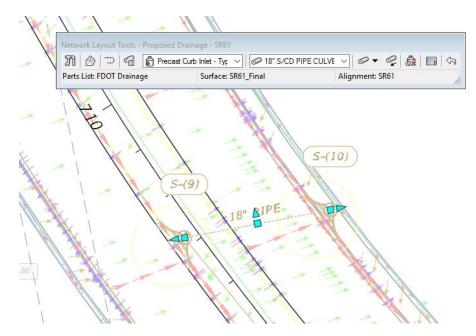
1. From the Network Layout Tools - Proposed Drainage - SR61 toolbar > Pipes and Structures drop down list, select the Pipes Only command.



- 2. Zoom and Pan to display the *structure* S-(9).
- 3. Hover over structure S-(9). When the glyph appears click on the structure S-(9) to connect the pipe to *structure S-(9)*.

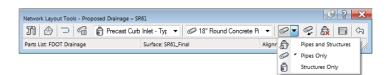


- 4. Zoom and Pan to display the *structure* S-(10).
- 5. Hover over structure S-(10). When the glyph appears click on the structure S-(10) to connect the pipe to *structure S-(10)*.
- 6. Press **ESC** to end command.

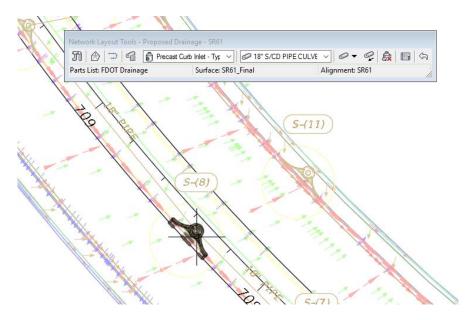


7. Review results of adding PIPE-(18) from structure S-(9) to structure S-(10).

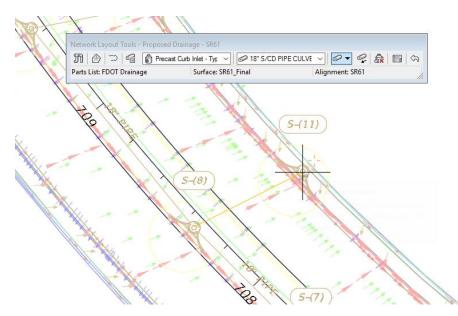
> Add Pipe From S-(8) To S-(11)



1. From the Network Layout Tools - Proposed Drainage - SR61 toolbar > Pipes and Structures drop down list, select the Pipes Only command.

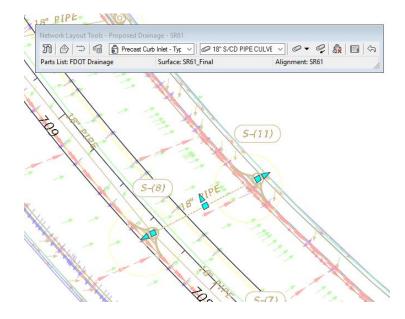


- 2. Zoom and Pan to display the *structure* S-(8).
- 3. Hover over structure S-(8). When the glyph appears click on the structure S-(8) to connect the pipe to *structure S*-(8).



4. Zoom and Pan to display the *structure* S-(11).

- 5. Hover over structure S-(11). When the glyph appears click on the structure S-(11) to connect the pipe to *structure S-(11)*.
- 6. Press **ESC** to end command.



- 7. Review results of adding pipe from *structure S*-(8) to *structure S*-(11).
- 8. Close Network Layout Tools by clicking on the X in the upper right corner of the toolbar.
- 9. Save and Close the *DRPRRD02.dwg* file.

# **9** ALIGNMENTS & PROFILE VIEWS OF REVISED NETWORK PARTS

## DESCRIPTION

In this chapter, you will review the changes made in the plan view in the previous chapter. With the addition of new alignments and a reconfigured layout of structures and pipes you must now create the alignments and profile views for the new pipe network layout.

## **OBJECTIVES**

In this chapter, you will learn about:

- Defining Alignments from Network Parts (refresher)
- Creating Profile Views
- Adding Network Parts to Profile Views

## **CHAPTER SETUP**

Run the Chapter 9 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

#### **Exercise 9.1** Create an Alignment and Profile View from Network Parts

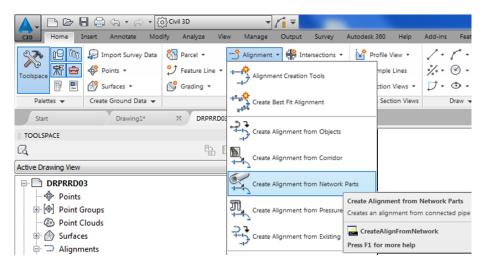
To generate profile views of the network parts you first create alignments. The next steps will show you how to do both from the wizards that are available.

From the TOOLSPACE palette on the Prospector tab, expand the Alignments List, notice that the Miscellaneous Alignments folder is empty. You will create the Alignments that populate this list.

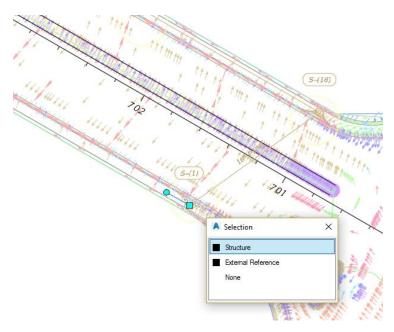
| TOOLSPACE                 |
|---------------------------|
| G.                        |
| Active Drawing View       |
| P DRPRRD03                |
| 🗇 Points                  |
| ⊕ [�] Point Groups        |
| Point Clouds              |
| 🕀 🔗 Surfaces              |
| 🕂 🎞 Alignments            |
| 🖃 🗇 Centerline Alignments |
| ⊞ 😳 🍢 🖉 🖉 🖉               |
| - 🗇 Offset Alignments     |
| 🛃 Curb Return Alignments  |
| - 🔁 Rail Alignments       |
| Miscellaneous Alignments  |
|                           |
| <b>—</b>                  |

The following steps will show you how to create the Alignment and Profile View. You will use the same steps to finish the exercise for the other network parts.

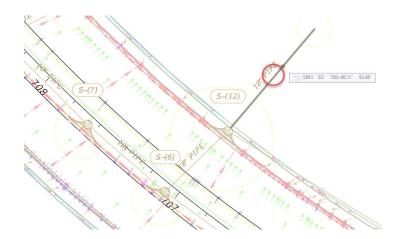
- 1. Start the FDOT Civil 3D State Kit and open the *DRPRRD02.dwg* located in the Chapter 9 dataset drainage folder.
- 2. With the drawing file open type in **Save as**, name the new file *DRPRRD03.dwg* and save in the same *drainage* folder.
- 3. As shown in previous steps, associate the drawing file to the **22049555201 Project** by right clicking on the *data shortcut* working folder and selecting **Associate Project to Current Drawing**.



4. From the *Home tab > Create Design panel >* Alignment drop down list, select **Create Alignment from Network Parts.** 



- 5. Zoom and Pan to the area of structure S-(1) and select the structure S-(1).
- 6. With *selection cycling* toggled *On*, a Selection dialog box displays. From the Selection dialog box select **Structure**.



- 7. **Zoom** and **Pan** to the area of structure S-(12), select **Pipe-(6)** the outgoing pipe which we refer to as the *Outfall pipe*. (Where the pipe empties into the proposed Drainage Pond.)
- 8. Press ENTER to complete the alignment creation.
- *Note* Structures S-(1), S-(16), S-(12), and the outfall pipe PIPE-(6) form the alignment geometry because they are connected.

| Create Alignment - From Pipe Network |
|--------------------------------------|
| Site:                                |
| None>                                |
| Name:                                |
| S-1 <[Pipe Network Name(CP)] >       |
| Type:                                |
| TIII) Miscellaneous                  |
| Description:                         |
| A                                    |
| -                                    |
| Starting station: 0+00.00'           |
| Alignment style:                     |
| FDOT Proposed 🔹 💽 💌 💽                |
| Alignment layer:                     |
| CLConst_dp                           |
| Alignment label set:                 |
|                                      |
| Create profile and profile view      |
| OK Cancel Help                       |

- 9. The Create Alignment From Pipe Network dialog box displays.
  - a. In the *Name:* field only add S-1 before <[Pipe Network Name(CP)]>.

*Note* Always make the name the beginning structure in the Alignment.

- b. Set *Type*: to **Miscellaneous.**
- c. Give a good *Description*: such as S-(1) to S-(12) including outlet pipe.
- d. Alignment label set: from drop down list select \_No Labels.
- e. Check the **Create profile and profile view** check box.

| nage - SR61 |            | -                | sR6                     | 1_Final                       |  |   |  |  |
|-------------|------------|------------------|-------------------------|-------------------------------|--|---|--|--|
|             |            |                  |                         |                               |  |   |  | _  |
|             |            |                  |                         |                               |  |   |  |  |
|             |            |                  |                         |                               |  |   |  |  |
| En          | d:         |                  |                         |                               |  |   |  |  |
| 7           | +54.78'    |                  |                         |                               |  |   |  |  |
| -12         | 7+54.78'   |                  | C Samp                  | e offsets:                    |  |   | Add>   | >  |
|             |            |                  |                         |                               |  | Station                                   |  | Ele  |
| n Type      | Data Sou   | Offset           | Update                  | Layer                         | Style  | Start                                     | End  | м.   |
| M           | SR61_Final | 0.00'            | Dynamic                 |                               | FDOT Pro   | 0+00.00'                                  | 6+88.55  | 29.  |
|             | on Type    | on Type Data Sou | on Type Data Sou Offset | n Type Data Sou Offset Update | T+54.78'       Type       Data Sou       Offset       Update       Layer | n Type Data Sou Offset Update Layer Style | T+54.78'     Sample offsets:       Type     Data Sou Offset     Update       Layer     Style       Start | an Type Data Sou Offset Update Layer Style Station Start End |

10. Click OK to close the Create Alignment – From Pipe Network dialog box.

- 11. From the Create Profile from Surface dialog box, set the following:
  - a. Set *Alignment*: to S-1 Proposed Drainage SR61.
  - b. In the Select surface: highlight SR61\_Final, then click the Add button to add to Profile list.
  - c. Profile list: area populates with the newly defined surface profile content.
- 12. Click the Draw in profile view button. This will launch the Create Profile View wizard.
- 13. In the **Create Profile View** wizard, visit each panel setting the values as instructed and clicking the **Next** button at the bottom to continue to the next panel. The blue links on the left side display an arrow next to the current panel title being displayed.

| A Create Profile View - General             | -X-  |
|---|--|
| <u>General</u> <u>Station Range</u>         | Select alignment:<br>The S-1 Proposed Drainage – SR61                                |
| Profile View Height Profile Display Options | <[Parent Alignment]><[Profile View Station Range]>                                   |
| Pipe/Pressure Network                       | Profile view style:  |
| Profile Hatch Options                       | Profile view layer: Tables Show offset profiles by vertically stacking profile views |
|   |  |
|   | < Back Next > Create Profile View Cancel Help  |

14. In the General panel click the Profile view style: drop down list and click FDOT 40 Horz x 4 Vert Scale 10x GRID ON. Click the Next button.

| Create Profile View - Station Range              |                        |                         | ×                           |
|--|------------------------|-------------------------|-----------------------------|
| General  | Station range          |                         |                             |
| Station Range Profile View Height                | Automatic              | Start:<br>0+00.00'      | End:<br>7+54.78'            |
| Profile Display Options<br>Pipe/Pressure Network | O User specified range | 0+00.00'                | 7+54.78'         □13<br>-18 |
| Data Bands<br>Profile Hatch Options              |                        |                         |                             |
|  |                        |                         |                             |
|  |                        |                         |                             |
|  | < Bac                  | k Next > Create Profile | e View Cancel Help          |

15. Accept the default in the **Station Range** panel. Click the **Next** button.

| Create Profile View - Profile View H | eight                     |                        |                          | ×        |
|--------------------------------------|---------------------------|------------------------|--------------------------|----------|
| General                              | Profile view height       |                        |                          |          |
| Station Range                        | Automatic                 | Minimum:<br>29.56'     | Maximum:<br>34.96'       |          |
| <u>Station Range</u>                 | Addinade                  | 25.30                  | 34.90                    |          |
| Profile View Height                  | O User specified          | 28.00'                 | 36.00'                   |          |
| Profile Display Options              | Split profile view        |                        |                          |          |
| Pipe/Pressure Network                | First split view style:   |                        | Split station:           |          |
| Data Bands                           | FDOT 40 Horz x 4 V        | fert Scale 10x 💌 🌄 💌 🗔 | Exact station            | <b>-</b> |
|                                      | Intermediate split view s | tyle:                  | Datum option:            |          |
| Profile Hatch Options                | FDOT 40 Horz x 4 V        |                        | Exact elevation          | -        |
|                                      | Last split view style:    | fert Scale 10x V       |                          |          |
|                                      |                           |                        |                          |          |
|                                      |                           | < Back Next > Cre      | eate Profile View Cancel | Help     |

16. Accept the default in the **Profile View Height** panel. Click the **Next** button.

| General                 | Specify pr | ofile display | options:  |          |             |        |            |          |         |
|-------------------------|------------|---------------|-----------|----------|-------------|--------|------------|----------|---------|
| Station Range           | Name       | Draw          | Clip Grid | Split At | Description | Туре   | Data Sou   | . Offset | Update  |
| Profile View Height     | SR61_Fi    | . 🔽           | ۲         | ۲        |             | $\sim$ | SR61_Final | 0.00'    | Dynamic |
| Profile Display Options |            |               |           |          |             |        |            |          |         |
| Pipe/Pressure Network   |            |               |           |          |             |        |            |          |         |
| Data Bands              |            |               |           |          |             |        |            |          |         |
| Profile Hatch Options   |            |               |           |          |             |        |            |          |         |
| Frome fraterroptions    |            |               |           |          |             |        |            |          |         |
|                         |            |               |           |          |             |        |            |          |         |
|                         |            |               |           |          |             |        |            |          |         |
|                         |            |               |           |          |             |        |            |          |         |
|                         |            |               |           |          |             |        |            |          |         |
|                         |            |               |           |          |             |        |            |          |         |
|                         | •          |               | 111       |          |             |        |            |          |         |

| General<br>Station Range | Select parts from screen                         |        |
|--------------------------|--|--------|
| Profile View Height      | Name   | Select |
| Profile view fielding    | Proposed Drainage – SR61                         |        |
| Profile Display Options  |  | Ves    |
|                          | - Ø PIPE-(5)                                     | Ves    |
| Pipe/Pressure Network    | PIPE-(6)   | Ves    |
| Data Bands               | - 6 PIPE-(16)                                    | Ves    |
| Data Danus               | S-(16)   | Ves    |
| Profile Hatch Options    | - 🛱 S-(1)  | Ves    |
|                          | S-(13)   | Ves    |
|                          | S-(12)   | Ves    |
|                          | Show only parts selected to draw in profile view |        |

17. Accept the defaults in the Profile Display Options panel. Click the Next button

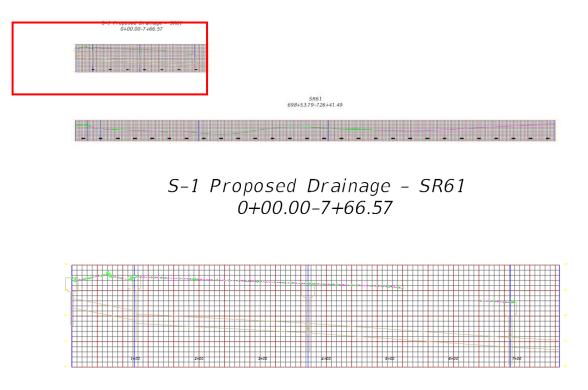
18. The Pipe/Pressure Network panel shows the pipes and structures to be displayed in the Profile View. Review and keep all selections checked as shown below. Click the Next button.

| Create Profile View - Data Bands   |  |   |                                       |                            |                           | ×                |
|--|--|---|---------------------------------------|----------------------------|---------------------------|------------------|
| General<br>Station Range<br>Profile View Heicht<br>Profile Display Options<br>Pipe/Pressure Network<br>Data Bands<br>Profile Hatch Options | Select band set:<br>The FDOT 10x VExa<br>Some of the c<br>lines groups of<br>List of bands<br>Location:<br>Bottom of profile | data bands need to l<br>or materials). Please | e associated wit<br>select them below | h appropriate data         | -<br>                     | profiles, sample |
|  | Set band propertie<br>Band Type<br>Profile Data  | Style<br>FDOT 10x VExage                      | Profile1<br>SR61_Final (7)            | Profile2<br>SR61_Final (7) | Alignment<br>S-1 Proposed | Geometry Points  |
|  |  |   |                                       |                            |                           |                  |
|  |  | < Back  | Next >                                | Create Profile Vi          | ew Cance                  | l Help           |

19. In the Data Bands panel click the FDOT 10x VExagg Stations style from the Select band set drop down list. Click the Next button

| General  | Cut Area:            |            | 4 🗙     |             |
|--|----------------------|------------|---------|-------------|
| Station Range<br>Profile View Height                           |                      | Hatch Area | Profile | Shape Style |
| Profile Display Options<br>Pipe/Pressure Network<br>Data Bands | Fill Area:           |            |         |             |
| Profile Hatch Options  | Multiple boundaries: |            |         |             |
|  | From criteria:       |            |         |             |
|  |                      |            |         |             |

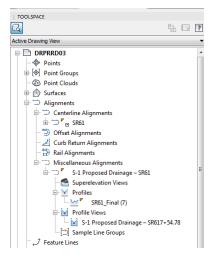
- 20. Accept the defaults in the Profile Hatch Options panel and select Create Profile View.
- 21. In model space pick the *insertion point* for the S-1 Proposed Drainage-SR61 Profile View. The insertion point is the lower left corner of the Profile View grid. Place the S-1 Proposed Drainage-SR61 Profile View above the SR61 Profile View as shown below.



22. Zoom in to the S-1 Proposed Drainage – SR61 Profile View. The SR61 Surface Profile and the Proposed Drainage Network parts created from the Alignment are displayed.

*Note* Correcting the pipe invert elevations will be done in a later process

- Review S-1 Proposed Drainage SR61 Alignment Profiles and Profile Views
- 1. From the *TOOLSPACE* > *Prospector tab* > *Alignments* > *Miscellaneous Alignments*, expand S-1 Proposed Drainage SR61, then expand both Profiles and Profile Views.



*Note* Profiles and Profile Views are child objects of the Alignment and are therefore displayed in the hierarchy below the Alignment name.

#### > Create Additional Alignments with Profile Views

1. Using steps above, create an alignment along with a profile view and place them in model space for the following network parts

| Alignment Path             | Parts Included                             |
|----------------------------|--|
| From S-(2) to S-(13)       | S-(2), S-(3), S-(13)                       |
| From S-(4) to S-(3)        | S-(4), S-(3)                               |
| From S-(5) to Outfall Pipe | S-(5), S-(6), S-(12), Outlet Pipe          |
| From S-(7) to Outfall Pipe | S-(7), S-(6), S-(12), Outlet Pipe          |
| From S-(8) to S-(11)       | S-(8), S-(11)                              |
| From S-(9) to Outfall Pipe | S-(9), S-(10), S-(11), S-(12), Outlet Pipe |

2. When complete review your drawing which should match the image below.

| S-1 Proposed Drainage - SR61<br>0+00.00-7+66.57 | 5-2 Proposed Drainage - SR61<br>0+00.00-1+37.12 | 5-4 Proposed Drainage - SR61<br>0+00.00-0+74.45 | 5-5 Proposed Drainage - SR6<br>0+00.00-2+17.76 | 1<br>5-7 Proposed Drainage - SR61<br>0+00.00-1+86.68 | 5-8 Proposed Drainage - SR61<br>0+00.00-0+51.98 | S-9 Proposed Drainage - SR61<br>0+00.00-3+40.44 |
|---|---|---|--|--|---|---|
|   |   |   |  |  |   |   |
|   | 698   | 5R61<br>+53.79-726+41.49                        |  |  |   |   |
|   |   |   |  |  |   |   |

3. Save 🗐 the *DRPRRD03.dwg* file before continuing to the next exercise.

## **Exercise 9.2** Set Display to Show Both Profile and Plan View

Now you will set your display to conveniently show both the profile and plan views in model space in two horizontal views.

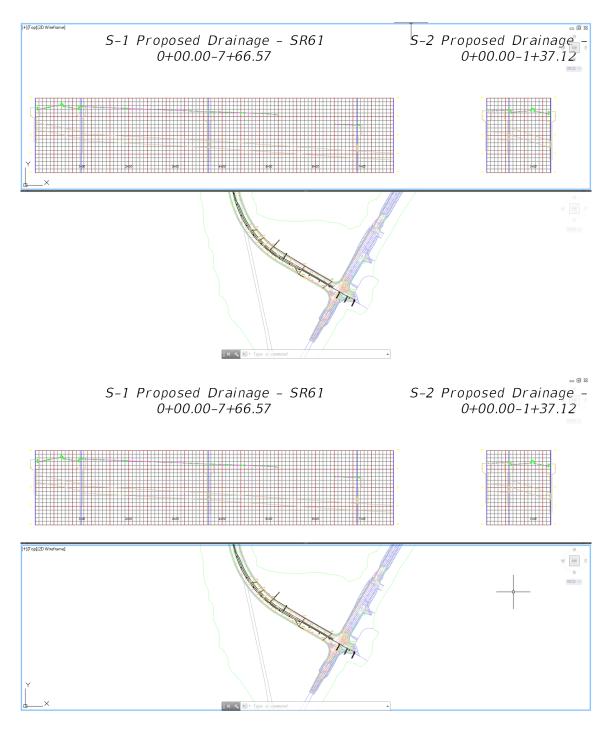
1. From the *View tab > Model Viewports > Viewport Configuration dropdown*, select **Two Horizontal**.



2. Review your Drawing Space which should look like image below.



3. Click in **top Viewport** to make active, then **Zoom** and **Pan** to display the **S-1 Proposed Drainage Profile View.** 



4. Click **bottom Viewport** to make active, then **Zoom** and **Pan** to show both **structures S-(1)** and the **Outfall PIPE-(6)**. Your drawing should look like the image above.

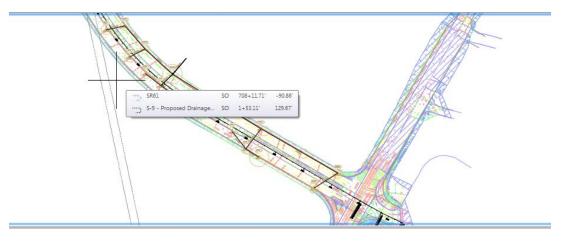
### **Exercise 9.3** Use the 2 Point Twist to Rotate the Plan View

Next, you will use the 2 Point Twist command to rotate the plan view. This command rotates your drawing in model space to align parallel with your drawing screen. It mimics a sheet layout and is used to label objects.



1. From the *FDOT tab* > *Tools panel*, select **2 Point Twist** command.

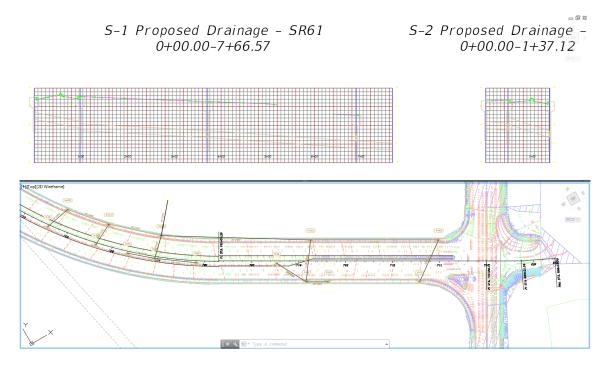
*HINT* If you cannot see the FDOT tab, try typing FDOTRIBBON on the command line and Press ENTER key



>> Specify start point (left):

2. The command prompt asks you to pick the **left location point**. Use the **Alignment** as your pick object. Select anywhere on the Alignment for the left side and anywhere to the right of the first pick point along the Alignment to complete the command.

3. Review your drawing which should look like the image below where the Plan View is parallel to your Viewport.



4. Save the *DRPRRD03.dwg* file.

### **Exercise 9.4** Insert the Extend Alignment.dwg file

In the next steps, you will insert the Extend Alignment.dwg file using Block Insert

A file named Extend Alignment.dwg has been created for you. The Extend Alignment.dwg contains AutoCAD points to be inserted into the *DRPRRD03.dwg*. These AutoCAD points will be used in the later process of extending the miscellaneous alignments that have been created from the Proposed Drainage – SR61 Pipe Network's Structures and Pipes.

1. Continue working with the drawing from the previous task

<OR>

Close the *DRPRRD03.dwg* and open the Chapter 9 - DRPRRD03 - Completed - 9.1A.dwg from: *C:\Civil 3D Projects\22049555201\Drainage\complete.* 

2. Execute a **Save As** using *DRPRRD03.dwg* as the file name to:

C:\Civil 3D Projects\22049555201\Drainage.

- 3. When prompted click **Yes** to replace existing *DRPRRD03.dwg*.
- 4. Type **I** for insert on the command line.
- 5. From the Insert dialog box click on Browse.

| Name: ClosedBlank                 | ▼ Brov                     | se  |         |
|-----------------------------------|----------------------------|---|---------|
| Path:                             | c Data                     | Opens the Select Drawing File dialog box (<br>where you can select a block or drawing fil |         |
| Insertion point Specify On-screen | Scale<br>Specify On-screen | Rotation  |         |
| ×: 0                              | X: 1                       | Angle: 0  |         |
| Y: 0                              | Y: 1                       | Block Unit  |         |
| Z: O                              | Z: 1                       | Unit: Unitless  | And and |
|                                   | Uniform Scale              | Factor: 1   |         |
| Explode                           | ОК                         | Cancel Help   | tittt   |

6. From the Select Drawing File dialog, navigate to: C:\Civil 3D Projects\22049555201\Drainage.

| A Select Drawing File |                                 |     |                    | ×                                  |
|-----------------------|---------------------------------|-----|--------------------|------------------------------------|
| Look in:              | 🔐 Drainage 👻                    | ∉ [ | 🕽 🔍 🗙 🖡            | 📮 <u>V</u> iews 🕶 Too <u>i</u> s 🕶 |
|                       | Name                            | D   | at, Preview        |                                    |
|                       | 📕 c3d                           | 1/  | /12                |                                    |
| Drainage              | li complete                     | 1/  | /12                |                                    |
|                       | 퉬 dem data                      | -   | /12                |                                    |
|                       | 퉬 dgn                           | -   | /12                | teles est                          |
| Roadway               | 🎉 eng_data                      | -   | /12                |                                    |
|                       | 🌽 ssa                           | -   | /12                |                                    |
|                       | DRMPRD01.dwg                    | -   | /11                |                                    |
| Survey                | DRPRRD01.dwg                    | -   | /11                |                                    |
|                       | DRPRRD02.dwg                    |     | /1:                |                                    |
|                       | DRPRRD03.dwg                    |     | /14                |                                    |
| 22049555201           | Extend Alignment.dwg            |     | /1:                |                                    |
|                       | Inlet Placement.dwg             |     | /1(<br>2/ <u>5</u> |                                    |
|                       | Water Drop.dwg                  | 1.  | 2/5                |                                    |
| Civil 3D Proj         |                                 |     |                    |                                    |
|                       |                                 |     |                    |                                    |
|                       | •                               |     | •                  |                                    |
| Downloads             |                                 |     |                    |                                    |
| <b>S</b>              | File name: Extend Alignment.dwg |     |                    | ▼ <u>O</u> pen ▼                   |
| History 🖕             | Files of type: Drawing (*.dwg)  |     |                    | Cancel                             |

7. Select Extend Alignment.dwg, then click Open to close the Select Drawing File dialog box.

| A Insert   |                 | X                          |  |  |
|--|-----------------|----------------------------|--|--|
| Name: Extend Alignme   | ent 🔻 Brows     | se                         |  |  |
| Path: C:\Civil 3D Projects\22049555201\Drainage\Extend Align  Locate using Geographic Data |                 |                            |  |  |
| Insertion point Specify On-screen  | Scale           | Rotation Specify On-screen |  |  |
| X: 0   | X: 1            | Angle: 0                   |  |  |
| Y: 0   | Y: 1            | Block Unit                 |  |  |
| Z: 0   | Z: 1            | Unit: Feet                 |  |  |
|  | ✓ Uniform Scale | Factor: 1                  |  |  |
| Explode  | ОК              | Cancel Help                |  |  |

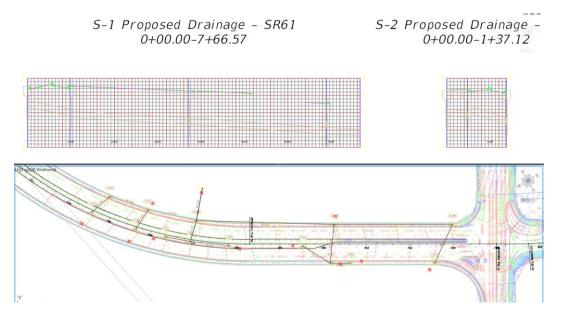
8. From the Insert dialog box, Uncheck *Insertion Point, Scale,* and *Rotation* boxes, Check *Explode* box, then click OK to close the Insert dialog box.

#### > Set PDMODE to 34

To view the AutoCAD Points to be used in the next process of Extending Alignments the Point Display Mode PDMODE must be set. PDMODE controls the size of AutoCAD Points which can be increased or decreased, to be better seen in the drawing.

PDMODE Enter new value for PDMODE <0>: 34

- 1. From the command line: Type: **PDMODE**, then press **ENTER**.
- 2. From the command line: Type: 34, then press ENTER again.



- 3. Review the results of inserting the *Extend Alignment.dwg* file and setting *PDMODE* to 34.
- 4. Save and Close the *DRPRRD03.dwg* file.

## **10** EXTEND ALIGNMENTS

## DESCRIPTION

In this chapter, you will review the changes made to the profile views in the previous chapter. With the addition of new alignments and a reconfigured layout of structures and pipes you used to create the new profile views, you will need to extend the profile view grids so the structures and pipes are entirely within the grid in each of the profile views.

## **OBJECTIVES**

In this chapter, you will learn about:

• Editing Alignment Geometry to Extend the Profile View

## CHAPTER SETUP

Run the Chapter 10 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

## **Exercise 10.1** Extend Alignments in Profile Views

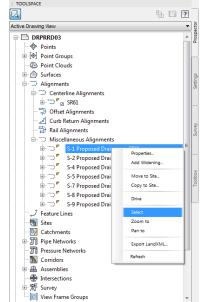
In the next few steps you will extend the Alignment at both ends in Plan View.

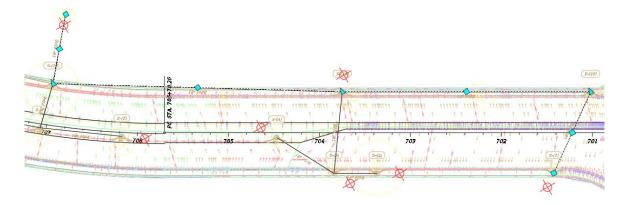
This will extend the Profile View grid so the structures and pipes are entirely within the grid on the Profile View.

#### > Extend the S-1 Proposed Drainage – SR61 alignment

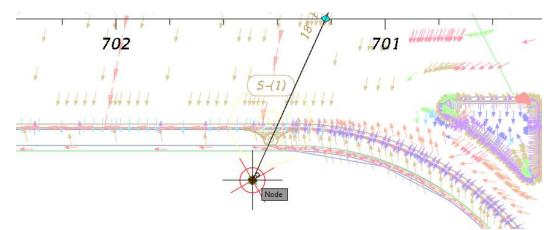
- 1. Start the FDOT Civil 3D State Kit and open the **DRPRRD03.dwg** located in the *Chapter 10* dataset drainage folder.
- 2. From the *TOOLSPACE > Prospector tab*, expand **Alignments**, expand **Miscellaneous Alignments**.

3. Right click on the S-1 Proposed Drainage - SR61 Alignment and choose Select.



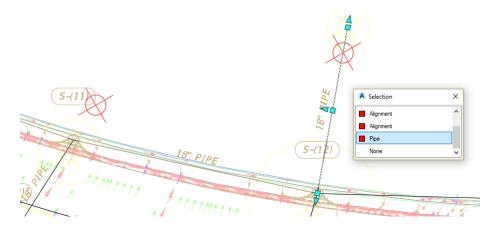


4. Grips display on the selected S-1 Proposed Drainage - SR61 Alignment. Zoom in to structure S-(1).

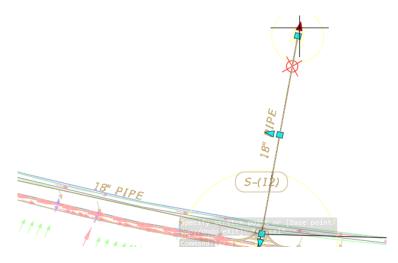


- 5. Select the grip at the end of the *structure* S-(1), then using a Node Object Snap, click on the AutoCAD Point as displayed above.
- 6. Press **ESC** to clear the grips. By extending the S-1 Proposed Drainage SR61 Alignment in the S-1 Proposed Drainage-SR61 Profile View, the structure S-(1) is displayed fully in the S-1 Proposed Drainage-SR61 Profile View grid.

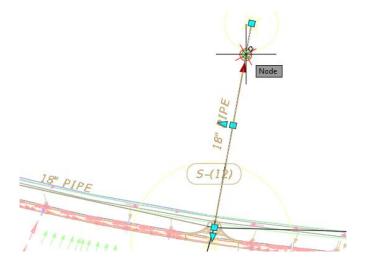
## **Exercise 10.2** Shorten the Outfall PIPE-(6) Pipe



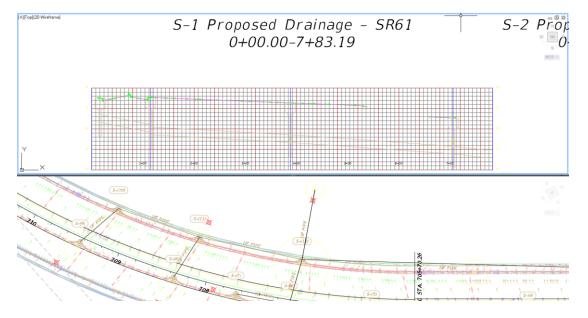
- 1. **Zoom** and **Pan** to display the **Outfall pipe PIPE-(6)**. Since all the alignments terminate at the Outfall Pipe it is easier to change 1 pipe rather than 7 alignments.
- 2. Select the **PIPE-(6)** with no command active. From the **Selection** dialog box, select **Pipe**. *Grips* will display on the pipe object when selected.



3. Select the **triangle grip** to *lengthen* (in this case *shorten*) the pipe.



- 4. Using a Node Object Snap, select the AutoCAD Point as displayed above to make the PIPE-(6) shorter.
- 5. Press **ESC** to clear the grips.

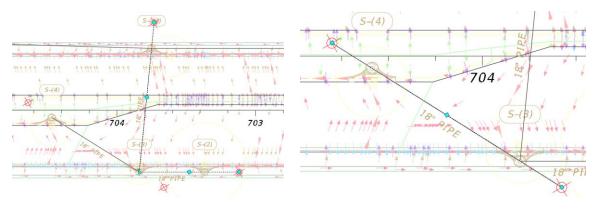


6. Review the shortened PIPE-(6) now displayed in the S-1 Proposed Drainage-SR61 Profile View.

#### Extend Additional Alignments

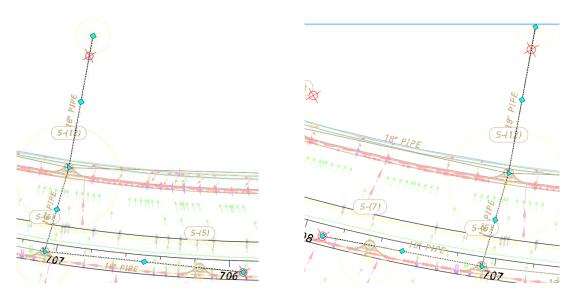
Using steps from exercise 10.1 above extend the Alignments to the **Red AutoCAD Points** for the following alignments. The images below show how the Alignments will look after adjustments.

| S-2 Proposed Drainage - SR61 | S-4 Proposed Drainage – SR61 |
|------------------------------|------------------------------|
| S-5 Proposed Drainage – SR61 | S-7 Proposed Drainage – SR61 |
| S-8 Proposed Drainage – SR61 | S-9 Proposed Drainage – SR61 |



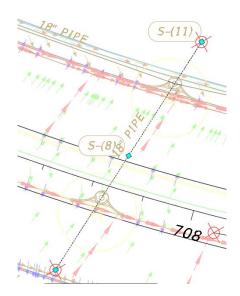
S-2 Proposed Drainage - SR61

S-4 Proposed Drainage – SR61

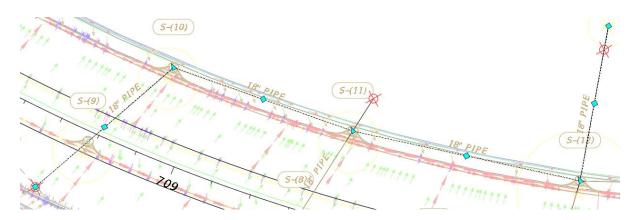


S-5 Proposed Drainage - SR61

S-7 Proposed Drainage - SR61



S-8 Proposed Drainage - SR61



S-9 Proposed Drainage - SR61

#### > Set PDMODE back to 0

The process of extending the Alignments has now been completed, the AutoCAD Points used in the process of extending the Alignments no longer need to be displayed. The Point Display Mode PDMODE must be set again.

- 1. From the command line Type: **PDMODE**, then press **ENTER**.
- 2. From the command line Type: 0, then press ENTER again.

PDMODE Enter new value for PDMODE <34>: 0

- 3. Setting *PDMODE* to **0** has now turned **Off** the displaying of the Red AutoCAD Points used for extending the Miscellaneous Alignments.
- 4. Save and Close the *DRPRRD03.dwg* file:

## **11** PIPE NETWORK LABELS

## DESCRIPTION

In this chapter, you will add various labels to Structures and Pipes in profile views. Labeling is a necessary step and FDOT has created Label styles that are contained in the State Kit to help your plans match standards. There are label styles specifically for Plan View, Profile View, & Section Views.

## **OBJECTIVES**

In this chapter, you will learn about:

• Adding Labels to Structures and Pipes in Profile Views

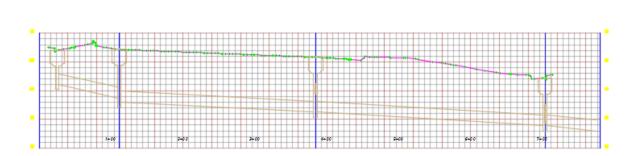
## **CHAPTER SETUP**

Run the Chapter 11 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

## **Exercise 11.1** Add Labels to the Drainage Profile Views

- 1. Start the FDOT Civil 3D State Kit and open the **DRPRRD03.dwg** located in the Chapter 11 dataset drainage folder.
- 2. Select the **top Viewport** to make it the active Viewport.
- 3. Pan to display the S-1 Proposed Drainage-SR61 Profile View.

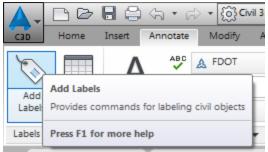


S-1 Proposed Drainage - SR61 0+00.00-7+79.78

4. Click in the **bottom Viewport** to make it the active Viewport.

5. Pan to display the S-1 Proposed Drainage-SR61 alignment.

|                      |   | sta √g<br>wcs ⇒ |
|----------------------|---|-----------------|
| (0, VIS<br>5-67)<br> | Image: 1         1< | 5-(18)          |



6. From the *Annotate tab* > *Labels panel*, click the top half of the **Add Labels** button.

| Add Labels                        | 🥑 ? 🗙 |
|-----------------------------------|-------|
| Feature:                          |       |
| Pipe Network                      | •     |
| Label type:                       |       |
| Entire Network Profile            | - 😼   |
| Pipe label style:                 |       |
| 🖓 FDOT Pipe Profile 🔹             |       |
| Structure label style:            |       |
| √ FDOT Structure-Profile          | 🚺 🗖   |
| Crossing pipe label style:        |       |
| √ Standard                        | 🗾 🗖   |
|                                   |       |
|                                   |       |
|                                   |       |
|                                   |       |
| Reference text object prompt meth | od:   |
| Dialog                            | -     |
| Add Close                         | Help  |
|                                   | //,   |

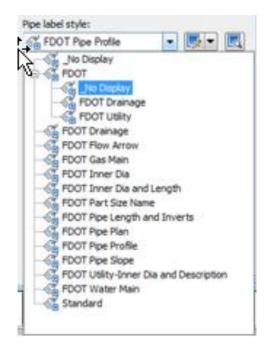
- 7. The Add Labels dialog box displays. Set the selections as indicated below:
  - a. From *Feature: drop down list*, select **Pipe Network**.

| Add Labels  | <i>9</i> ? × |
|---|--------------|
| Feature:  |              |
| Pipe Network  | ~            |
| Note<br>Line and Curve<br>Alignment<br>Parcel<br>Profile View<br>Section View<br>Surface<br>Pipe Network<br>Pressure Pipe Network<br>Intersection<br>Survey Figure<br>Catchment |              |

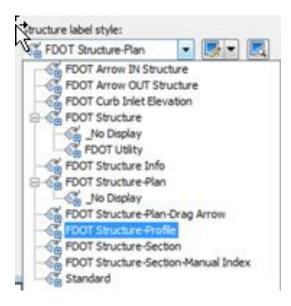
b. From the *Label type: drop down list*, select **Entire Network Profile**.

| Add Labels             | <i>S</i> ? X |
|------------------------|--------------|
| Feature:               |              |
| Pipe Network           | ~            |
| Label type:            |              |
| Entire Network Profile | ~ 😰          |
| Entire Network Plan    |              |
| Entire Network Profile |              |
| Entire Network Section |              |
| Single Part Plan       |              |
| Single Part Profile    |              |
| Single Part Section    |              |
| Spanning Pipes Plan    |              |
| Spanning Pipes Profile |              |
|                        |              |
| 🖓 Standard 🗸 🗸 🗸       |              |
|                        |              |

c. From the *Pipe label style: drop down list,* select **FDOT Pipe Profile**.

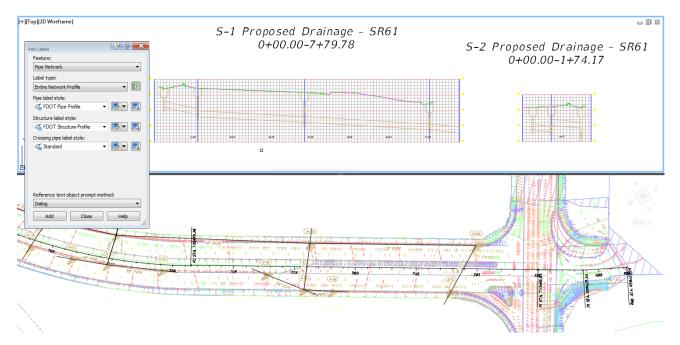


d. From the Structure label style: drop down list, select FDOT Structure-Profile.

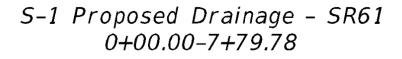


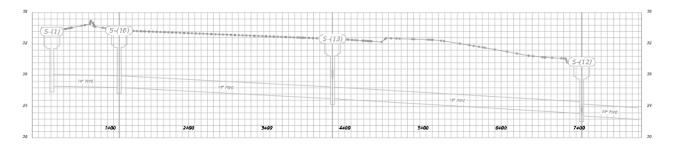
8. From the bottom of the Add Labels dialog box, click Add.

9. The command line prompts you to *Select a part (in profile view)*. Select the **top Viewport** to make it the active Viewport.



- 10. Select any Pipe or Structure from the S-1 Proposed Drainage-SR61 Profile View.
- 11. With *selection cycling* toggled **On** a **Selection** dialog box displays. In the **Selection** dialog box select **Pipe or Structure Profile**.





- 12. Labels are applied to structures and pipes in the S-1 Proposed Drainage-SR61 Profile View as shown above.
- 13. Using steps from the above exercise, **label** the remaining *Profile Views*. A list is provided below for reference.

| S-2 Proposed Drainage – SR61 |
|------------------------------|
| S-5 Proposed Drainage – SR61 |

- S-4 Proposed Drainage SR61 S-7 Proposed Drainage – SR61
- S-8 Proposed Drainage SR61
- S-9 Proposed Drainage SR61
- 14. Save and Close the *DRPRRD03.dwg* file.

# 12 ADJUST PIPE INVERTS & PIPE SLOPES

## DESCRIPTION

In this chapter, you will adjust Pipe Inverts and Pipe Slopes in Proposed Drainage - SR61 Profile Views. Civil 3D makes editing drainage networks easy, because of the many ways you can edit, such as editing the same network in the Plan View, Profile View, & Section View. The FDOT civil 3D State Kit contains default command settings that allow the user to layout and create Drainage Networks with FDOT Standards already in place, including Pipe Rules which control slope, cover, and run. The Structures contain rules that control sump, depth, and slope within structure. The user can add additional rules or edit the existing ones.

# **O**BJECTIVES

In this chapter, you will learn about:

- Understanding Structure & Pipe Rules
- Editing Pipe Inverts in Profile Views

# **CHAPTER SETUP**

Run the Chapter 12 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

# **ADJUSTING PIPE INVERTS AND PIPE SLOPES**

In the next few steps you will review how structures and pipes are placed based on FDOT pipe and structure rules.

Before you start the process of adjusting pipe inverts and pipe slopes displayed in any of the Proposed Drainage - SR61 Profile Views, you need to review how structures and pipes are placed based on FDOT pipe and structure rules located in the **FDOT Drainage** parts list within the template used to create a DRPRRD (Proposed Drainage) file.

### **REVIEW STRUCTURE AND PIPE RULES**

### STRUCTURE RULES

The Structure Rules and their description within the State Kit are as follows:

- **Pipe Drop Across Structure** This rule compares all pipes connected to a single structure and ensures that pipes enter and exit the structure at logical locations. For more information, see the About the Pipe Drop Across Structure Rule.
- **Drop Reference Location** Determines the drop location by using the pipe's invert, crown, or centerline elevation.
- **Drop Value** Specifies what the drop value is between the lowest incoming pipe and any outgoing pipe connected to the structure.
- **Maximum Drop Value** Specifies the maximum drop value between the lowest incoming pipe and any outgoing pipe connected to the structure. Note that this parameter provides validation only; it does not alter (move or resize) the part in the drawing in any way. It simply produces a rule violation on the part if the specified value is exceeded

| Parame        | eter                           | Value  |
|---------------|--------------------------------|--------|
| <u></u> ⊢ Se  | t Sump Depth                   |        |
|               | Sump Depth                     | 0.08'  |
| <u>⊨</u> . Ma | aximum pipe size check         |        |
|               | Maximum pipe diameter or width | 4.00'  |
| 🗄 - Pip       | pe Drop Across Structure       |        |
|               | Drop Reference Location        | Invert |
|               | Drop Value                     | 0.10'  |
|               | Maximum Drop Value             | 3.00'  |
|               |                                |        |

Default Structure Rules

### PIPE RULES

- **Minimum Maximum Slope -** Specifies the minimum slope of the pipe, expressed in percent. During layout, a pipe will be created per its minimum slope rule value. If the pipe is edited so that its slope is less than the minimum, you can still edit the pipe as desired, breaking the minimum slope rule, but a rule violation occurs for that object. If a pipe exceeds its maximum allowed slope it will give a warning icon telling you the rule was violated.
- **Minimum Maximum Length -** Specifies the minimum and maximum lengths allowed when laying out a drainage network. The length rules is either a single run of pipe or between structures, if the design violates either one of these rules a notification icon will display warning you of the violation.

| Param               | eter           | Value   |
|---------------------|----------------|---------|
| <mark>₽</mark> . Co | over and Slope |         |
|                     | Minimum Slope  | 1.00%   |
|                     | Maximum Slope  | 8.00%   |
|                     | Minimum Cover  | 3.00'   |
|                     | Maximum Cover  | 10.00'  |
| 🗄 - Le              | ngth Check     |         |
|                     | Maximum Length | 200.00' |
|                     | Minimum Length | 1.00'   |
|                     |                |         |

Default Pipe Rules

### RULES OF THUMB

When adjusting pipe inverts you need to apply some *Rules of Thumb* beyond the Pipe and Structure Rules that you just reviewed.

- Review the Profile View for Flow Continuity.
- Visually Inspect to Check for Adverse Slopes.
- Visually Inspect Each Structure to Check for Node Drop for the Outgoing Pipe.
- Make Note of the Changes Needed.
- Order any Edits from Downstream to Upstream.

### > Editing Structures Pipe Inverts:

- You have been working from Downstream to Upstream to make the elevations work. Changing the Out Invert could invalidate work you have already completed downstream.
- From the Structure Properties dialog box > Connected Pipes tab review Hold Out Invert.
- Set incoming inverts currently below Out Invert to 0.1 above Out Invert.
- Higher inverts of incoming pipes can be left unchanged.
- Ideally you should hold slopes of pipes being adjusted so you don't end up with odd values like 1.57% slope.
- In the Structure Properties dialog box, you can edit inverts of connected pipes but you cannot make edits to the slope value column in this dialog.

### > Edit Pipe Slopes:

- To edit pipe slopes, use the Pipe Properties dialog box.
- 1%, 2%, 0.5%, or 0.1% are examples of preferred values for pipe slopes because they are easier to layout during construction.
- Avoid odd slope values such as 1.81% for example.
- Make the mental math easier for determining feet per foot drop.

Example: For a 10' length of pipe at 2% what is the elevation drop? 2% is 2 feet per 100 feet. That makes it .2 feet in 10 feet.

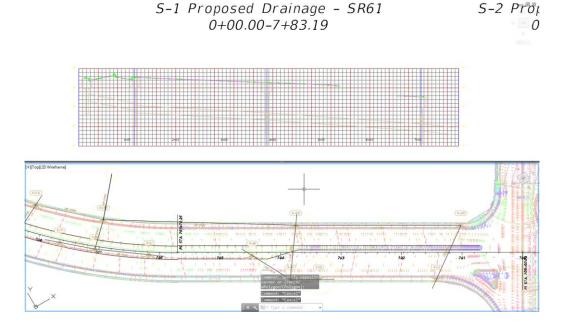
*Note* The above *Rules of Thumb* will be applied in the following adjustments in each of the Proposed Drainage - SR61 Profile Views that have been created for the project.

### **Exercise 12.1** Adjust Pipe Inverts & Slopes of Pipes Connected to Structures

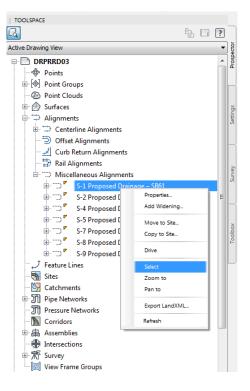
In the next few steps you will either adjust the pipe inverts elevations at a structure or adjust a pipe's slope where necessary in each of the Proposed Drainage - SR61 Profile Views.

The next exercise will show you how to adjust pipe inverts and slopes of the upstream and downstream pipes connected to structures displayed in the S-1 Proposed Drainage-SR61 Profile View.

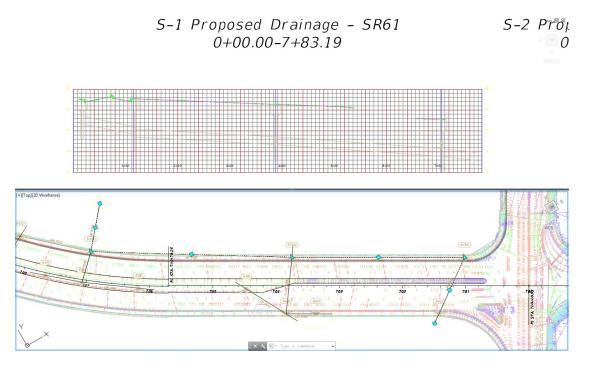
1. Start the FDOT Civil 3D State Kit and open the **DRPRRD03.dwg** located in the Chapter 12 dataset drainage folder.



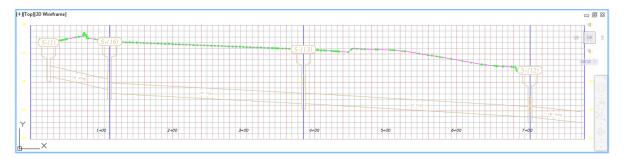
2. Select the **bottom Viewport** to make it the active Viewport as shown above.



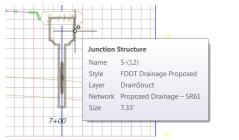
- 3. From the *TOOLSPACE* > *Prospector tab*, expand Alignments, expand Miscellaneous Alignments, right-click on S-1 Proposed Drainage SR61 and choose Select.
- 4. Zoom and Pan to display the S-1 Proposed Drainage SR61 Alignment.

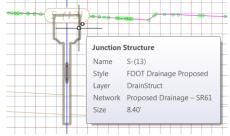


- 5. Select the **top Viewport** to make it the active viewport and Pan to display the S-1 Proposed Drainage-SR61 Profile View.
- 6. Press **ESC** to clear the grips. Do you see any **Adverse Slopes** in the *S-1 Proposed Drainage-SR61 Profile View?* No **Adverse Slopes** displayed, you can continue to the next step.



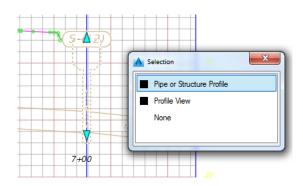
7. **Zoom in** closer to display the **Pipes** connected to the structures displayed the S-1 Proposed Drainage-SR61 Profile View. Do you see any **Outgoing Pipes** that may be equal to or higher than the *Incoming Pipes*? Yes, so you need to make a **list of Structures** to investigate.





*HINT* If you hover over a structure a tooltip is displayed listing the name of the structure.

8. Select structure S-(12).



- 9. With *selection cycling* toggled **On**, a **Selection** dialog box displays. In the **Selection** dialog box select **Pipe or Structure Profile**.
- 10. From the *Pipe Networks Proposed Drainage SR61 tab > Modify panel*, select **Structure Properties**.

| ▲. ▷ ▷ 문 🛢                     | i <a @o<="" th="" •="" ⊳=""><th>ivil 3D</th><th></th><th></th><th>/1 =</th><th></th><th></th><th></th><th></th><th></th><th>Autod</th><th>esk AutoCAD Ch</th><th>II 3D 2016</th><th>DRPRRD03.dwg [</th><th>2049555201]</th><th>manual lines.</th><th></th></a> | ivil 3D |                    |        | /1 =           |            |                                  |        |         |            | Autod                    | esk AutoCAD Ch        | II 3D 2016      | DRPRRD03.dwg [                         | 2049555201]               | manual lines.                      |                               |
|--------------------------------|--|---------|--------------------|--------|----------------|------------|----------------------------------|--------|---------|------------|--------------------------|-----------------------|-----------------|--|---------------------------|------------------------------------|-------------------------------|
| C3D Home Insert                | Annotate Modify  | Analyze | View               | Manage | Output         | Survey     | Autodesk 360                     | Help   | Add-ins | Featured ( | Apps Exp                 | oress Tools V         | ehicle Traci    | ing Bridge Mo                          | seler Geolos              | ation Pipe Netwo                   | rks: Proposed Drainage – SR61 |
| Add Add Reset<br>Labels Tables |  | Network | Pipe<br>Properties | Prog   | itructure Proj | perties    | nect Part                        | Spik / | . Non   |            | Draw Parts<br>in Profile | Interference<br>Check | Storm<br>Sewers | Edit in Storm and<br>Sanitary Analysis | Alignment<br>from Network | Storm Sewers  Hydrographs  Express |                               |
| Labels & Tables                | General Tools 👻  |         |                    |        |                |            |                                  |        |         |            | Tools                    |                       | Analyza         |  | La                        | unch Pad                           |                               |
| Start                          | DRPRRD03*  | × +     | 1                  |        |                |            | e of the struct<br>an also chang |        |         |            |                          |                       |                 |  |                           |                                    |                               |
| TOOLSPACE                      |  |         |                    | 1      | EditStruct     | tureProper | ties                             |        |         |            |                          | 10                    |                 |  |                           |                                    |                               |
|                                |  |         |                    |        | ress F1 for m  | ore help   |                                  |        |         |            | J                        |                       |                 |  |                           |                                    |                               |

11. From the Structure Properties - S-(12) dialog box, select the **Rules** tab. The Structure S-(12) values are within the desired limits.

|          | set:  |        |                 |        |
|----------|---|--------|-----------------|--------|
| 2        | FDOT Structures                             |        | ▼ ↓ ▼           |        |
| Us       | se values from rule set                     |        |                 |        |
| Par      | ameter                                      | Value  | Structure Value | Status |
| <b>-</b> | Set Sump Depth                              |        |                 |        |
|          | Sump Depth                                  | 0.08'  | 0.08'           |        |
| ÷        | Maximum pipe size check                     |        |                 |        |
|          | Maximum pipe diameter or width              | 4.00'  | 1.50'           |        |
| <u> </u> | Pipe Drop Across Structure                  |        |                 |        |
|          | <ul> <li>Drop Reference Location</li> </ul> | Invert |                 |        |
|          | Drop Value                                  | 0.10'  |                 |        |
|          | Maximum Drop Value                          | 3.00'  | 0.00'           |        |
|          |   |        |                 |        |
|          |   |        |                 |        |
|          |   |        |                 |        |
|          |   |        |                 |        |

12. From the Structure Properties - S-(12) dialog box, select the Connected Pipes tab. This tab displays the pipes connected to structure S-(12).

|           | 1          |   |                                  |   |   |   |  | Crown   |  | In/Out   | From S.  |
|-----------|------------|---|----------------------------------|---|---|---|--|---|--|--|--|
|           |            |   |                                  |   |   |   |  |   |  |  |  |
| PIPE-(5)  | <b>1</b> 2 | Round Concrete Pipe   | 18.00"                           |   |   | 23.12'                                  | 23.87'   | 24.62'  | 0.59%  | In   | S-(13)   |
| PIPE-(6)  | <b>V</b> 0 | Round Concrete Pipe   | 18.00"                           |   |   | 23.12'                                  | 23.87'   | 24.62'  | -1.07%   | Out  |  |
| PIPE-(8)  | <b>V</b> 0 | Round Concrete Pipe   | 18.00"                           |   |   | 24.55'                                  | 25.30'   | 26.05'  | 1.00%  | In   | S-(6)  |
| PIPE-(10) | 🖋 0        | Round Concrete Pipe   | 18.00"                           |   |   | 23.49'                                  | 24.24'   | 24.99'  | 2.00%  | In   | S-(11)   |
|           |            |   |                                  |   |   |   |  |   |  |  |  |
|           | PIPE-(8)   | PIPE-(6)         ✓ 0           PIPE-(3)         ✓ 0           PIPE-(10)         ✓ 0 | PIPE-(8) 🖋 0 Round Concrete Pipe | PIPE-(8) 🖋 0 Round Concrete Pipe 18.00" | PIPE-(8) 🖋 0 Round Concrete Pipe 18.00" | PIPE-(8) ✔ 0 Round Concrete Pipe 18.00" | PIPE-(8) 🖋 0 Round Concrete Pipe 18.00" 24.55' | PIPE-(8) ✔ 0 Round Concrete Pipe 18.00" 24.55' 25.30' | PIPE-(8)         ✓ 0         Round Concrete Pipe         18.00"         24.55'         25.30'         26.05' | PIPE-(8)         ✓ 0         Round Concrete Pipe         18.00"         24.55'         25.30'         26.05'         1.00% | PIPE-(8) ✔ 0 Round Concrete Pipe 18.00" 24.55 25.30 26.05 1.00% In |

- a. Review the Structure's connected Pipes and their data to make a list of required adjustments.
- b. Review the PIPE-(6) Outgoing Pipe Invert value and hold the current **Invert Elevation** of **23.12** for PIPE-(6), the Outgoing pipe.

| Name          | Status   | Description         | Inner D | In | Inner H | Invert El | Centerl | Crown  | Slope  | In/Out | From S. |
|---------------|----------|---------------------|---------|----|---------|-----------|---------|--------|--------|--------|---------|
| 🖃 🌍 S-(12)    | <b>V</b> |                     |         |    |         |           |         |        |        |        |         |
| ···· 🥟 PIPE-( | 5) 🏑 2   | Round Concrete Pipe | 18.00"  |    |         | 23.22     | 23.87'  | 24.62' | 0.59%  |        |         |
| PIPE-(        | 6) ✔ 0   | Round Concrete Pipe | 18.00"  |    |         | 23.12'    | 23.87'  | 24.62' | -1.07% | Out    |         |
| PIPE-         | 8) 🗹 0   | Round Concrete Pipe | 18.00"  |    |         | 24.55'    | 25.30'  | 26.05' | 1.00%  | In     | S-(6)   |
| Ø PIPE-(      | 10) 🖋 0  | Round Concrete Pipe | 18.00"  |    |         | 23.49'    | 24.24'  | 24.99' | 2.00%  | In     | S-(11)  |
|               |          |                     |         |    |         |           |         |        |        |        |         |
|               |          |                     |         |    |         |           |         |        |        |        |         |

- c. PIPE-(5) and PIPE-(6) have the same invert elevations. PIPE-(5) must be 23.22 or greater to meet the node drop requirement of 0.1'. Adjust the **Invert Elevation** for Pipe-(5) to **23.22**
- *Note* Based upon the Rules of Thumb being followed, PIPE-(5) needs the slope adjusted from 0.59% to 0.5%. But this adjustment cannot be done from the Structure Properties S-(12) dialog box, it must be done by editing the PIPE-(5) properties.
  - 13. Click Apply then OK to close the Structure Properties S-(12) dialog box.

> Edit PIPE-(5) Pipe Properties

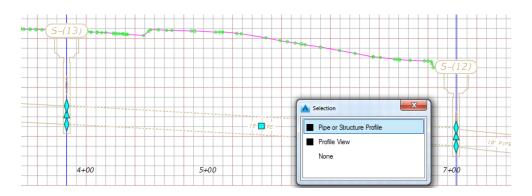
- Pipe
   12: P/DE

   Pipe
   12: P/DE

   Variable
   Size

   13: Pipe

   14: PO
- 1. **Zoom** and **Pan** in the Profile View to display **structures S-(13)** and **S-(12)**. Hover over the pipe that is between the structures to display a tooltip listing the pipe as **PIPE-(5)**



2. Select **PIPE-(5)**. With *selection cycling* toggled On, a Selection dialog box displays. In the Selection dialog box select **Pipe or Structure Profile**.

*HINT* Notice the Ribbon changes to a context sensitive state displaying the commands relevant to the selected object.

| ▲, ▷ > 8 8                     | )<br>(A • A • ∰                               | Civil 3D              |       | -               | / =    |        |   |         |         |
|--------------------------------|---|-----------------------|-------|-----------------|--------|--------|---|---------|---------|
| C3D Home Insert                | Annotate Modif                                | y Analyze             | Vie   | w Manage        | Output | Survey | Autodesk 360                              | Help    | Add-ins |
| Add Add Reset<br>Labels Tables | Properties Object Viewer Viewer Viewer Viewer | Network<br>Properties | Prope | Pipe Properties |        | 0      | q   | Split N | etwork  |
| Labels & Tables Start          | General Tools 👻<br>DRPRRD03*                  | × +                   |       |                 |        |        | e object, descripti<br>Ige part propertie |         |         |
|                                |   |                       | E     | EditPipePro     | -      |        |   |         |         |
| Active Drawing View            |   |                       |       | •               | ê I    |        |   |         |         |

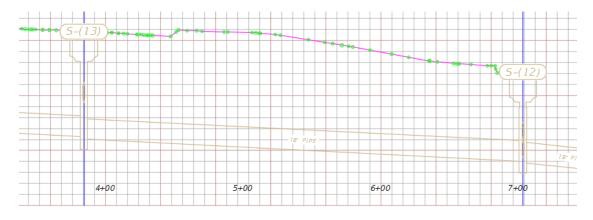
3. From the *Pipe Networks Proposed Drainage - SR61 tab > Modify panel*, select **Pipe Properties**.

| Pipe Properties            | Value           | - |
|----------------------------|-----------------|---|
| General                    |                 |   |
| Pipe Flow Direction Method | Start to End    |   |
| Flow Direction             | Start to End    | = |
| Reference Surface          | SR61_Final      |   |
| Reference Alignment        | SR61            |   |
| Geometry                   |                 |   |
| Start Structure            | S-(13)          |   |
| End Structure              | S-(12)          |   |
| Bearing                    | N 58° 19' 25" W |   |
| Start Station              | 703+75.00'      |   |
| End Station                | 707+00.00'      |   |
| Start Offset               | 38.50'          |   |
| End Offset                 | 38.66'          |   |
| Pipe Slope (Hold Start)    | -0.56%          |   |
| Pipe Slope (Hold End)      | .5              |   |
| Slope                      | 0.56%           |   |
| Start Invert Elevation     | 25.00'          |   |
| End Invert Elevation       | 23.22'          |   |
| Start Crown Elevation      | 26.50'          | - |

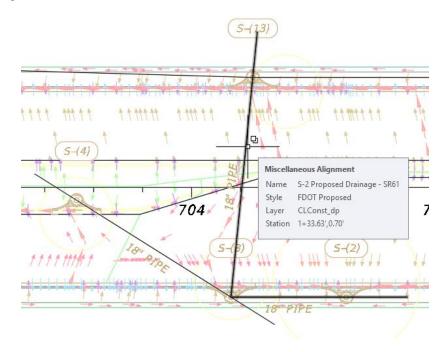
4. From the Pipe Properties - PIPE-(5) dialog box, select the Part Properties tab.

| Pipe | e Properties               | Value           | 4 |
|------|----------------------------|-----------------|---|
| ⊟ (  | General                    |                 |   |
|      | Pipe Flow Direction Method | Start to End    |   |
|      | Flow Direction             | Start to End    |   |
|      | Reference Surface          | SR61_Final      |   |
|      | Reference Alignment        | SR61            |   |
| Ξ (  | Geometry                   |                 | _ |
|      | Start Structure            | S-(13)          |   |
|      | End Structure              | S-(12)          |   |
|      | Bearing                    | N 58° 19' 25" W |   |
|      | Start Station              | 703+75.00'      |   |
|      | End Station                | 707+00.00'      |   |
|      | Start Offset               | 38.50'          |   |
|      | End Offset                 | 38.66'          |   |
|      | Pipe Slope (Hold Start)    | -0.50%          |   |
|      | Pipe Slope (Hold End)      | 0.50%           |   |
|      | Slope                      | 0.50%           |   |
|      | Start Invert Elevation     | 24.81'          |   |
|      | End Invert Elevation       | 23.22'          |   |
|      | Start Crown Elevation      | 26.31'          | • |

- 5. Adjust the *Pipe Slope (Hold End) value* to **0.5%**. By adjusting the Pipe Slope (Hold End) value you are modifying the elevation of the Start Invert. A positive slope value indicates the direction is uphill.
- 6. Press **ENTER** to complete the adjustment, then click **Apply**. The values for both Hold End and Hold Start are recalculated and displayed.
- 7. Click **OK** to close the Pipe Properties PIPE-(5) dialog box. The PIPE-(5) adjusted slope now displays.



8. The S-2 Proposed Drainage - SR61 Alignment intersects with the S-1 Proposed Drainage - SR61 Alignment S-1 at structure S-(13). You will review this in the next exercise.

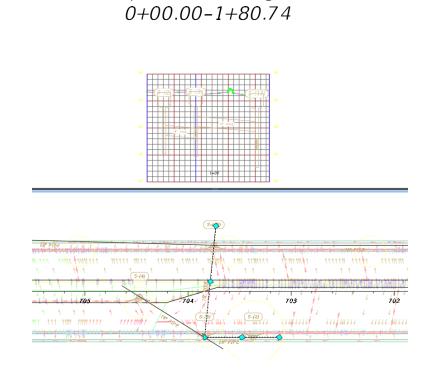


9. Save the *DRPRRD03.dwg* before continuing.

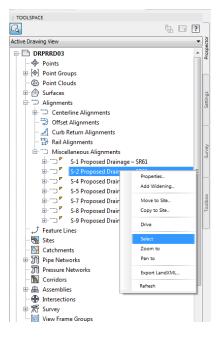
# **Exercise 12.2** Adjust Pipe Inverts & Slopes of Upstream/Downstream Pipes Connected to Structures

The next steps will show you how to adjust pipe inverts and slopes of the upstream and downstream pipes connected to structures displayed in the S-2 Proposed Drainage - SR61 Profile View.

S-2 Proposed Drainage - SR61



1. Select the **bottom Viewport** to make it the active Viewport.

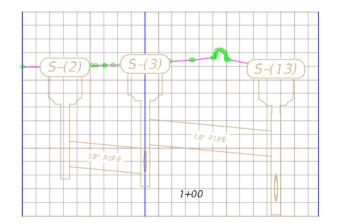


2. From the *TOOLSPACE > Prospector tab*, expand Alignments, expand Miscellaneous Alignments, right-click on S-2 Proposed Drainage - SR61 and click Select.

- 3. Zoom and Pan to display the S-2 Proposed Drainage SR61 Alignment.

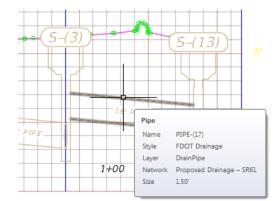
S-2 Proposed Drainage - SR61 0+00.00-1+80.74

- 4. Select the **top Viewport** to make it the active Viewport. **Pan** to display the **S-2 Proposed Drainage - SR61 Profile View**. Press **ESC** to clear the grips.
- 5. Do you see any **Adverse Slopes** in the S-2 Proposed Drainage SR61 Profile View? No adverse slopes displayed, you can continue to the next step.



6. **Zoom in** closer to display the **Pipes** connected to the structures displayed the S-2 Proposed Drainage - SR61 Profile View.

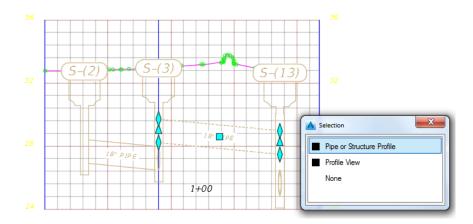
7. Do you see any **Outgoing Pipes** that may be equal to or higher than the *Incoming Pipes*? Yes, so you need to make a **list of Structures** to investigate.



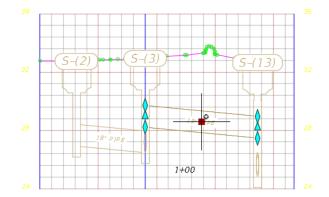
- 8. Hover over the Pipe that is between structure S-(3) and S-(13) to display a tooltip listing the Pipe as **PIPE-(17).**
- 9. PIPE-(17) needs to be **lowered** to meet the *Incoming Pipe* requirements for structure S-(13) and the *Outgoing Pipe* requirements for structure S-(3). After PIPE-(17) has been adjusted investigate the structure S-(3) properties.

### > Adjust PIPE-(17)

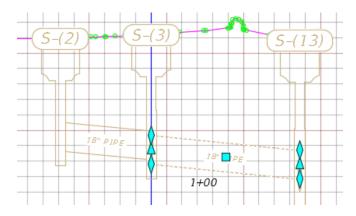
The next steps will show you how to adjust PIPE-(17) by using grips to move PIPE-(17) to lower location.



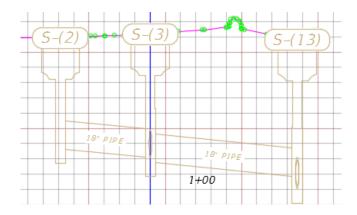
1. Select **PIPE-(17).** With *selection cycling* toggled On, a Selection dialog box displays. In the Selection dialog box select **Pipe or Structure Profile**.



2. Select the middle **square grip** of PIPE-(17) to maintain the slope while moving the pipe vertically downward.



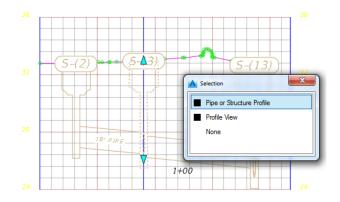
3. **Zoom in** closer as you *grip edit* to confirm placement at the upstream end of the pipe just below the incoming pipe at structure S-(3) and above the outgoing pipe at structure S-(13).



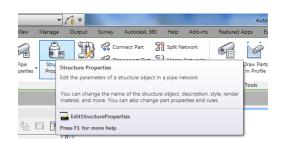
4. Move the grip downward, at the *command prompt* Type **20** and then press **ENTER** to move the PIPE-(17) downward 20'. Press **ESC** to clear grips

### **Exercise 12.3** Edit the Structure Properties

At this position, the upstream end of pipe PIPE-(17) is below the incoming pipe at structure S-(3). The next steps will show you how to Edit the Structure Properties of structure S-(3) to see if the invert elevations meet our requirements.



- 1. Select structure S-(3). With *selection cycling* toggled On, a Selection dialog box displays. In the Selection dialog box select Pipe or Structure Profile.
- 2. From the Pipe Networks Proposed Drainage SR61 tab >Modify panel, select Structure Properties.



| Name      | Status   | Description         | Inner D | In | Inner H | Invert El | Centerl | Crown  | Slope  | In/Out | From S |
|-----------|----------|---------------------|---------|----|---------|-----------|---------|--------|--------|--------|--------|
| 🖃 🛱 S-(3) | <b>V</b> |                     |         |    |         |           |         |        |        |        |        |
| PIPE-     | 2) 🖋 0   | Round Concrete Pipe | 18.00"  |    |         | 26.46'    | 27.21'  | 27.96' | 1.00%  | In     | S-(2)  |
| - PIPE-   | 3) ✔ 0   | Round Concrete Pipe | 18.00"  |    |         | 26.46'    | 27.21'  | 27.96' | -1.00% | Out    | S-(4)  |
| PIPE-     | 17) 🖋 0  | Round Concrete Pipe | 18.00"  |    |         | 26.23'    | 26.98'  | 27.73' | -1.00% | Out    | S-(13) |
|           |          |                     |         |    |         |           |         |        |        |        |        |

3. From the Structure Properties - S-(3) dialog box, select the Connected Pipes tab. This tab displays the pipes connected to the structure S-(3).

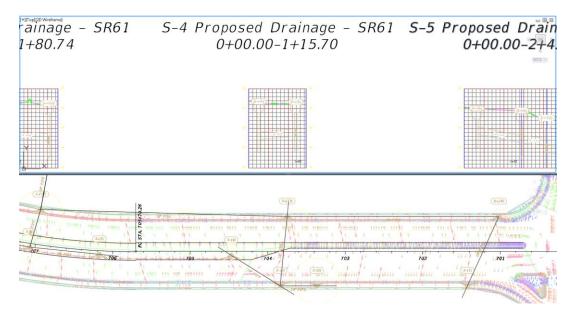
- A Structure Properties - S-(3) Information Part Properties Connected Pipes Rules Name Status Description Inner D... In... Inner H... Invert El... Centerl... Crown Slope In/Out From S.. 🖃 🎒 S-(3) 🥏 PIPE-(2) ✔ 0 Round Concrete Pipe 18.00" 26.46 27 21' 27.96' 1.00% In S-(2) PIPE-(3) 0 Round Concrete Pipe 18.00" 26.46' 27.21' 27.96 -1.00% Out S-(4) PIPE-(17) 0 Round Concrete Pipe 18.00" 26.23' 26.98 27.73 -1.00% Out S-(13) OK Cancel Apply Help
- 4. Review the Structure S-(3) connected Pipes data and make a list of required adjustments.

- 5. Review the PIPE-(17) Outgoing Pipe Invert value and hold Invert elevation 26.23 for the Outgoing Pipe.
- 6. There are 2 pipes designated as an Outgoing Pipe. PIPE-(3) is NOT an Outgoing Pipe. You must change the flow direction of PIPE-(3) to correct this problem.
- *Note* Changing the flow direction of PIPE-(3) will be performed in the next exercise, when editing the S-4 Proposed Drainage SR61 Profile View.
  - 7. All other Incoming Pipes have elevations greater than 0.1' above the Outgoing Pipe. No edits are required.
  - 8. Review Slope for Values that have odd values. No edits are required.
  - 9. Click Apply then OK to close the Structure Properties S-(3) dialog box
  - 10. Save the *DRPRRD03.dwg* file.

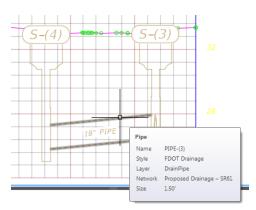
### **Exercise 12.4** Change Flow Direction for a Pipe

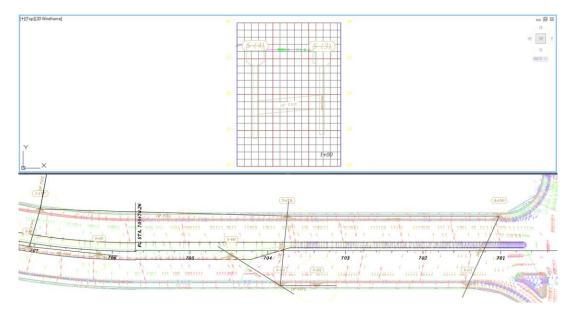
The next steps will show you how to change the flow direction for a pipe connecting structures displayed in the S-4 Proposed Drainage - SR61 Profile View

1. Zoom and Pan to display the S-4 Proposed Drainage - SR61 Profile View.



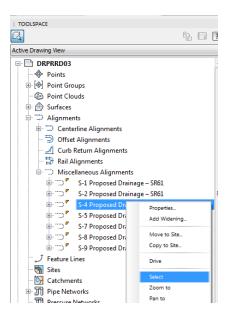
2. Zoom in closer to display structures S-(4) and S-(3). Hover over the Pipe that is between structure S-(4) and S-(3) to display a tooltip listing the Pipe as PIPE-(3).

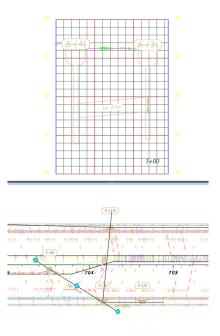




3. Select the **bottom Viewport** to make it the active Viewport.

4. From the *TOOLSPACE > Prospector tab*, expand Alignments, expand Miscellaneous Alignments, right-click on S-4 Proposed Drainage - SR61 and click Select.

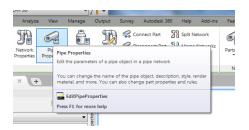




5. Zoom and Pan to display the S-4 Proposed Drainage - SR61 Alignment. Press ESC to clear grips.

| (stap)                              |                                      |
|-------------------------------------|--------------------------------------|
|                                     |                                      |
| T04 &                               | Selection                            |
| It thinks for the the time the time | Pipe     External Reference     None |
|                                     |                                      |

6. Select the **downstream pipe** from structure S-(4). With *selection cycling* toggled On, a Selection dialog box displays. From the Selection dialog box select **Pipe**.



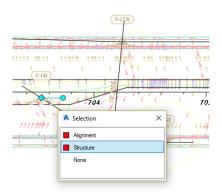
7. From the *Pipe Networks Proposed Drainage - SR61 tab > Modify panel*, select the **Pipe Properties** button.

| ormation Part Properties Rules |                  |   |
|--------------------------------|------------------|---|
| Pipe Properties                | Value            |   |
| E General                      |                  |   |
| Pipe Flow Direction Method     | Start to End     |   |
| Flow Direction                 | Start to End     | = |
| Reference Surface              | SR61_Final       |   |
| Reference Alignment            | SR61             |   |
| Geometry                       |                  |   |
| Start Structure                | S-(3)            |   |
| End Structure                  | S-(4)            |   |
| Bearing                        | N 38° 39' 20'' W |   |
| Start Station                  | 703+83.91'       |   |
| End Station                    | 704+47.02'       |   |
| Start Offset                   | -37.99'          |   |
| End Offset                     | -13.34'          |   |
| Pipe Slope (Hold Start)        | -1.00%           |   |
| Pipe Slope (Hold End)          | 1.00%            |   |
| Slope                          | 1.00%            |   |
| Start Invert Elevation         | 26.46'           |   |
| End Invert Elevation           | 25.78'           |   |
| Start Crown Elevation          | 27.96'           | - |

- 8. From the Pipe Properties PIPE-(3) dialog box, select the Part Properties tab.
- The flow direction is not correct, notice the Start Structure is S-(3) and the End Structure is S-(4). The Pipe Flow Direction Method is Start to End. Press Cancel to close the Pipe Properties - PIPE-(3) dialog box.

| 🔺 🚬 🖻 🖻 🖶 😂 🖘 • 🖉 🖓 🕬 31            | 3D 🗸 👔 🖛  |                                     | utodesk AutoCAD Civil 3D 2016 DRPRRD03.                                   | dwg                          | -                              |
|-------------------------------------|---|-------------------------------------|---|------------------------------|--------------------------------|
| Cap Home Insert Annotate Modify A   | Analyze View Manage Output Survey Autodesk 360 Help Add-ins   | Featured Apps Expre                 | ss Tools Vehicle Tracking Bridge Mod                                      | eler Geolocation Pipe Networ | ks: Proposed Drainage – SR61 A |
| Add Add Reset EQ Object viewer Netv | Properties | Parts List Draw Parts<br>in Profile | Interference<br>Check Storm Edit in Storm and<br>Sewers Statiany Analysis | Alignment<br>from Network    |                                |
| Labels & Tables General Tools 👻     |   | Network Tools                       | Analyze   | Launch Pad                   |                                |
| Start DRPRRD03*                     | Rename Parts  |                                     |   |                              |                                |
|                                     | Apply Rules   |                                     | 36  |                              |                                |
| Q 2                                 | Change Flow Direction   |                                     |   |                              |                                |
| Active Drawing View                 | Change Flow Direction   |                                     |   |                              |                                |
| - DRPRRD03                          | Changes or assigns a flow direction to a series of connected pipes  |                                     |   |                              |                                |
| - 🔶 Points                          | ChangeFlowDirection   |                                     |   | (S-(4)) •••••                | $\Theta \circ (S - (3))$       |
| Point Groups     Point Clouds       | Press F1 for more help  |                                     | 32  |                              |                                |

10. From the *Pipe Networks Proposed Drainage - SR61 tab > Modify panel*, click the **Modify** panel to reveal the *hidden commands*. Select the **Change Flow Direction** command. The *command line* displays the prompt: *Select the intended UPSTREAM starting point in plan*.



- 11. Select **structure S-(4)**. With *selection cycling* toggled On, a **Selection** dialog box displays. From the **Selection** dialog box select **Structure.**
- 12. The command line displays the prompt: Select the intended DOWNSTREAM ending point in plan.

| (5-(73)                               |                                   |
|---------------------------------------|-----------------------------------|
| Were had a week with the first of the |                                   |
| min timt nintt tim tittin th          | A Selection × 111111              |
| 704                                   | Structure External Reference None |
|                                       |                                   |

13. Select structure S-(3). With *selection cycling* toggled On, a Selection dialog box displays. From the Selection dialog box select Structure. Press ENTER.

Flow direction successfully applied to 1 pipes.

14. The command line history indicates the change in flow direction was successful.

|   | }Civil 3D                     | ▼ 1 =  |                                 | Autode                              | esk AutoCAD Civil 3D 2016 DRPRRD | 003.dwg [22049555201]                | and the second second          |
|---|-------------------------------|--|---------------------------------|-------------------------------------|----------------------------------|--------------------------------------|--------------------------------|
| C3D Home Insert Annotate Mod  | fy Analyze V                  | ew Manage Output Survey Au                                       | utodesk 360 Help Add-ins        | Featured Apps Exp                   | ress Tools Vehicle Tracking B    | ridge Modeler Geolocation Pipe Netwo | orks: Proposed Drainage – SR61 |
| Add Add Add Reset<br>Labels Tables Labels & Tables Construction Construct | Network<br>Properties<br>Prop | Pipe Properties<br>Edit the parameters of a pipe object in a pip |                                 | Parts List Draw Parts<br>in Profile | Check Sewers Sanitary            | - Copiess                            |                                |
|   | 1                             | You can change the name of the pipe obje                         | ect, description, style, render | Network Tools                       | Analyze                          | Launch Pad                           | _                              |
| Start DRPRRD03*   | × (+                          | material, and more. You can also change p                        | part properties and rules.      |                                     |                                  |                                      |                                |
| TOOLSPACE   |                               | EditPipeProperties   |                                 |                                     |                                  |                                      |                                |
|   |                               | Press F1 for more help   |                                 |                                     |                                  |                                      | )                              |
| Active Drawing View   |                               | ► cto  |                                 |                                     |                                  |                                      |                                |

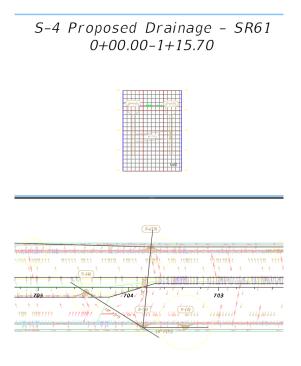
15. From the *Pipe Networks Proposed Drainage - SR61 tab > Modify panel*, select **Pipe Properties**.

| Pipe Properties            | Value           |  |
|----------------------------|-----------------|--|
| 🗉 General                  |                 |  |
| Pipe Flow Direction Method | End to Start    |  |
| Flow Direction             | End to Start    |  |
| Reference Surface          | SR61_Final      |  |
| Reference Alignment        | SR61            |  |
| Geometry                   |                 |  |
| Start Structure            | S-(3)           |  |
| End Structure              | S-(4)           |  |
| Bearing                    | N 38° 39' 20" W |  |
| Start Station              | 703+83.91'      |  |
| End Station                | 704+47.02'      |  |
| Start Offset               | -37.99'         |  |
| End Offset                 | -13.34'         |  |
| Pipe Slope (Hold Start)    | -1.00%          |  |
| Pipe Slope (Hold End)      | 1.00%           |  |
| Slope                      | -1.00%          |  |
| Start Invert Elevation     | 26.46'          |  |
| End Invert Elevation       | 25.78'          |  |
| Start Crown Elevation      | 27.96           |  |

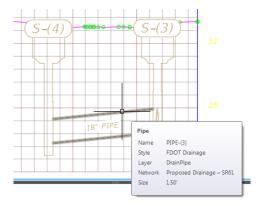
- 16. From the Pipe Properties PIPE-(3) dialog box, select the **Part Properties** tab. The *Flow Direction* is now correct, notice the Start Structure is S-(3) and the End Structure is S-(4), but the *Pipe Flow Direction Method* is now End to Start.
- 17. Press Apply then OK to close the Pipe Properties PIPE-(3) dialog. Save the DRPRRD03.dwg.

### **Exercise 12.5** Review Structures in the S-4 Proposed Drainage - SR61 Profile View

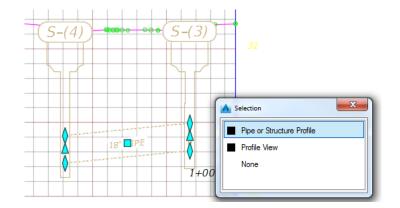
The next steps will show you how to review the S-4 Proposed Drainage - SR61 Profile View to verify flow direction and edit slope if necessary.



- 1. Zoom and Pan to display the S-4 Proposed Drainage SR61 Alignment.
- 2. Select the **top Viewport** to make it the active Viewport. Zoom and Pan to visually inspect the Profile View and make a **list of required edits**. Do you see any adverse slopes? Yes. **Edits are required**.



3. Hover over the **Pipe** that is between structure S-(4) and S-(3) to display a tooltip listing the Pipe as **PIPE-(3).** You need to **edit PIPE-(3) properties** to correct the *adverse slope*.



4. Select the **downstream Pipe** from structure S-(4). With *selection cycling* toggled On, a Selection dialog box displays. From the Selection dialog box select **Pipe or Structure Profile.** 

| ▲, ▷ ☞ 등 등                     | ) <h th="" •="" ☆="" 🔯<=""><th>Civil 3D</th><th></th><th><b>€</b></th><th>-</th><th></th><th></th><th></th><th>Autoc</th><th>desk AutoCAD (</th><th>Civil 3D 2016</th><th>DRPRRD03.dwg [2</th><th>049555201]</th><th>manual land</th><th>Statement in the second</th></h> | Civil 3D  |                               | <b>€</b>                                  | -              |        |         |            | Autoc                    | desk AutoCAD (        | Civil 3D 2016   | DRPRRD03.dwg [2                        | 049555201]                | manual land                                      | Statement in the second        |
|--------------------------------|---|-----------|-------------------------------|---|----------------|--------|---------|------------|--------------------------|-----------------------|-----------------|--|---------------------------|--|--------------------------------|
| C3D Home Insert                | Annotate Modify   | y Analyze | View Manage                   | Output Surve                              | / Autodesk 36  | 0 Help | Add-ins | Featured   | Apps Ex                  | press Tools           | Vehicle Trackin | ng Bridge Mod                          | eler Geoloc               | ation Pipe Netw                                  | orks: Proposed Drainage – SR61 |
| Add Add Reset<br>Labels Tables | Properties Object Viewer Isolate Objects  | Network   | Pip<br>Pip<br>Pipe Properties | 211 2                                     | Discourse Dark |        |         | Parts List | Draw Parts<br>in Profile | Interference<br>Check | e Storm Sewers  | Edit in Storm and<br>Sanitary Analysis | Alignment<br>from Network | Storm Sewers  Storm Sewers  Hydrographs  Express |                                |
| Labels & Tables                | General Tools 👻   |           | _                             |   |                |        |         | Netwo      | k Tools                  |                       | Analyze         |  | La                        | unch Pad   |                                |
| Start                          | DRPRRD03*   | × +       |                               | the name of the p<br>are. You can also ch |                |        |         |            |                          |                       |                 |  |                           |  |                                |
| TOOLSPACE                      |   |           | EditPipePro                   | perties                                   |                |        |         |            |                          |                       |                 |  |                           |  | ~                              |
| 4                              |   |           | Press F1 for mo               | re help                                   |                |        |         |            |                          |                       |                 |  |                           |  | )                              |
| Active Drawing View            |   |           | •                             |   |                |        | _       |            |                          |                       |                 |  |                           |  |                                |

5. From the *Pipe Networks Proposed Drainage - SR61 tab > Modify panel*, select **Pipe Properties** and select the **Pipe** between S-(4) and S-(3).

| Pipe Properties          |   | Value           |   |
|--------------------------|---|-----------------|---|
| 🖃 General                |   |                 |   |
| Pipe Flow Direction Meth | d | Start to End    |   |
| Flow Direction           |   | Start to End    |   |
| Reference Surface        |   | SR61_Final      |   |
| Reference Alignment      |   | SR61            |   |
| Geometry                 |   |                 | L |
| Start Structure          |   | S-(3)           |   |
| End Structure            |   | S-(4)           |   |
| Bearing                  |   | N 38° 39' 20" W |   |
| Start Station            |   | 703+83.91'      |   |
| End Station              |   | 704+47.02'      |   |
| Start Offset             |   | -37.99'         |   |
| End Offset               |   | -13.34'         |   |
| Pipe Slope (Hold Start)  |   | -1.00%          |   |
| Pipe Slope (Hold End)    |   | 1.00%           |   |
| Slope                    |   | 1.00%           |   |
| Start Invert Elevation   |   | 26.46'          |   |
| End Invert Elevation     |   | 25.78'          |   |
| Start Crown Elevation    |   | 27.96'          |   |

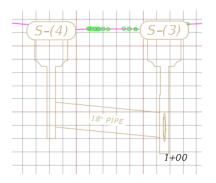
6. From the Pipe Properties - PIPE-(3) dialog box, select the Part Properties tab.

| orma | tion Part Properties Rules |                 |   |
|------|----------------------------|-----------------|---|
| Pipe | e Properties               | Value           | ^ |
| Ξ (  | General                    |                 |   |
|      | Pipe Flow Direction Method | End to Start    |   |
|      | Flow Direction             | End to Start    | E |
|      | Reference Surface          | SR61_Final      |   |
|      | Reference Alignment        | SR61            |   |
| Ξ (  | Geometry                   |                 |   |
|      | Start Structure            | S-(3)           |   |
|      | End Structure              | S-(4)           |   |
|      | Bearing                    | N 38° 39' 20" W |   |
|      | Start Station              | 703+83.91'      |   |
|      | End Station                | 704+47.02'      |   |
|      | Start Offset               | -37.99'         |   |
|      | End Offset                 | -13.34'         |   |
|      | Pipe Slope (Hold Start)    | 1.00%           |   |
|      | Pipe Slope (Hold End)      | 1.00%           |   |
|      | Slope                      | -1.00%          |   |
|      | Start Invert Elevation     | 26.46'          |   |
|      | End Invert Elevation       | 25.78'          |   |
|      | Start Crown Elevation      | 27.96'          | * |

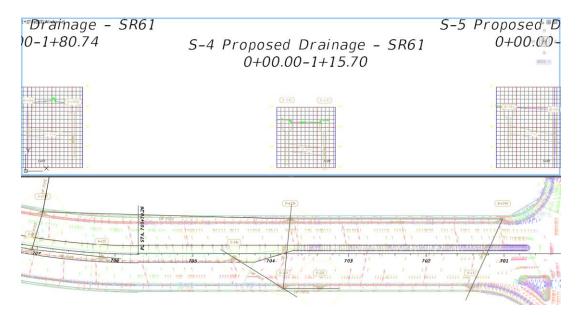
7. Adjust the *Pipe Slope (Hold End) value* to **1.0%**. By adjusting the Pipe Slope (Hold Start) value you are modifying the elevation of the Start Invert. A positive slope value indicates the direction is uphill.

| Pipe Properties            | Value           |  |
|----------------------------|-----------------|--|
| 🗉 General                  |                 |  |
| Pipe Flow Direction Method | End to Start    |  |
| Flow Direction             | End to Start    |  |
| Reference Surface          | SR61_Final      |  |
| Reference Alignment        | SR61            |  |
| Geometry                   |                 |  |
| Start Structure            | S-(3)           |  |
| End Structure              | S-(4)           |  |
| Bearing                    | N 38° 39' 20" W |  |
| Start Station              | 703+83.91'      |  |
| End Station                | 704+47.02'      |  |
| Start Offset               | -37.99'         |  |
| End Offset                 | -13.34'         |  |
| Pipe Slope (Hold Start)    | 1.00%           |  |
| Pipe Slope (Hold End)      | -1.00%          |  |
| Slope                      | 1.00%           |  |
| Start Invert Elevation     | 26.46'          |  |
| End Invert Elevation       | 27.14'          |  |
| Start Crown Elevation      | 27.96'          |  |

- 8. Press **ENTER** to complete the adjustment, then click **Apply**. The values for both Hold End and Hold Start are recalculated and displayed.
- 9. Click **OK** to close the Pipe Properties PIPE-(3) dialog box.



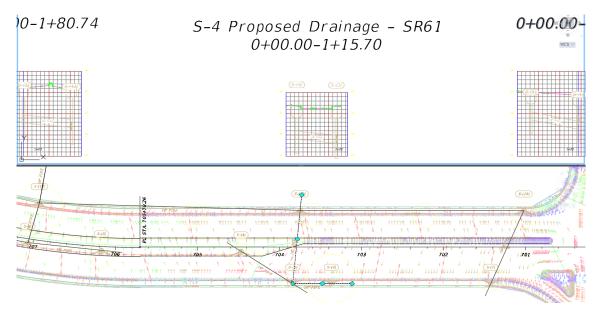
- 10. Review each Structure in the S-4 Proposed Drainage SR61 Profile View. Do you see any **Downstream Pipes** that may be equal to or higher than the *Upstream Pipes*? No.
- 11. Notice that the adjusted PIPE-(3) slope now displays in the S-4 Proposed Drainage Profile View. This completes the edits required for the S-4 Profile View.



- 12. Zoom and Pan to display the S-4 Proposed Drainage Profile View.
- 13. Save the DRPRRD03.dwg file.

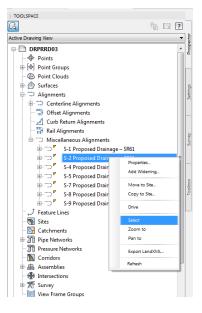
### **Exercise 12.6** Review Upstream and Downstream Pipes and Structures

The next steps will show you will review upstream and downstream pipes and structures displayed in the S-2 Proposed Drainage - SR61 Profile View.

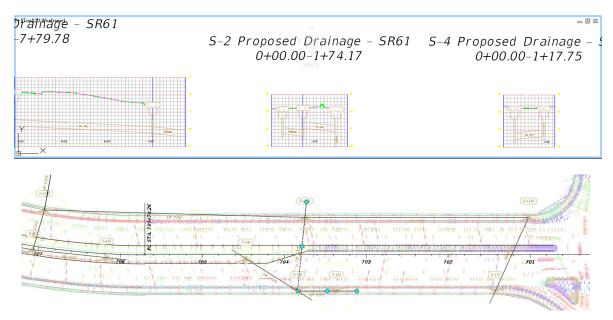


1. Select the **bottom Viewport** to make it the active Viewport.

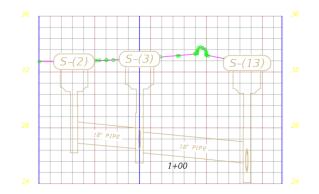
2. From the *TOOLSPACE > Prospector tab*, expand Alignments, expand Miscellaneous Alignments, right-click on S-2 Proposed Drainage - SR61 and click Select.



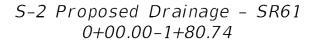
- 3. Zoom and Pan to display the S-2 Proposed Drainage SR61 Alignment.
- 4. Select the top Viewport to make it the active Viewport.



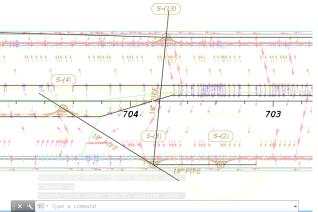
5. Pan to display the S-2 Proposed Drainage - SR61 Profile View. Press ESC to clear the grips.



- 6. Zoom in closer to display the Pipes connected to the structures and review each.
  - a. Do you see any **Downstream Pipes** that may be equal to or higher than the *Upstream Pipes*? No, then no edits are required.
  - b. Do you see any **Adverse Slopes** in the S-2 Proposed Drainage SR61 Profile View? No, then no edits are required.







- 7. Zoom and Pan to display the S-2 Proposed Drainage SR61 Profile View.
- 8. Save the DRPRRD03.dwg file.

### Review and Build a List of Actions

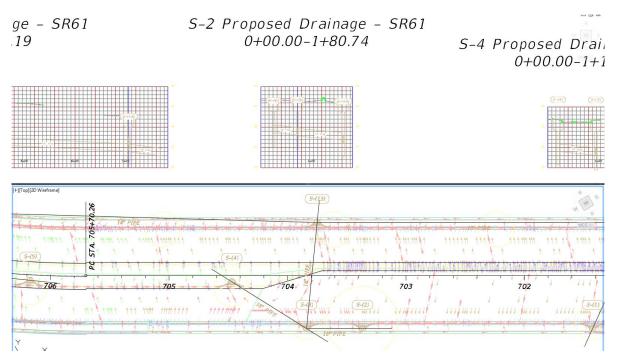
Review what has been completed so far and build a list of actions still needed to be completed:

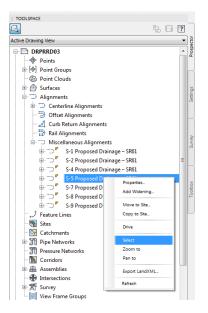
- S-1 Proposed Drainage SR61 Profile View edits completed
- S-2 Proposed Drainage SR61 Profile View edits completed
- S-4 Proposed Drainage SR61 Profile View edits completed
- S-5 Proposed Drainage SR61 Profile View edits need review
- S-7 Proposed Drainage SR61 Profile View edits need review
- S-8 Proposed Drainage SR61 Profile View edits need review
- S-9 Proposed Drainage SR61 Profile View edits need review

### **Exercise 12.7** Review Structures in the S-5 Proposed Drainage - SR61 Profile View

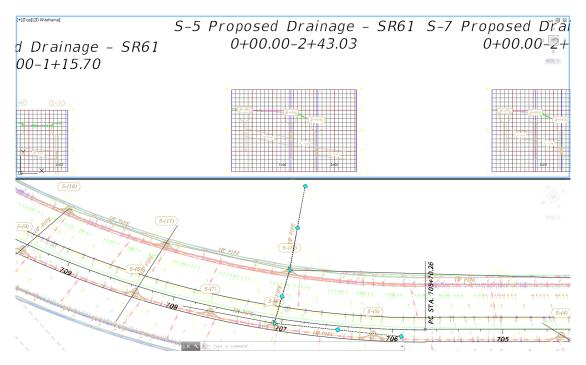
The next steps will show you will review upstream and downstream pipes and structures displayed in the S-5 Proposed Drainage - SR61 Profile View

1. Select the **bottom Viewport** to make it the active Viewport.

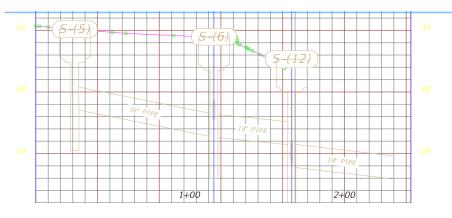




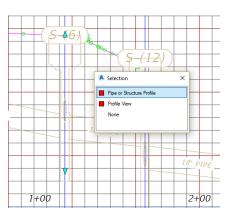
- 2. From the *TOOLSPACE > Prospector tab*, expand Alignments, expand Miscellaneous Alignments, right-click on S-5 Proposed Drainage SR61 and click Select.
- 3. Zoom and Pan to display the S-5 Proposed Drainage SR61 alignment.



- 4. Select the top Viewport to make it the active Viewport.
- 5. Pan to display the S-5 Proposed Drainage SR61 Profile View. Press ESC to clear the grips.



- 6. Zoom in closer to display the Pipes connected to the structures and review each Structure.
  - a. Do you see any **Adverse Slopes** in the S-5 Proposed Drainage SR61 Profile View? No, then no edits are required.
  - b. Do you see any **Downstream Pipes** that may be equal to or higher than any *Upstream Pipes*? Yes, then **edits are required**. The downstream pipe from structure S-(6) needs closer inspection.
- 7. Hover over the **Pipe** that is between structure S-(6) and S-(12) to display a tooltip listing the Pipe as **PIPE-(8).**



8. Select structure S-(6). With *selection cycling* toggled On, a Selection dialog box displays. From the Selection dialog box select Pipe or Structure Profile.



9. From the *Pipe Networks Proposed Drainage - SR61 tab > Modify panel*, select the **Structure Properties** command.

| Name  |           | Status     | Description         | Inner D | In | Inner H | Invert El | Centerl | Crown  | Slope  | In/Out | From S |
|-------|-----------|------------|---------------------|---------|----|---------|-----------|---------|--------|--------|--------|--------|
| - 🖨 S | -(6)      | <b>V</b>   |                     |         |    |         |           |         |        |        |        |        |
|       | PIPE-(7)  | <b>√</b> 0 | Round Concrete Pipe | 18.00"  |    |         | 25.06'    | 25.81'  | 26.56' | 2.00%  | In     | S-(5)  |
| - 6   | PIPE-(8)  | <b>√</b> 0 | Round Concrete Pipe | 18.00"  |    |         | 25.06'    | 25.81'  | 26.56' | -1.00% | Out    | S-(12) |
| 6     | PIPE-(13) | <b>√</b> 0 | Round Concrete Pipe | 18.00"  |    |         | 26.08'    | 26.83'  | 27.58' | 1.00%  | In     | S-(7)  |
|       |           |            |                     |         |    |         |           |         |        |        |        |        |

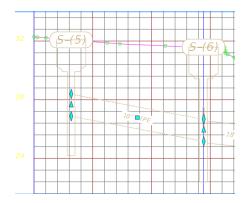
10. From the Structure Properties - S-(6) dialog box, select the Connected Pipes tab. This tab displays the pipes connected to the structure S-(6). Review the Structure S-(6) connected Pipes data and make a list of required adjustments. Hold elevation 25.06 for Outgoing PIPE-(8).

|              |              | ,                   |         |    |         |           |         |        |        |        |        |
|--------------|--------------|---------------------|---------|----|---------|-----------|---------|--------|--------|--------|--------|
| Name         | Status       | Description         | Inner D | In | Inner H | Invert El | Centerl | Crown  | Slope  | In/Out | From S |
| 🖃 🛱 S-(6)    | $\checkmark$ |                     |         |    |         |           |         |        |        |        |        |
| ···· 🜮 PIPE- |              | Round Concrete Pipe | 18.00"  |    |         | 25.16'    | 25.91'  | 26.66' | 1.89%  | In     | S-(5)  |
| PIPE-        | (8) √ 0      | Round Concrete Pipe | 18.00"  |    |         | 25.06'    | 25.81'  | 26.56' | -1.00% | Out    | S-(12) |
| PIPE-        | (13) √ 0     | Round Concrete Pipe | 18.00"  |    |         | 26.08'    | 26.83'  | 27.58' | 1.00%  | In     | S-(7)  |
|              |              |                     |         |    |         |           |         |        |        |        |        |
|              |              |                     |         |    |         |           |         |        |        |        |        |

11. Change the *PIPE-(7) Invert Elevation* to **25.16'** making it 0.1' above the Outgoing pipe, PIPE-(8). Click **Apply** to update the values in Structure Properties - S-(6) dialog box.

|               | <u>~</u>   |                     |        |  |        |        | Crown  |        | In/Out | From S |
|---------------|------------|---------------------|--------|--|--------|--------|--------|--------|--------|--------|
|               |            |                     |        |  |        |        |        |        |        |        |
| PIPE-(7)      | <b>V</b> 0 | Round Concrete Pipe | 18.00" |  | 25.16' | 25.91' | 26.66' | 1.89%  | In     | S-(5)  |
| <br>PIPE-(8)  | <b>√</b> 0 | Round Concrete Pipe | 18.00" |  | 25.06' | 25.81' | 26.56' | -1.00% | Out    | S-(12) |
| <br>PIPE-(13) | <b>√</b> 0 | Round Concrete Pipe | 18.00" |  | 26.08' | 26.83' | 27.58' | 1.00%  | In     | S-(7)  |
|               |            |                     |        |  |        |        |        |        |        |        |

- 12. Review the Slope Column for values that are odd values.
- *Note* Based upon the Rules of Thumb being followed, the PIPE-(7) slope needs adjusting from 1.89%% to 1.5%. This adjustment cannot be done from the Structure Properties S-(6) dialog box, but must be edited in the PIPE-(7) Properties.
  - 13. Click Apply then OK to close the Structure Properties S-(6) dialog box
  - 14. Hover over the **Pipe** that is between structure S-(5) and S-(6) to display a tooltip listing the pipe as **PIPE-(7)**.



15. Select **PIPE-(7)**. With *selection cycling* toggled On, a Selection dialog box displays. From the Selection dialog box select **Pipe or Structure Profile**.

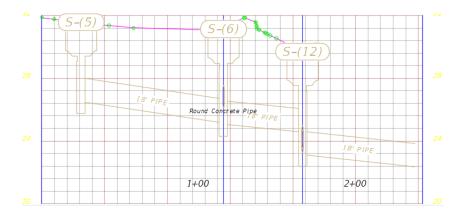
| A. DD88                  | i <a (ĝ]cwi<="" th="" •="" ⊳=""><th>AI 3D</th><th>- 11</th><th>₹</th><th>-</th><th></th><th></th><th></th><th>Autode</th><th>esk AutoCAD Ci</th><th>vil 3D 2016</th><th>DRPRRD03.dwg [2</th><th>2049555201]</th><th>manual lines</th><th></th><th></th></a> | AI 3D                          | - 11  | ₹            | -            |               |       |             | Autode                   | esk AutoCAD Ci        | vil 3D 2016     | DRPRRD03.dwg [2                        | 2049555201]               | manual lines                     |                            |      |
|--------------------------|---|--------------------------------|---|--------------|--------------|---------------|-------|-------------|--------------------------|-----------------------|-----------------|--|---------------------------|----------------------------------|----------------------------|------|
| C2D Home Insert          | Annotate Modify   | Analyze Vie                    | ew Manage Ou                                | itput Survey | Autodesk 360 | Help Add      | d-ins | Featured Ap | ops Exp                  | ress Tools V          | /ehicle Trackir | ng Bridge Mod                          | eler Geoloc               | ation Pipe Netwo                 | rks: Proposed Drainage – S | SR61 |
| Add Add Add Reset Labels |   | Vetwork Pig<br>roperties Prope | Pipe Properties                             | 20 2         | 5            | Split Network |       |             | Draw Parts<br>in Profile | Interference<br>Check |                 | Edit in Storm and<br>Sanitary Analysis | Alignment<br>from Network | Storm Sewers Hydrographs Express |                            |      |
| Labels & Tables          | General Tools 👻   |                                |   |              |              |               |       | Network 1   | Fools                    |                       | Analyze         |  | La                        | unch Pad                         |                            |      |
| Start                    | DRPRRD03*   | × +                            | You can change the<br>material, and more. 1 |              |              |               |       |             |                          |                       |                 |  |                           |                                  |                            |      |
|                          |   | E                              | EditPipePropert                             |              |              |               | Γ     |             |                          |                       |                 |  |                           |                                  |                            | 5    |
| Active Drawing View      |   |                                | ■ Cto                                       |              |              |               | 1     |             |                          |                       |                 |  |                           |                                  |                            |      |

16. From the *Pipe Networks Proposed Drainage - SR61 tab > Modify panel*, select **Pipe Properties**.

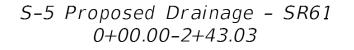
| orma | tion Part Properties Rules |                 |  |
|------|----------------------------|-----------------|--|
| Pipe | e Properties               | Value           |  |
| ⊟ (  | General                    |                 |  |
|      | Pipe Flow Direction Method | Start to End    |  |
|      | Flow Direction             | Start to End    |  |
|      | Reference Surface          | SR61_Final      |  |
|      | Reference Alignment        | SR61            |  |
| Ξ (  | Geometry                   |                 |  |
|      | Start Structure            | S-(5)           |  |
|      | End Structure              | S-(6)           |  |
|      | Bearing                    | N 54° 02' 08" W |  |
|      | Start Station              | 706+17.01'      |  |
|      | End Station                | 707+06.66'      |  |
|      | Start Offset               | -5.25'          |  |
|      | End Offset                 | -5.25'          |  |
|      | Pipe Slope (Hold Start)    | -1.90%          |  |
|      | Pipe Slope (Hold End)      | 1.5             |  |
|      | Slope                      | 1.90%           |  |
|      | Start Invert Elevation     | 26.87           |  |
|      | End Invert Elevation       | 25.16'          |  |
|      | Start Crown Elevation      | 28.37           |  |

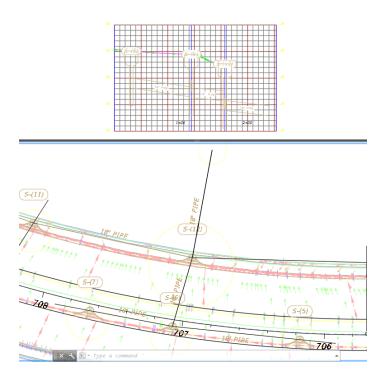
- 17. From the Pipe Properties PIPE-(7) dialog box, select the Part Properties tab.
- 18. Adjust the Pipe Slope (Hold End) value from 1.89% to 1.5%.
- 19. Press **ENTER** to complete the adjustment, then click **Apply**. The values for both Hold End and Hold Start recalculate and display.

20. Click OK to close the Pipe Properties - PIPE-(7) dialog box.



21. The S-5 Proposed Drainage - SR61 Profile View shows pipe PIPE-(7) sloped correctly.





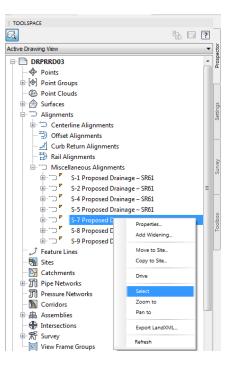
- 22. Zoom and Pan to display the S-5 Proposed Drainage SR61 Profile View.
- 23. Save the DRPRRD03.dwg file.

### **Exercise 12.8** Review Structures in the S-7 Proposed Drainage - SR61 Profile View

The next steps will show you will review upstream and downstream pipes and structures displayed in the S-7 Proposed Drainage - SR61 Profile View.

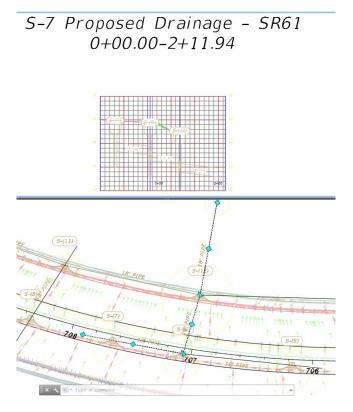


1. Select the **bottom Viewport** to make it the active Viewport.

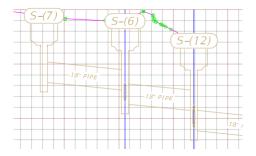


2. From the *TOOLSPACE > Prospector tab*, expand Alignments, expand Miscellaneous Alignments, right-click on S-7 Proposed Drainage - SR61 and click Select.

3. Zoom and Pan to display the S-7 Proposed Drainage - SR61 Alignment.



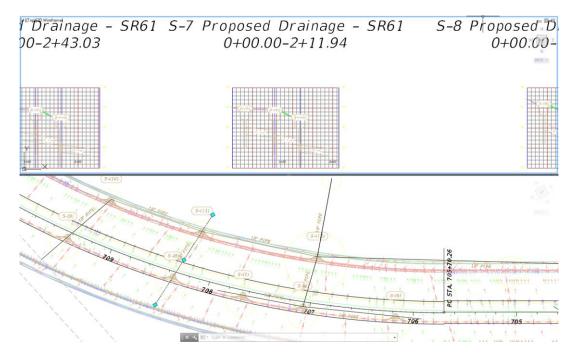
4. Select the **top Viewport** to make it the active Viewport. **Zoom** and **Pan** to display the **S-7 Proposed Drainage - SR61 Profile View**. Press **ESC** to clear the grips.



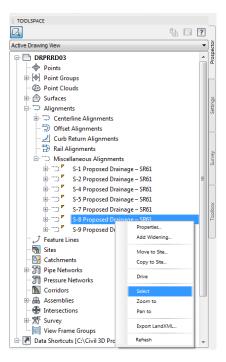
- 5. Zoom in closer to display the Pipes connected to the structures and review each.
  - a. Do you see any **Downstream Pipes** that may be equal to or higher than the Upstream Pipes? No, then no edits are required.
  - b. Do you see any **Adverse Slopes** in the S-7 Proposed Drainage SR61 Profile View? No, then no edits are required.
- 6. Save the *DRPRRD03.dwg* file.

### **Exercise 12.9** Review Structures in the S-8 Proposed Drainage - SR61 Profile View

The next steps will show you will review upstream and downstream pipes and structures displayed in the S-8 Proposed Drainage - SR61 Profile View.



1. Select the **bottom Viewport** to make it the active Viewport.



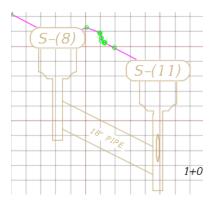
2. From the *TOOLSPACE > Prospector tab*, expand Alignments, expand Miscellaneous Alignments, right-click on S-8 Proposed Drainage - SR61 and click Select.

3. Zoom and Pan to display the S-8 Proposed Drainage - SR61 Alignment.

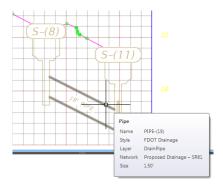
S-8 Proposed Drainage - SR61 0+00.00-1+03.75



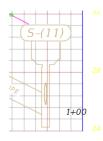
- 4. Select the top Viewport to make it the active Viewport.
- 5. Zoom and Pan to display S-7 Proposed Drainage SR61 Profile View. Press ESC to clear grips.



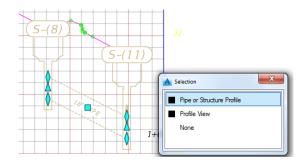
- 6. Zoom in closer to display the Pipes connected to the structures and review each Structure.
  - a. Do you see any **Adverse Slopes** in the S-8 Proposed Drainage SR61 Profile View? No, then no adjustments are required.
  - b. Do you see any **Downstream Pipes** that may be equal to or higher than the Upstream Pipes? Yes, so you need to make a **list of Structures** to investigate.



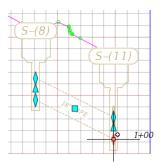
7. Hover over the Pipe that is between structure S-(8) and S-(11) to display a tooltip listing the pipe as **PIPE-(19).** 



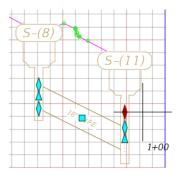
8. Notice that Structure S-(11) appears to have a higher Outgoing Pipe than the upstream PIPE-(19).



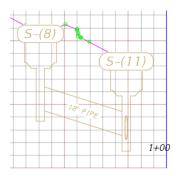
9. Select **PIPE-(19**). With *selection cycling* toggled On, a Selection dialog box displays. From the Selection dialog box select **Pipe or Structure Profile**.



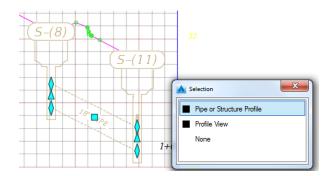
10. Select the downstream invert diamond grip of pipe PIPE-(19).



- 11. **Zoom in** closer as you **grip edit** to confirm placement of the downstream invert of the pipe just above the Outgoing Pipe at structure S-(11).
- 12. Move the **invert grip** upward, at the *command prompt* Type **10** and press **ENTER** to move the PIPE-(19) upward **10**'. Press **ESC** to clear grips.



- 13. Notice that Structure S-(11) now displays lower with the Outgoing Pipe lower than the Upstream PIPE-(19).
- 14. From the *Pipe Properties* of PIPE-(19) change the *Pipe Slope* to a nominal value of **3.0%**.



15. Select **PIPE-(19).** With *selection cycling* toggled On, a **Selection** dialog box displays. From the **Selection** dialog box select **Pipe or Structure Profile**.

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|---|---|---|--|
| Cab Home Insert Annotate Modify Ar                | Analyze View Manage Output Survey Autodesk 360 Help Add-ir  | is Featured Apps Express Tools Vehicle Tracking Bridge Mod          | eler Geolocation Pipe Networks: Proposed Drainage – SR61 |
| Add Add Reset<br>Labels Tables Labels             | The Properties Soft the parameters of a pipe object in a pipe network   | Parts List Draw Parts<br>In Profile Check: Sewers Sanitary Analysis | Alignment Hydrographs<br>from Network E press            |
| Labels & Tables General Tools   Start DRPRRD03* X | You can change the name of the pipe object, description, style, render material, and more. You can also change part properties and rules. | Network Tools Analyze   | Launch Pad   |
|   | Press F1 for more help  |   | ;  |
| Active Drawing View                               | ▼ 000   |   |  |

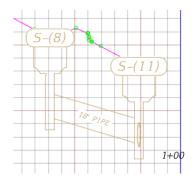
16. From the *Pipe Networks Proposed Drainage - SR61 tab > Modify panel*, select **Pipe Properties**.

|     | ation Part Properties Rules |                 |   |
|-----|-----------------------------|-----------------|---|
| Pip | e Properties                | Value           | - |
|     | General                     |                 |   |
|     | Pipe Flow Direction Method  | Start to End    |   |
|     | Flow Direction              | Start to End    | E |
|     | Reference Surface           | SR61_Final      |   |
|     | Reference Alignment         | SR61            |   |
| Ξ   | Geometry                    |                 |   |
|     | Start Structure             | S-(8)           |   |
|     | End Structure               | S-(11)          |   |
|     | Bearing                     | N 62° 12' 27" E |   |
|     | Start Station               | 708+35.08'      |   |
|     | End Station                 | 708+20.55'      |   |
|     | Start Offset                | -13.33'         |   |
|     | End Offset                  | 38.49'          |   |
|     | Pipe Slope (Hold Start)     | -3.20%          |   |
|     | Pipe Slope (Hold End)       | 3.20%           |   |
|     | Slope                       | 3.20%           |   |
|     | Start Invert Elevation      | 27.68'          |   |
|     | End Invert Elevation        | 25.96'          |   |
|     | Start Crown Elevation       | 29.18'          | - |

- 17. From the Pipe Properties PIPE-(19) dialog box, select the Part Properties tab.
- 18. Adjust the *Pipe Slope (Hold End) value* to **3.0%**. By adjusting the Pipe Slope (Hold End) value you are modifying the elevation of the Start Invert. A positive slope value indicates the direction is uphill.

| Pipe Properties            | Value           |   |
|----------------------------|-----------------|---|
| 🗉 General                  |                 |   |
| Pipe Flow Direction Method | Start to End    |   |
| Flow Direction             | Start to End    | : |
| Reference Surface          | SR61_Final      |   |
| Reference Alignment        | SR61            |   |
| Geometry                   |                 | L |
| Start Structure            | S-(8)           |   |
| End Structure              | S-(11)          |   |
| Bearing                    | N 62° 12' 27" E |   |
| Start Station              | 708+35.08'      |   |
| End Station                | 708+20.55'      |   |
| Start Offset               | -13.33'         |   |
| End Offset                 | 38.49'          |   |
| Pipe Slope (Hold Start)    | -3.00%          |   |
| Pipe Slope (Hold End)      | 3.00%           |   |
| Slope                      | 3.00%           |   |
| Start Invert Elevation     | 27.57           |   |
| End Invert Elevation       | 25.96'          |   |
| Start Crown Elevation      | 29.07           |   |

- 19. Press **ENTER** to complete the adjustment, then click **Apply**. The values for both Hold End and Hold Start recalculate and display.
- 20. Click OK to close the Pipe Properties PIPE-(19) dialog box.



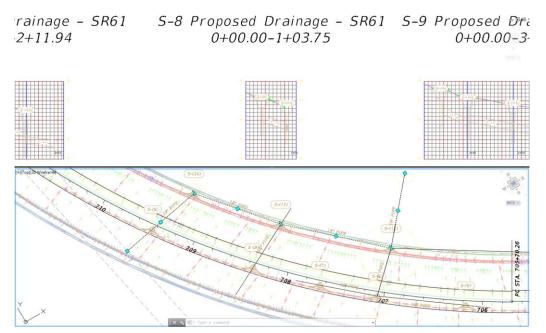
21. Notice that the S-8 Proposed Profile View now displays PIPE-(19) sloped correctly.

S-8 Proposed Drainage - SR61 0+00.00-1+03.75

- 22. Zoom and Pan to display the S-8 Proposed Drainage SR61 Profile View.
- 23. Save the DRPRRD03.dwg file.

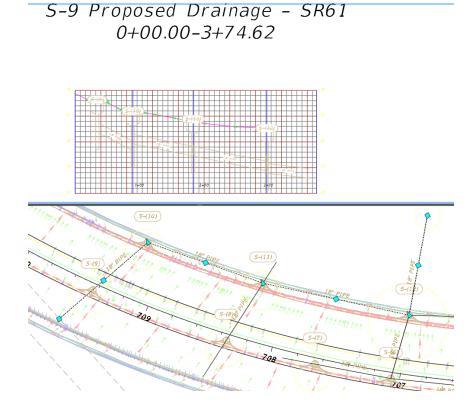
### **Exercise 12.10** Review Structures in the S-9 Proposed Drainage - SR61 Profile View

The next steps will show you will review upstream and downstream pipes and structures displayed in the S-9 Proposed Drainage - SR61 Profile View.

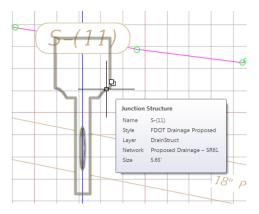


- TOOLSPACE Q h 🛛 ? Active Drawing View DRPRRD03 Points Deint Groups Point Clouds 🗉 放 Surfaces D Alignments E- 🗇 Centerline Alignments 🕀 Offset Alignments 🧾 Curb Return Alignments 🕆 Rail Alignments Miscellaneous Alignments S-1 Proposed Drainage - SR61 S-2 Proposed Drainage – SR61 S-4 Proposed Drainage – SR61 S-5 Proposed Drainage – SR61 ---- 7 S-7 Proposed Drainage – SR61 Ę١. ÷----> 🗖 S-8 Proposed Drainage – SR61 Properties ナ Feature Lines Add Widening 😽 Sites Catchments Move to Site... 🗄 📆 Pipe Networks Copy to Site... m Pressure Networks Drive Corridors Assemblies Zoom to Intersections Pan to 🕅 🕅 🕅 🕅 Export LandXML 🐨 🔟 View Frame Groups Data Shortcuts [C:\Civil 3D Pr Refresh
- 1. Select the **bottom Viewport** to make it the active Viewport.

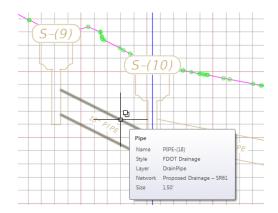
- 2. From the *TOOLSPACE > Prospector tab*, expand Alignments, expand Miscellaneous Alignments, right-click on S-9 Proposed Drainage SR61 and click Select.
- 3. Zoom and Pan to display the S-9 Proposed Drainage SR61 Alignment.



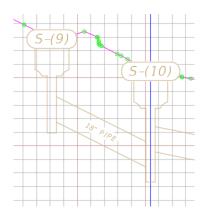
- Select the top Viewport to make it the active Viewport. Pan to display the S-9 Proposed Drainage SR61 Profile View. Press ESC to clear the grips.
- 5. Zoom in closer to display the Pipes connected to the structures and review each Structure.
  - a. Do you see any **Adverse Slopes** in the S-9 Proposed Drainage SR61 Profile View? **No**, then no adjustments are required.
  - b. Do you see any **Downstream Pipes** that may be equal to or higher than the *Upstream Pipes*? **Yes**, so you need to make a **list of Structures to investigate**.



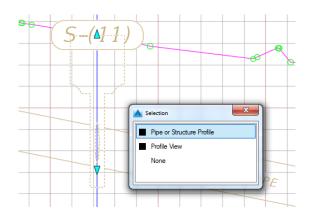
6. **Zoom** and **Pan** to display **structure S-(11)**, as it may have inverts to adjust.



7. Zoom and Pan to display structures S-(9) and S-(10). Hover over the Pipe that is between structure S-(9) and S-(10) to display a tooltip listing the pipe as PIPE-(18).



8. Structure S-(10) has an Upstream PIPE-(18) which is lower than the Downstream Pipe. Perform the **required adjustments** in the order of Downstream to Upstream. Edit **Structure S-(11) Properties**.



9. Zoom and Pan to display structure S-(11). Select structure S-(11). With *selection cycling* toggled On, a Selection dialog box displays. From the Selection dialog box select Pipe or Structure Profile.

| <b>A</b> -    |         | ) 🗁       | 88              | <≒ • ≓> •     | Civil 3D     |                    | *      | / =           |           |                                   |        |            |          | Autod                    | esk AutoCAD Ci        | vil 3D 2016   | DRPRRD03.dwg [2                        | 2049555201]               | successfit Name                  |                               |
|---------------|---------|-----------|-----------------|---------------|--------------|--------------------|--------|---------------|-----------|-----------------------------------|--------|------------|----------|--------------------------|-----------------------|---------------|--|---------------------------|----------------------------------|-------------------------------|
| CBD           | Ho      | ome       | Insert          | Annotate Mi   | dify Analyze | e View             | Manage | Output        | Survey    | Autodesk 36                       | 0 Help | Add-ins    | Featured | Apps Exp                 | press Tools V         | ehicle Tracki | ing Bridge Mod                         | leler Geoloc              | ation Pipe Netwo                 | rks: Proposed Drainage – SR61 |
| Add<br>Labels | > [<br> | Add ables | Reset<br>Labels | Properties    | Network      | Pipe<br>Properties | Prop   | itructure Pro | perties   |                                   | Split  | - Maturala |          | Draw Parts<br>in Profile | Interference<br>Check |               | Edit in Storm and<br>Sanitary Analysis | Alignment<br>from Network | Storm Sewers Hydrographs Express |                               |
| L             | abels   | & Table   | es              | General Tools |              |                    |        |               |           |                                   |        |            |          | Tools                    |                       | Analyze       |  | Lai                       | unch Pad                         |                               |
| St            | tart    |           |                 | DRPRRD03*     | × +          | •                  |        |               |           | ne of the struc<br>can also chang |        |            |          |                          |                       |               |  |                           |                                  |                               |
| TOOL          | LSPAC   | ε         |                 |               |              |                    |        | EditStruc     | turePrope | rties                             |        |            |          |                          | 70                    |               |  |                           |                                  |                               |
|               |         |           |                 |               |              |                    |        | ress F1 for m | nore help |                                   |        |            |          | J                        |                       |               |  |                           |                                  |                               |

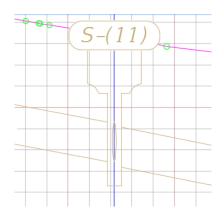
10. From the *Pipe Networks Proposed Drainage - SR61 tab > Modify panel*, select the **Structure Properties** command.

| Name       | Status    | Description         | Inner D | In | Inner H | Invert El | Centerl | Crown  | Slope  | In/Out | From S. |
|------------|-----------|---------------------|---------|----|---------|-----------|---------|--------|--------|--------|---------|
| 🖃 🖨 S-(11) | <b>V</b>  |                     |         |    |         |           |         |        |        |        |         |
| @ PIPE     | -(9) 🗹 0  | Round Concrete Pipe | 18.00"  |    |         | 25.80'    | 26.55'  | 27.30' | 2.00%  | In     | S-(10)  |
| - PIPE     | -(10) ✔ 0 | Round Concrete Pipe | 18.00"  |    |         | 25.80'    | 26.55'  | 27.30' | -2.00% | Out    | S-(12)  |
| I PIPE     | -(19) ✔ 0 | Round Concrete Pipe | 18.00"  |    |         | 25.96'    | 26.71'  | 27.46' | 3.00%  | In     | S-(8)   |
|            |           |                     |         |    |         |           |         |        |        |        |         |

- 11. From the Structure Properties S-(11) dialog box, select the Connected Pipes tab. This tab displays the pipes connected to the structure S-(11). Review the Structure S-(11) Connected Pipes data and make a list of required adjustments. Look for *Outgoing Pipe Invert*.
- 12. Hold elevation 25.80 for Outgoing PIPE 10.

| Name        | Status   | Description         | Inner D | In | Inner H | Invert El | Centerl | Crown  | Slope  | In/Out | From S |
|-------------|----------|---------------------|---------|----|---------|-----------|---------|--------|--------|--------|--------|
| 🖃 🌍 S-(11)  | <b>V</b> |                     |         |    |         |           |         |        |        |        |        |
| ··· 🤗 PIPE- |          |                     |         |    |         | 25.90'    | 26.65'  |        | 1.89%  |        |        |
| PIPE-       | (10) 🖋 0 | Round Concrete Pipe | 18.00"  |    |         | 25.80'    | 26.55'  | 27.30' | -2.00% | Out    | S-(12) |
| PIPE-       | (19) 🖋 0 | Round Concrete Pipe | 18.00"  |    |         | 25.96'    | 26.71'  | 27.46' | 3.00%  | In     | S-(8)  |
|             |          |                     |         |    |         |           |         |        |        |        |        |

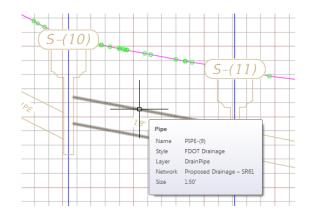
13. Change the PIPE-9 Invert Elevation to 25.90' making it 0.1' above the Outgoing pipe PIPE-10.



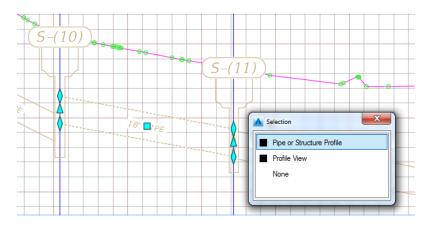
- 14. Click Apply to update the value in the dialog and in the S-9 Proposed Drainage SR61 Profile View.
- 15. Review for *Slope Values* that have **odd** values.

| Name       | Status   | Description         | Inner D | In | Inner H | Invert El | Centerl | Crown  | Slope  | In/Out | From S. |
|------------|----------|---------------------|---------|----|---------|-----------|---------|--------|--------|--------|---------|
| 🖃 🎒 S-(11) | <b>V</b> |                     |         | -  |         |           |         |        |        |        |         |
| PIPE-      | 9) 🖌 0   | Round Concrete Pipe | 18.00"  |    |         | 25.90'    | 26.65'  | 27.40' | 1.89%  | In     | S-(10)  |
| PIPE-      | 10) ✔ 0  | Round Concrete Pipe | 18.00"  |    |         | 25.80'    | 26.55'  | 27.30' | -2.00% | Out    | S-(12)  |
| PIPE-      | 19) 🖋 0  | Round Concrete Pipe | 18.00"  |    |         | 25.96'    | 26.71'  | 27.46' | 3.00%  | In     | S-(8)   |
|            |          |                     |         |    |         |           |         |        |        |        |         |

- Note Based upon the Rules of Thumb being followed, the PIPE-(9) slope needs adjustment from 1.89% to 1.5%, but this adjustment cannot be done from the Structure Properties S-(11) dialog box, it has to be done by editing the PIPE-(9) properties.
  - 16. Click Apply then OK to close the Structure Properties S-(11) dialog box



17. Zoom and Pan to display structures S-(10) and S-(11). Hover over the Pipe that is between structure S-(10) and S-(11) to display a tooltip listing the pipe as PIPE-(9).



18. Select **PIPE-(9)**. With *selection cycling* toggled On, a Selection dialog box displays. From the Selection dialog box select **Pipe or Structure Profile**.

| 🛕 🚬 🖻 🗁 🖶 😂 🖏 ד 🖒 ד 🐯 CMI 3D                                | ✓ 1 =  | Autodesk AutoCAD Civil 3D 2016 DRPRRD03.dwg [2   | 2049555201]  |
|---|--|--|--|
| cap Home Insert Annotate Modify Analyze                     | iew Manage Output Survey Autodesk 360 Help Add-in                      | s Featured Apps Express Tools Vehicle Tracking Bridge Mod  | eler Geolocation Pipe Networks: Proposed Drainage – SR61 |
| Add Add Reset<br>Labels Tables Labels C Isolate Objects Pro |  | Parts List Draw Parts Interference Storm Edit in Storm and<br>The Check Sewers Sanitary Analysis | Algnment Wrdrographs<br>from Network Express             |
| Labels & Tables General Tools 👻                             | You can change the name of the pipe object, description, style, render | Network Tools Analyze  | Launch Pad   |
| Start DRPRRD03* X +   | material, and more. You can also change part properties and rules.     |  |  |
| TOOLSPACE   | EditPipeProperties   |  | -  |
|   | Press F1 for more help   |  | )  |
| Active Drawing View   | -  |  |  |

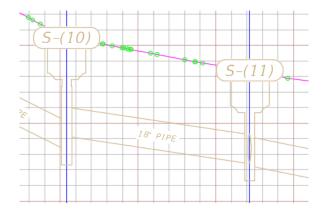
19. From the *Pipe Networks Proposed Drainage - SR61 tab > Modify panel*, select the **Pipe Properties** button.

| ormation Part Properties Rules |                 |   |
|--------------------------------|-----------------|---|
| Pipe Properties                | Value           | A |
| 🗉 General                      |                 |   |
| Pipe Flow Direction Method     | Start to End    |   |
| Flow Direction                 | Start to End    | E |
| Reference Surface              | SR61_Final      |   |
| Reference Alignment            | SR61            |   |
| Geometry                       |                 | U |
| Start Structure                | S-(10)          |   |
| End Structure                  | S-(11)          |   |
| Bearing                        | S 41° 03' 15" E |   |
| Start Station                  | 709+18.98'      |   |
| End Station                    | 708+20.55'      |   |
| Start Offset                   | 37.60'          |   |
| End Offset                     | 38.49'          |   |
| Pipe Slope (Hold Start)        | -1.89%          |   |
| Pipe Slope (Hold End)          | 1.89%           |   |
| Slope                          | 1.89%           |   |
| Start Invert Elevation         | 27.68'          |   |
| End Invert Elevation           | 25.90'          |   |
| Start Crown Elevation          | 29.18'          | - |

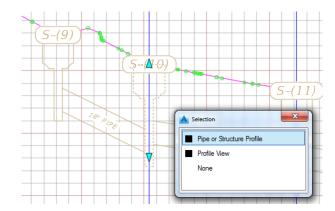
- 20. From the Pipe Properties PIPE-(9) dialog box, select the Part Properties tab.
- 21. Adjust the *Pipe Slope (Hold End) value* to **1.5%.** By adjusting the Pipe Slope (Hold End) value you are modifying the elevation of the Start Invert. A positive slope value indicates the direction is uphill.

| Pipe Properties            | Value           |   |
|----------------------------|-----------------|---|
| 🗉 General                  |                 |   |
| Pipe Flow Direction Method | Start to End    |   |
| Flow Direction             | Start to End    | : |
| Reference Surface          | SR61_Final      |   |
| Reference Alignment        | SR61            |   |
| Geometry                   |                 | L |
| Start Structure            | S-(10)          |   |
| End Structure              | S-(11)          |   |
| Bearing                    | S 41° 03' 15" E |   |
| Start Station              | 709+18.98'      |   |
| End Station                | 708+20.55'      |   |
| Start Offset               | 37.60'          |   |
| End Offset                 | 38.49'          |   |
| Pipe Slope (Hold Start)    | -1.50%          |   |
| Pipe Slope (Hold End)      | 1.50%           |   |
| Slope                      | 1.50%           |   |
| Start Invert Elevation     | 27.31'          |   |
| End Invert Elevation       | 25.90'          |   |
| Start Crown Elevation      | 28.81'          |   |

- 22. Press **ENTER** to complete the adjustment, then click **Apply**. The values for both Hold End and Hold Start re-calculate and display.
- 23. Click OK to close the Pipe Properties PIPE-(9) dialog box.



24. The S-9 Proposed Drainage - SR61 Profile View now displays PIPE-(9) sloped correctly. Continue by editing structure S-(10) structure properties.



25. Select structure S-(10). With *selection cycling* toggled On, a Selection dialog box displays. From the Selection dialog box select **Pipe or Structure Profile**.

| ▲ - B B B S S · S · Š ·           | 3D 🗸 🖉                            |   | Autodesk AutoCAD Civil 3D 2016 DR | PRRD03.dwg [22049555201]              |                                |
|-----------------------------------|-----------------------------------|---|-----------------------------------|---------------------------------------|--------------------------------|
| C3D Home Insert Annotate Modify   | Analyze View Manage Output Survey | Autodesk 360 Help Add-ins Featured App  | os Express Tools Vehicle Tracking | Bridge Modeler Geolocation Pipe Netwo | orks: Proposed Drainage – SR61 |
| Add Add Reset LQ Object Viewer Ne | etwork Pipe Structure Properties  |   |                                   | t in Storm and<br>nitary Analysis     |                                |
| Labels & Tables General Tools 👻   |                                   | То  | ools Analyze                      | Launch Pad                            |                                |
| Start DRPRRD03* X                 |                                   | ame of the structure object, description, style, render<br>u can also change part properties and rules. |                                   |                                       |                                |
| TOOLSPACE                         | EditStructureProp                 | perties   | 34.<br>                           |                                       | -                              |
|                                   | Press F1 for more help            | ,   |                                   |                                       |                                |

26. From the *Pipe Networks Proposed Drainage - SR61 tab > Modify panel*, select the **Structure Properties** command.

| Name       | Status   | Description         | Inner D | In | Inner H | Invert El | Centerl | Crown | Slope  | In/Out | From S |
|------------|----------|---------------------|---------|----|---------|-----------|---------|-------|--------|--------|--------|
| 🖃 🔓 S-(10) | <b>V</b> |                     |         |    |         |           |         |       |        |        |        |
| PIPE-      | 9) ✔ 0   | Round Concrete Pipe | 18.00"  |    |         | 27.31'    | 28.06'  | 28.81 | -1.50% | Out    | S-(11) |
| PIPE-      | 18) 🖋 0  | Round Concrete Pipe | 18.00"  |    |         | 26.61'    | 27.36'  | 28.11 | 5.00%  | In     | S-(9)  |
|            |          |                     |         |    |         |           |         |       |        |        |        |

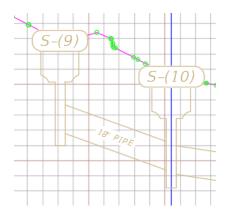
27. From the Structure Properties - S-(10) dialog box, select the Connected Pipes tab. This tab displays the pipes connected to the structure S-(10). Review the Structure S-(10) connected Pipes data and make a list of required adjustments. Look for Outgoing Pipe Invert.

| Name       | Status   | Description         | Inner D | In | Inner H | Invert El | Centerl | Crown  | Slope  | In/Out | From S |
|------------|----------|---------------------|---------|----|---------|-----------|---------|--------|--------|--------|--------|
| 🖃 🛱 S-(10) | <b>V</b> |                     |         |    |         |           |         |        |        |        |        |
| - PIPE-    | (9) √ 0  | Round Concrete Pipe | 18.00"  |    |         | 27.31'    | 28.06'  | 28.81  | -1.50% | Out    | S-(11) |
| PIPE-      | (18) √ 0 | Round Concrete Pipe | 18.00"  |    |         | 26.61'    | 27.36'  | 28.11' | 5.00%  | In     | S-(9)  |
|            |          |                     |         |    |         |           |         |        |        |        |        |

28. Hold elevation 27.31 for Outgoing PIPE-9. Edit PIPE-(18) Pipe Properties.

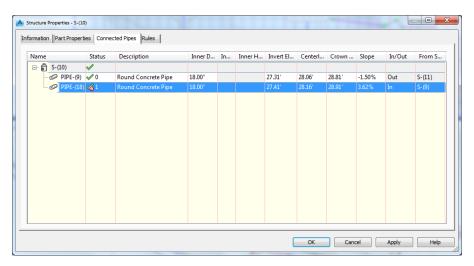
| Name       | Status   | Description         | Inner D | In | Inner H | Invert El | Centerl | Crown  | Slope  | In/Out | From S |
|------------|----------|---------------------|---------|----|---------|-----------|---------|--------|--------|--------|--------|
| 🖃 🛱 S-(10) | <b>V</b> |                     |         |    |         |           |         |        |        |        |        |
| PIPE-      | (9) 🗹 0  | Round Concrete Pipe | 18.00"  |    |         | 27.31'    | 28.06'  | 28.81' | -1.50% | Out    | S-(11) |
| PIPE-      | (18) 🏑 1 | Round Concrete Pipe | 18.00"  |    |         | 27.41     | 28.16'  | 28.91' | 3.62%  | In     | S-(9)  |
|            |          |                     |         |    |         |           |         |        |        |        |        |

29. Change the PIPE-(18) Invert Elevation to 27.41' making it 0.1' above the Outgoing PIPE-9.

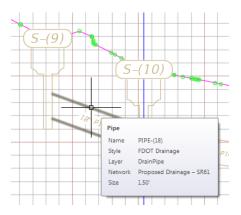


30. Click Apply to update values in the dialog and in the S-9 Proposed Drainage - SR61 Profile View.

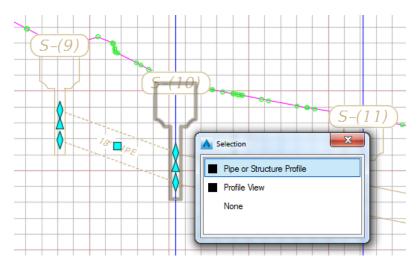
31. Review Slope Values for odd values.



- *Note* Based upon the Rules of Thumb being followed, the slope on PIPE-(18) needs adjustment from 3.62% to 3.0%, but this adjustment cannot be done from the Structure Properties S-(10) dialog box, it has to be done by editing the PIPE-(18) properties
  - 32. Click Apply then OK to close the Structure Properties S-(10) dialog box



33. Zoom and Pan to display structures S-(9) and S-(10). Hover over the Pipe that is between structure S-(9) and S-(10) to display a tooltip listing the pipe as PIPE-(18).



34. Select **PIPE-(18).** With *selection cycling* toggled On. A Selection dialog box displays. From the Selection dialog box select **Pipe or Structure Profile**.



35. From the *Pipe Networks Proposed Drainage - SR61 tab > Modify panel*, select the **Pipe Properties** button.

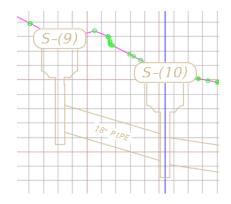
| Pipe Properties            | Value                          |  |  |  |  |  |
|----------------------------|--------------------------------|--|--|--|--|--|
| General                    |                                |  |  |  |  |  |
| Pipe Flow Direction Method | Start to End                   |  |  |  |  |  |
| Flow Direction             | Start to End                   |  |  |  |  |  |
| Reference Surface          | SR61_Final                     |  |  |  |  |  |
| Reference Alignment        | SR61                           |  |  |  |  |  |
| Geometry                   |                                |  |  |  |  |  |
| Start Structure            | S-(9)                          |  |  |  |  |  |
| End Structure              | S-(10)                         |  |  |  |  |  |
| Bearing                    | N 78° 08' 55'' E<br>709+43.61' |  |  |  |  |  |
| Start Station              |                                |  |  |  |  |  |
| End Station                | 709+18.98'                     |  |  |  |  |  |
| Start Offset               | -15.37                         |  |  |  |  |  |
| End Offset                 | 37.60'                         |  |  |  |  |  |
| Pipe Slope (Hold Start)    | -3.62%                         |  |  |  |  |  |
| Pipe Slope (Hold End)      | 3.62%                          |  |  |  |  |  |
| Slope                      | 3.62%                          |  |  |  |  |  |
| Start Invert Elevation     | 29.52                          |  |  |  |  |  |
| End Invert Elevation       | 27.41'                         |  |  |  |  |  |
| Start Crown Elevation      | 31.02'                         |  |  |  |  |  |

36. From the Pipe Properties - PIPE-(18) dialog box, select the Part Properties tab.

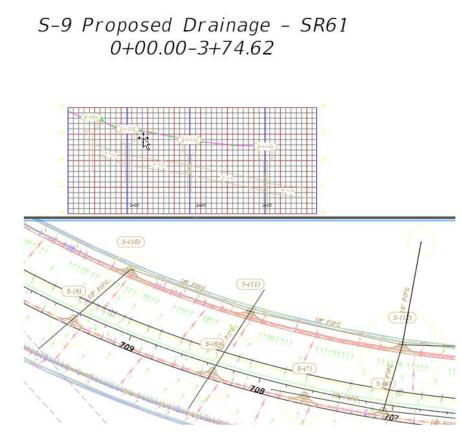
| Pipe Properties            | Value                               |   |  |  |  |  |
|----------------------------|-------------------------------------|---|--|--|--|--|
| General                    |                                     |   |  |  |  |  |
| Pipe Flow Direction Method | Start to End                        |   |  |  |  |  |
| Flow Direction             | Start to End                        | : |  |  |  |  |
| Reference Surface          | SR61_Final                          |   |  |  |  |  |
| Reference Alignment        | SR61                                |   |  |  |  |  |
| Geometry                   |                                     |   |  |  |  |  |
| Start Structure            | S-(9)                               |   |  |  |  |  |
| End Structure              | S-(10)                              |   |  |  |  |  |
| Bearing                    | N 78° 08' 55" E                     |   |  |  |  |  |
| Start Station              | 709+43.61'<br>709+18.98'<br>-15.37' |   |  |  |  |  |
| End Station                |                                     |   |  |  |  |  |
| Start Offset               |                                     |   |  |  |  |  |
| End Offset                 | 37.60'                              |   |  |  |  |  |
| Pipe Slope (Hold Start)    | -3.00%                              |   |  |  |  |  |
| Pipe Slope (Hold End)      | 3.00%                               |   |  |  |  |  |
| Slope                      | 3.00%                               |   |  |  |  |  |
| Start Invert Elevation     | 29.16                               |   |  |  |  |  |
| End Invert Elevation       | 27.41'                              |   |  |  |  |  |
| Start Crown Elevation      | 30.66'                              |   |  |  |  |  |

37. Adjust the *Pipe Slope (Hold End) value* to from 3.80% to **3.0%**. By adjusting the Pipe Slope (Hold End) value you are modifying the elevation of the Start Invert.

- 38. Press **ENTER** to complete the adjustment, then click **Apply**. The values for both Hold End and Hold Start recalculate and display.
- 39. Click **OK** to close the Pipe Properties PIPE-(18) dialog box.



40. Notice that the S-9 Proposed Drainage - SR61 Profile View now displays PIPE-(18) sloped correctly.



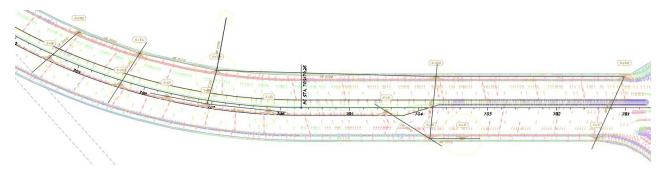
- 41. Zoom out to display the entire S-9 Proposed Drainage SR61 Profile View.
- 42. **Save** the *DRPRRD03.dwg* file. Adjusting the Pipe Inverts and Slopes for all the Proposed Drainage SR61 Profile Views is complete

### **Exercise 12.11** Change the Viewport Configuration to Single & Untwist View

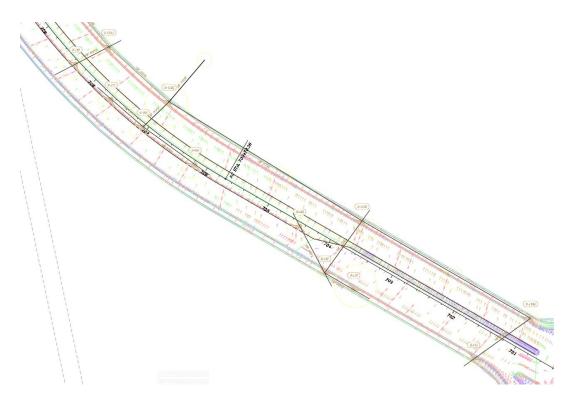
1. Select the **bottom Viewport** to make it the active Viewport.

| 🛕 🗖 🖻 🖶 🖨 🖨   | • 🖒 • {ô} €ivil 3D                | ▼                             | Autodesk AutoCAD Civil 3D 2016 DRP                               | RRD03.dwg [22 |
|---|-----------------------------------|-------------------------------|--|---------------|
| C3D Home Insert Ann                                   | otate Modify Analyze Vi           | v Manage Output Survey Autode | sk 360 Help Add-ins Featured Apps Express Tools Vehicle Tracking | Bridge Mode   |
| Back Forward<br>→ Pan<br>→ Orbit •<br>→ Can Extents • | Top<br>Bottom<br>Left Wie<br>Mana |                               | L2 - L2 L2 L2     Viewport     Configuration → C, Restore        |               |
| Navigate 2D   | Views 👻                           | Visual Styles 👻               | د Coordinates د Pale   | ttes 🔻        |
| Start Di  | RPRRD03* × +                      |                               | Tiled Viewports, Singl   | -             |
| TOOLSPACE   |                                   |                               | Two: Vertic<br>Press F1 for more help                            | _             |
| Q   | E                                 | 2                             |  | PIC           |
| Active Drawing View                                   |                                   | ▼ late                        | Two: Horizontal  |               |
| DRPRRD03     Points     Point Groups     Point Clouds |                                   | -00.00-1-                     | HO3.75   |               |

2. From the *View tab > Model Viewports panel > Viewport Configuration drop down list*, select **Single**.



- 3. A single viewport now displays, notice that it is still rotated as shown by the UCS icon displayed above.
- 4. From the *FDOT tab* > *Tools panel*, click on the **Untwist View** button.



- 5. The Viewport is **rotated** back to the correct rotation as shown by the UCS icon displayed above.
- 6. **Save** and **Close** the *DRPRRD03.dwg* file.

## **13** CATCHMENT AREAS

### DESCRIPTION

In this chapter, you will review the definition and purpose of Catchment Areas and perform a Watershed Analysis of a surface.

### **OBJECTIVES**

In this chapter, you will learn about:

- Catchment Areas Definition and Purpose
- Performing Watersheds Analysis on a Surface

### CHAPTER SETUP

Run the Chapter 13 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

### **CATCHMENT AREAS**

Catchment areas are used to delineate a drainage boundary that drains to a structure or pipe. Catchment areas can have additional hydrological data attached for further analysis.

### CATCHMENTS

In the next few steps you will review the processes of creating Catchments.

You can model drainage areas by using existing surface data or polyline data to create catchments.

A catchment object is comprised of a boundary and a flow path. The boundary represents the watershed area that produces the runoff. The flow path represents the Time of Concentration data for the runoff flow from the catchment area. This Time of Concentration data can be defined by using the TR-55 method or it may be user-defined.

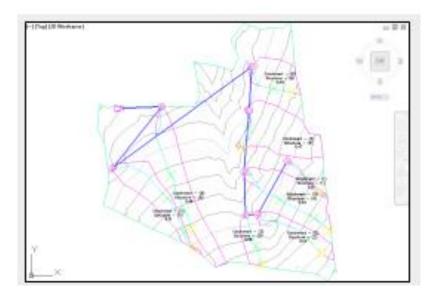
When a catchment is associated with a pipe network structure, the catchment data can be exported to Autodesk Storm and Sanitary Analysis for further analysis and development of the model.

### CREATE CATCHMENT OBJECTS TO MODEL DRAINAGE AREAS ON A SURFACE

Catchments can be accessed from the TOOLSPACE Prospector tab, and associated catchment styles and settings are accessed from the TOOLSPACE Settings tab. When you select a catchment in the drawing, the Catchment contextual ribbon is displayed where you can access catchment-related commands.

### CATCHMENT WORKFLOW

A catchment object is comprised of a boundary and a flow path. The boundary represents the watershed area that produces the runoff. The flow path represents the Time of Concentration data for the runoff flow from the catchment area. This Time of Concentration data can be defined by using the NRCS (SCS) TR-55 method or it may be user-defined.



### CREATING CATCHMENTS FROM SURFACES

If existing surface data is available, you can define a catchment and flow path from this surface data.

You may optionally use the Water Drop command to check how Civil 3D would calculate the flow path from the surface. If this command does not produce the desired results, due to surface irregularities such as localized depressions or erratic triangulation issues, you may opt to use the Create Catchment from Object command and select a manually drawn flow path.

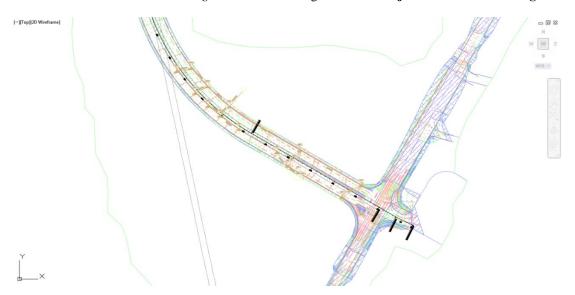
#### CREATING CATCHMENTS FROM OBJECTS

If existing surface data is not available, you can define a catchment and flow path from polylines. If the polylines have elevation data, you can use that data for the flow path slope, or you can edit the slopes of the flow path segments later by using the Flow Segments vista.

In this drawing we will be creating Catchment objects from polylines. The process starts by displaying the watershed boundaries analysis from the road design surface. The Watershed Analysis displays the same boundaries you make with the Define Catchments from Surface command. It is a good starting point for delineating sub basins which you will define later by subdividing the watershed into smaller areas each draining to a single inlet.

### **Exercise 13.1** Watersheds Analysis

- 1. Start the FDOT Civil 3D State Kit and open the **DRPRRD03.dwg** located in the Chapter 13 dataset drainage folder.
- 2. Save file as DRPRRD04.dwg in the same folder location.
- 3. As shown in previous steps, associate the drawing file to the 22049555201 Project by right clicking on the *data shortcut working* folder and selecting **Associate Project to Current Drawing**.



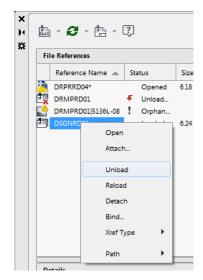
### > Review the Surface SR61\_Final.

In the next few steps you will review the Surface SR61\_Final that will be used to delineate watershed areas.

| TOOLSPACE           |                                       |
|---------------------|---------------------------------------|
| G.                  | 5a E                                  |
| Active Drawing View |                                       |
| DRPRRD04            |                                       |
| - Points            |                                       |
| 🕀 🚱 Point Gr        | oups                                  |
| - @ Point Cl        | ouds                                  |
| B- B Surfaces       |                                       |
| 🖻 💮 🕫 S             | R61_Final                             |
| E 🌐 Alignme         | ents                                  |
|                     | erline Alignments                     |
| ⊕-*⊅″               | SR61                                  |
| -⇒ Offse            | et Alignments                         |
|                     | Return Alignments                     |
|                     | Alignments                            |
|                     | ellaneous Alignments                  |
| Ð> <sup>7</sup>     | S-1 - Proposed Drainage - SR61        |
| •                   | S-2 - Proposed Drainage - SR61        |
|                     | S-4 - Proposed Drainage - SR61        |
|                     |                                       |
|                     | S-7 - Proposed Drainage - SR61        |
|                     | · · · · · · · · · · · · · · · · · · · |
| œ) <sup>₽</sup>     | S-9 - Proposed Drainage - SR61        |

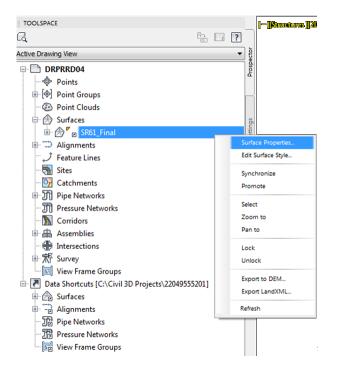
4. In the *TOOLSPACE* > *Prospector* tab notice SR61\_Final is the name of the surface we will use to delineate watershed areas. The *Pipe Network Proposed Drainage* – *SR61* is where we will find the inlets to be connected to Catchment objects.

- 5. On the *command line* Type: **Xref** to open the **Xref Manager**.
- 6. In the list right click on *DRMPRD01* and select **Unload**.
- 7. Repeating the above step to **Unload** the *DSGNRD01* file.



### Watersheds Analysis of SR61\_Final Surface

The contents of the current drawing is all that displays. In the next few steps you will perform **Watersheds Analysis** on the SR61\_Final surface.



1. In the *TOOLSPACE > Prospector tab*, expand **Surfaces**, right click on **SR61\_Final** surface and select **Surface Properties**.

| formation Definition Analysis Statistics |   |
|--|---|
| Name:                                    |   |
| SR61_Final                               |   |
| Description:                             |   |
| Triangles                                | A |
|  |   |
|  | - |
| Default styles                           |   |
| Surface style:                           |   |
| No Display                               |   |
| Analysis-3D Visualization                |   |
| Analysis-Watersheds                      |   |
| Border-Existing [Blue]                   |   |
| Border-Existing [Green]                  |   |
| Border-Existing [Orange]                 |   |
| Border-Existing [Purple]                 |   |
| Border-Proposed [Blue]                   |   |
| Border-Proposed [Purple]                 |   |
| Contours Major 10' Minor 2'              |   |
| Contours Major 2' Minor 0.5'             | E |
| Contours Major 5' Minor 1'               | - |
| DTM Bottom Mesh- Datum                   |   |
|  |   |
| DTM Top Mesh     Elevation Banding       |   |
| Existing Contours Major 10' Minor 2'     |   |
| Existing Contours Major 2' Minor 0.5     |   |
| Existing Contours Major 2 Minor 0.3      | · |
| Standard                                 |   |
|  |   |
| Triangles 1-1 Existing [Blue]            |   |
| Triangles 1-1 Existing [Green]           |   |
| Triangles 1-1 Existing [Orange]          |   |
| Triangles 1-1 Existing [Purple]          |   |
| Triangles 1-1 Proposed [Blue]            |   |

| ormation Definition Analysis Statistics |         |
|---|---------|
| lame:                                   |         |
| SR61_Final                              |         |
| escription:                             |         |
| Triangles                               |         |
| Default styles                          |         |
| Surface style:                          |         |
| Analysis-Watersheds                     | • 💽 • 🖪 |
| Render Material:                        |         |
| 🖓 Global                                | -       |
| Object locked                           |         |

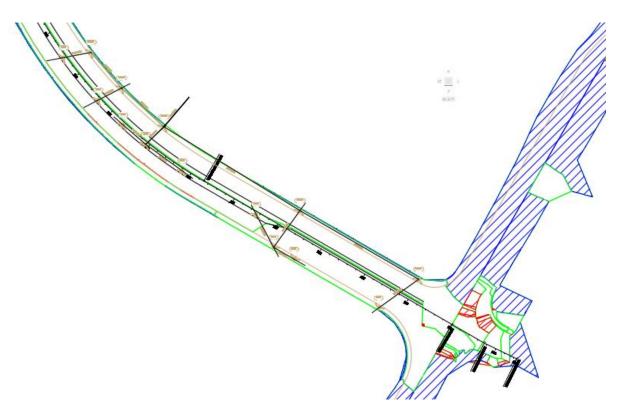
2. From the Surface Properties - SR61\_Final dialog box, select the Information tab. From the *Surface style: drop down list*, select Analysis-Watersheds.

| iurface Properties - SR61_Final   |                   |          |                   |                 |      |
|---|-------------------|----------|-------------------|-----------------|------|
| formation Definition Analysis Statistics  |                   |          |                   |                 |      |
| Elevations  |                   | •        | Preview           |                 |      |
| Contours<br>Directions<br>Elevations<br>Slopes<br>Slope Arrows<br>User-defined contours<br>Watersheds |                   |          |                   |                 |      |
| Number of ranges  | • 8               | -        | 1                 |                 |      |
| Datum elevation: 0.000000   |                   | <b>(</b> |                   |                 |      |
| Range Details<br>Scale scheme to fit  |                   |          | ,                 |                 |      |
| ID  | Minimum Elevation |          | Maximum Elevation | Color Scheme    |      |
|   |                   |          |                   |                 |      |
|   |                   |          |                   | OK Cancel Apply | Help |

3. From the Surface Properties - SR61\_Final dialog box, select the Analysis tab. From the Analysis type: drop down list, select Watersheds.

| atersheds                           |  |             | Preview       |                 |              |
|-------------------------------------|--|-------------|---------------|-----------------|--------------|
| egend                               |  |             |               |                 |              |
| FDOT Water                          | shed   | • 💽 • 🛃     |               |                 | -            |
| Vatershed Param                     | eters  |             |               |                 |              |
| lerge depression<br>when Minimum Av | s into single drain targets<br>erage Deoth is less than: |             |               |                 |              |
| D                                   | Å  | 長           |               |                 |              |
| Merge adjacent                      | t boundary watersheds                                    |             |               |                 |              |
|                                     |  |             |               |                 |              |
| ange Details                        |  |             |               |                 | 9            |
|                                     |  |             |               |                 | <u> </u>     |
| ID                                  | Туре   | Drains Into | Description   | Segment Display | Area Display |
| 1                                   | Boundary point   |             | Description 1 | Continuous      |              |
| 2                                   | Boundary segment   |             | Description 2 | Continuous      |              |
| 3                                   | Boundary segment   |             | Description 3 | Continuous      |              |
|                                     | Boundary segment   |             | Description 4 | Continuous      |              |
| 4                                   |  |             | Description 5 | Continuous      |              |
| 4<br>5                              | Boundary segment   |             |               |                 |              |
|                                     | Boundary segment   |             | Section of    | CF              |              |

- 4. Check the **Merge adjacent boundary watersheds** box and click the **down arrow** to populate the *Range Details* with the calculated Watershed areas.
- 5. Click Apply then OK to close the Surface Properties SR61\_Final dialog box.



- 6. **Zoom** and **Pan** to display the **Proposed Drainage SR61 Pipe Network**. Each inlet is located inside a Watershed Area. In the next chapter you will isolate the Watershed Areas relevant to the design and convert them into polylines.
- 7. Save and Close *DRPRRD04.dwg*.

# **14** POLYLINES FROM WATERSHED ANALYSIS

### DESCRIPTION

In this chapter, you will create Polylines from a Watershed Analysis.

### **OBJECTIVES**

In this chapter, you will learn about:

• Creating Polylines from a Watershed Analysis of the FG Road Surface

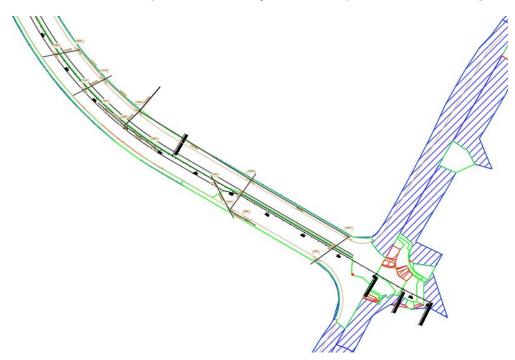
### **CHAPTER SETUP**

Run the Chapter 14 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

### **Exercise 14.1** Creating Polylines from a Watershed Analysis

- 1. Start the FDOT Civil 3D State Kit and open the **DRPRRD04.dwg** located in the Chapter 14 dataset drainage folder.
- 2. As shown in previous steps, associate the drawing file to the 22049555201 Project by right clicking on the *data shortcut working* folder and selecting **Associate Project to Current Drawing**.



3. The drawing containing the drainage pipe network opens. In the next few steps you will Extract Objects from the SR61\_Final surface.

| TOOLSPACE               |                    |     |            |
|-------------------------|--------------------|-----|------------|
| G.                      |                    | 87  | ?          |
| Active Drawing View     |                    |     | <b>→</b> § |
| DRPRRD04                |                    |     | Prospector |
| ···· 🌵 Points           |                    |     | -          |
| 🗊 🐵 Point Groups        |                    |     | _          |
| - 🐵 Point Clouds        |                    |     |            |
| 🖃 🍙 Surfaces            |                    |     | 5          |
| 🗄 💮 🍘 🛛 SR61_Fir=-      |                    |     | Settings   |
| Alignments              | Surface Properties | - [ |            |
| Teature Lines           | Edit Surface Style |     |            |
| - 🚮 Sites               | Synchronize        |     |            |
| - 📴 Catchments          | Promote            |     |            |
| 🐵 🎢 Pipe Networks       | Select             | _   | Survey     |
| 🎢 Pressure Netwo        | Zoom to            |     | 5          |
| - 🔊 Corridors           | 200m to<br>Pan to  |     |            |
| 🗉 🛔 Assemblies          | Pan to             | _   | _          |
| - 🏶 Intersections       | Lock               |     |            |
| ⊕ 📅 Survey              | Unlock             |     | Toolbox    |
| 🔄 View Frame Gro        | Export to DEM      | -1  | 10         |
| 🗄 🗷 Data Shortcuts [C:\ | Export LandXML     |     |            |
| 🗄 🗁 Surfaces            | Export LandAML_    | _   |            |
| Alignments              | Refresh            |     |            |
| Pipe Networks           |                    | _   |            |
| 📅 Pressure Networks     |                    |     |            |
| 💀 🕼 View Frame Groups   |                    |     |            |
|                         |                    |     |            |

4. From the *TOOLSPACE > Prospector tab*, expand **Surfaces**, right-click on **SR61\_Final** surface and click **Select**.

|   | ) 🗠 🖡           |          | h • 🖓 •                                      | ැලි <mark>Civi</mark> | il 3D                 |          |                        | /i =   |            |                                | Autodesk AutoCAD Civil 3D 2016 DRPRRD04.dwg [22049555201] |               |                   |                  |                     |             |                        |              |      |   |
|---|-----------------|----------|--|-----------------------|-----------------------|----------|------------------------|--------|------------|--------------------------------|---|---------------|-------------------|------------------|---------------------|-------------|------------------------|--------------|------|---|
| C3D H   | lome 1          | insert A | nnotate M                                    | odify                 | Analyze               | View     | Manage                 | Output | Survey     | Autodesk 360                   | Help Add-ins  | Featured Apps | Express Tools     | Vehicle Tracking | Bridge Modeler      | Geolocation | Surface Data Reference | E SR61_Final | FDOT | • |
| Add Add   | Add In<br>egend | quiry    | Properties<br>Object Viewe<br>Isolate Object | er                    | Surface<br>Properties | Dp 💼 Pro | en Source<br>mote Data |        | Water Drop | Resolve Crossing<br>Breaklines |   | ard           | et from Surface 🔻 | Profile          | ling Creation Tools |             |                        |              |      |   |
| Labels & Ta   | aures           | Gener    |  |                       |                       | WOL      | wy.                    |        |            | Analyz                         |   |               | nace roots        | Launc            |                     |             |                        |              |      |   |
| Labels & Tables     General Tools     Modity     Analyze     Surface Tools     Launch Pad |                 |          |  |                       |                       |          |                        |        |            |                                |   |               |                   |                  |                     |             |                        |              |      |   |

5. In the Surface Data Reference SR61\_Final > Surface Tools panel > Extract from Surface drop down *list*, select Extract Objects.

| Property     | Value    |     |      |
|--------------|----------|-----|------|
| Border       | Select A | AII | -    |
| ✓ Watersheds | Select A | All | •    |
|              | <br>     |     | <br> |
|              |          |     |      |
|              |          |     |      |
|              |          |     |      |
|              | <br>     |     | <br> |
|              | <br>     |     | <br> |
|              |          |     |      |
|              |          |     |      |
|              |          |     | <br> |
|              | <br>     |     |      |

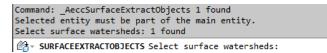
6. From the Extract Objects from Surface - <SR61\_Final> dialog box, clear the check next to **Border**.

| Value                   |
|-------------------------|
|                         |
| Select All 💌            |
| Select from Drawing 🔹 🕠 |
|                         |
|                         |
|                         |
|                         |
|                         |
|                         |
|                         |
|                         |
|                         |
| Cancel Help             |
|                         |

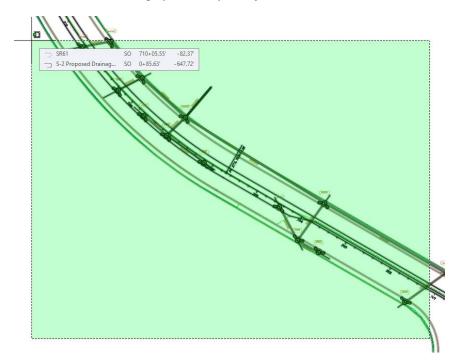
- 7. From the Watersheds Value drop down list, choose Select from Drawing.
- 8. Click the **Select from Drawing** icon. The Extract Objects from Surface <SR61\_Final> dialog box closes while you make your selection.
- 9. From the *command line* you are prompted to: *Select surface watersheds:*

Selected entity must be part of the main entity.

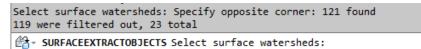
- 10. Select a green Watershed Boundary as shown above.
- 11. From the Selection dialog box, select Tin Surface.
- *Note* Selection cycling helps you click the correct Watershed since adjacent areas share a common boundary.



12. Notice the command line displays a history of objects selected.



13. **Zoom out** and use a *Crossing Window* as shown above to select other green **Watershed Boundaries**. Start a crossing window at the red circle displayed in the lower right location then end at the red circle displayed in the upper left location to complete the crossing window selection.

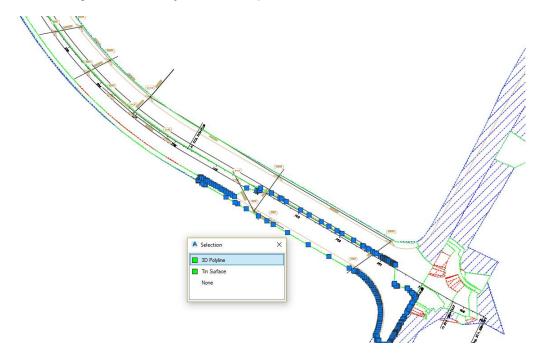


- 14. Notice the command line displays a history of objects selected.
- 15. Press ENTER to return to the Extract Objects from Surface <SR61\_Final> dialog box.

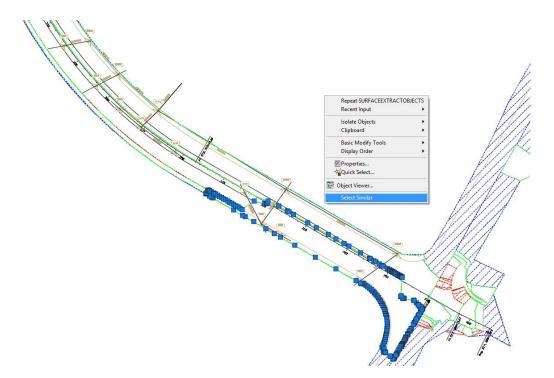
| Extract Objects from Surface | - <sr61_p< th=""><th>inal&gt;</th><th>X</th></sr61_p<> | inal>               | X    |
|------------------------------|--|---------------------|------|
| Property                     |  | Value               |      |
| Border                       |  | Select All          | -    |
| Watersheds                   |  | Select from Drawing |      |
|                              |  |                     |      |
|                              |  |                     |      |
|                              |  |                     |      |
|                              |  |                     |      |
|                              |  |                     |      |
|                              |  |                     |      |
|                              |  |                     |      |
|                              |  |                     |      |
|                              |  |                     |      |
|                              |  |                     |      |
| _                            |  |                     |      |
|                              | OK   | Cancel              | Help |

- 16. Click OK to close the Extract Objects from Surface <SR61\_Final> dialog box.

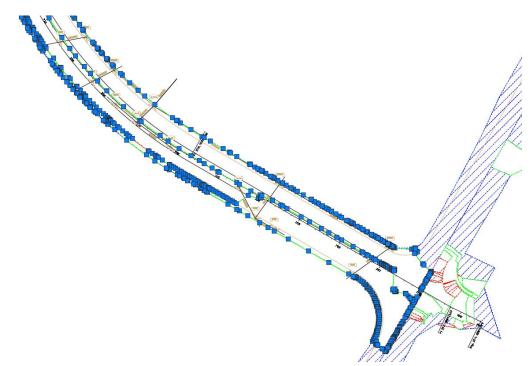
17. Zoom and Pan in a little closer and hover over the Watershed Boundary to display the tooltip revealing the extracted object is a **3D Polyline**.



18. Select the **3D Polyline.** With selection cycling toggled on, a **Selection** dialog box displays. From the **Selection** dialog box select **3D Polyline.** 



19. Right-click and choose **Select Similar** from the shortcut menu.



- 20. The display of grips confirms that other 3D Polyline objects were extracted. Press ESC to clear grips.
- 21. Save and Close the *DRPRRD04.dwg* file.

### **15** BOUNDARY LINES DOWNSTREAM OF STRUCTURES

### DESCRIPTION

In this chapter, you will do some basic setup of your design file and then you create boundary lines downstream of structures.

### **OBJECTIVES**

In this chapter, you will learn about creating Boundary Lines Downstream of Structures.

### **CHAPTER SETUP**

Run the Chapter 16 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

### **Exercise 15.1** Create Boundary Lines Downstream of Structures

### > Drawing Catchment Boundary Lines

- 1. Start the FDOT Civil 3D State Kit and open the **DRPRRD04.dwg** located in the Chapter 15 dataset drainage folder.
- 2. As shown in previous steps, associate the drawing file to the 22049555201 Project by right clicking on the *data shortcut working* folder and selecting **Associate Project to Current Drawing**.



- 3. The drawing containing the Drainage Pipe Network opens.
- 4. On the command line Type: Xref. Reload Reference Drawings back into your current drawing file.

| <b>B</b> | Ð          | - J   | ∆ <b>- ?</b> |  |
|----------|------------|-------|--------------|--|
| File     | e Referenc | es    |              |  |
|          | Referenc   | e Nam | e            |  |
|          | DRPRRD     | )4    |              |  |
|          | DRMPRD     | 01    |              |  |
| 1        | DSGNRD     |       | Open         |  |
|          |            |       | Attach       |  |
|          |            |       | Unload       |  |
|          |            |       | Reload       |  |
|          |            |       | Detach       |  |
|          |            |       | Bind         |  |

- 5. On the *File Reference list* right click on **DRMPRD01** and select **Reload.** The drawing is reloaded and now visible.
- 6. Right click on **DSGNRD01** and select **Reload**.
- 7. Close the External References tool palette.
- 8. Save the *DRPRRD04.dwg* file.

### Set Xref Fading for Attached Xrefs

The next steps will show you how to set Xref fading for all attached Xrefs. Xref fading controls how visible your referenced files are in your source drawing. The higher the number the more screened objects are.

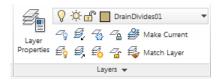


- 1. From the *Insert tab* > *Reference panel*, click on the panel title to display the hidden commands.
- 2. Set the Xref fading value to zero.

| Attach Clip Adjus | t Underlay Lay | * • | ON - |
|-------------------|----------------|-----|------|
| Edit Reference    |                |     |      |
| Xref fading       | ]              | 0   |      |
| -(b) Ref          | ference        |     | ы    |



- 3. Notice in the drawing editor the Xrefs appear brighter. The alignment's display remains at full intensity.
- 4. From the *Home tab > Layers panel > Layer drop down list*, and set the current Layer to **DrainDivides01**.



HINT You can also type in the layer name on the command line to change it.

### > Define Temporary Drainage Divide Lines

The next steps will show you how to define temporay Drainage Divide lines to be used as boundaries when creating polylines for each subbasin

You need to define temporay Drainage Divide lines to be used as boundaries when creating polylines for each subbasin. These lines will form the downstream limits of the subbasin at each inlet. Beyond these downstream limits the water will be flowing toward another downstream inlet (as bypass flow).

A file named Catchment Line *Placement.dwg* has been created for you. The Catchment Line *Placement.dwg* contains AutoCAD points to be inserted into the *DRPRRD04.dwg*. These AutoCAD points will used as aids in the later process of defining temporay Drainage Divide lines to be used as boundaries when creating polylines for each subbasin

1. On the *Command Line* Type **Insert** <OR> **I** to open the **Insert** dialog.

|                         | /                 |   |
|-------------------------|-------------------|---|
| A Insert                |                   | ×                                       |
| Name: ClosedBlank       | ▼ Brows           | e                                       |
| Path:                   |                   | Opens the Select Drawing File dialog b  |
| Locate using Geographic | Data              | where you can select a block or drawing |
| Insertion point         | Scale             | Rotation                                |
| Specify On-screen       | Specify On-screen | Specify On-screen                       |
| X: 0                    | X: 1              | Angle: 0                                |
| Y: 0                    | Y: 1              | Block Unit                              |
| Z: 0                    | Z: 1              | Unit: Unitless                          |
|                         | ☑ Uniform Scale   | Factor: 1                               |
| ☑ Explode               | ОК                | Cancel Help                             |

2. From the Insert dialog box click on Browse.

| Look in:  | 🕕 Drainage 🔹 🔻                          | 🖛 🖣 | K 🔊 🕻        | EI,  | <u>V</u> iews | <ul> <li>Too</li> </ul> |
|-----------|---|-----|--------------|------|---------------|-------------------------|
|           | Name                                    | Da  | ti - Preview |      |               |                         |
|           | \mu c3d                                 | 1/2 | e.           |      |               |                         |
|           | 🌗 complete                              | 1/2 | 5            | - ** | *# 4          |                         |
|           | 🌗 dem data                              | 1/2 | ۱¢           |      | * 4F          |                         |
|           | \mu dgn                                 | 1/2 | <u>۱</u> ۴   |      | +74           |                         |
|           | 퉬 eng_data                              | 1/2 | te .         |      |               |                         |
| <b>N</b>  | 🌗 ssa                                   | 1/2 | le .         |      |               |                         |
|           | 🚰 Catchment Line Placement.dwg          | 1/2 | 5            |      |               |                         |
|           | CRMPRD01.dwg                            | 1/1 | 1            |      |               |                         |
|           | CRPRRD01.dwg                            | 1/1 | .1           |      |               |                         |
|           | DRPRRD02.dwg                            | 1/1 | <u>.</u>     |      |               |                         |
|           | DRPRRD03.dwg                            | 1/2 | 1            |      |               |                         |
|           | DRPRRD04.dwg                            | 1/2 |              |      |               |                         |
|           | Extend Alignment.dwg                    | 1/1 |              |      |               |                         |
| I 3D Proj | Inlet Placement.dwg                     | 1/1 | .0           |      |               |                         |
|           | 🗎 Water Drop.dwg                        | 12/ | ŝ            |      |               |                         |
| 12        |   |     |              |      |               |                         |
|           | < III                                   |     |              |      |               |                         |
|           |   |     |              |      |               |                         |
|           | File name: Catchment Line Placement.dwg |     |              |      | -             | Open                    |

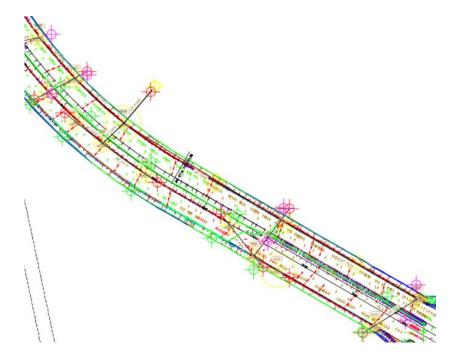
- 3. From the Select Drawing File dialog box, navigate to: C:\Civil 3D Projects\22049555201\Drainage.
- 4. Select Catchment Line Placement.dwg, then click Open to close Select Drawing File dialog box.

| Insert                            |                                      | ×                          |
|-----------------------------------|--------------------------------------|----------------------------|
| Name: Catchment Line Place        | ment                                 |                            |
| Path: C:\Civil 3D Projects\22     | 2049555201\Drainage\Catchmen<br>Data | t L                        |
| Insertion point Specify On-screen | Scale<br>Specify On-screen           | Rotation Specify On-screen |
| X: 0                              | X: 1                                 | Angle: 0                   |
| Y: 0                              | Y: 1                                 | Block Unit                 |
| Z: 0                              | Z: 1                                 | Unit: Feet                 |
|                                   | VIII Uniform Scale                   | Factor: 1                  |
| 📝 Explode                         | ОК                                   | Cancel Help                |

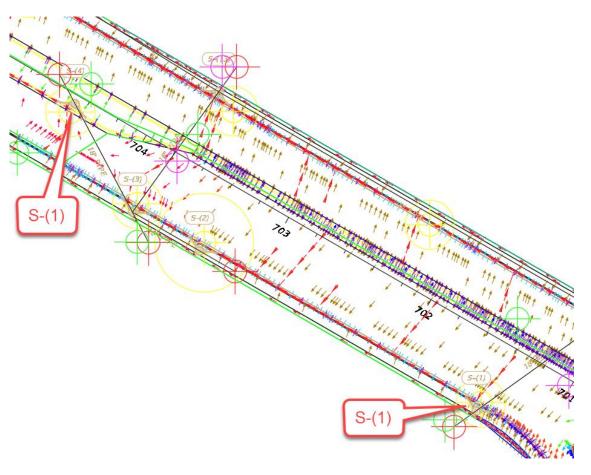
- 5. From the Insert dialog box, Uncheck Insertion Point, Scale, and Rotation boxes, then Check *Explode* box.
- 6. Click **OK** to close the **Insert** dialog box.
- 7. To view the AutoCAD Points to be used in the next process of defining temporay Drainage Dividing lines the Point Display Mode PDMODE must be set. From the *command line* Type: **PDMODE**, then press **ENTER**.

PDMODE Enter new value for PDMODE <0>: 34

8. On the *command line* Type: **34**, then Press ENTER again. The drawing should display as shown below.



9. Zoom and Pan to display structures S-(1) and S-(4).



10. AutoCAD Points from the inserted Catchment Line Placement.dwg display in the following ways:

- AutoCAD Points that are south of the SR61 median display using the color Green.
- AutoCAD Points that are north of the SR61 median display using the color Magenta.
- AutoCAD Points that display using the color Red were used in the process of extending the Proposed Drainage SR61 Alignments and are not used in this example.

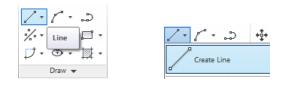
*HINT* If the AutoCAD Points are displayed to large execute a REGEN command from the command line. The REGEN command will resize the AutoCAD Points based on the current zoom display scale

11. Save the DRPRRD04.dwg file.

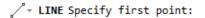
# **Exercise 15.2** Draw Boundary Lines Downstream of Structures

#### > Draw Lines Downstream of Structure S-(1)

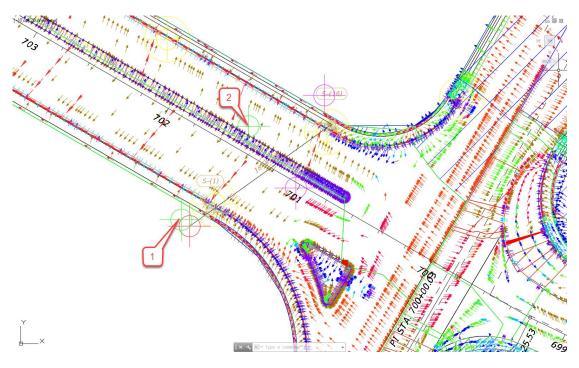
The next steps will show you how to draw lines that will represent the downstream boundary of the catchment areas.



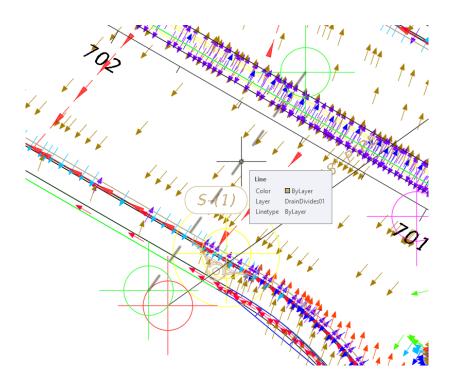
1. From the *Home tab* > *Draw panel drop down list*, select the **Create Line** command. The *command line* prompts you for the *starting point*.



#### 2. Zoom and Pan to display structure S-(1).



- 3. Using a Node Object Snap select the green AutoCAD Point (1) as displayed above on the downstream side of structure S-(1). The *command line* prompts you for the *second point*.
- 4. Using a Node Object Snap select the green AutoCAD Point (2) as displayed above the SR61 Median.
- 5. Press ENTER to end the Line command.



- 6. Hover over the **Line** just created representing the *Downstream Boundary*. This line is parallel to the flow direction arrows and represents a Subbasin Boundary on the immediate downstream side of the structure S-(1).
- 7. Save the *DRPRRD04.dwg* file.

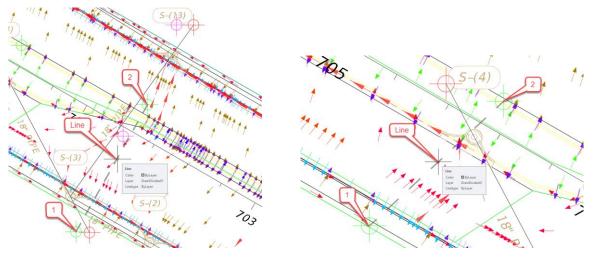
#### > Draw Lines Downstream of Structures S-(2)

Using Steps from the previous exercise draw a line downstream from the following structures. The Lines will be parallel to the Flow direction arrows.

1. Structure List to use in this exercise:

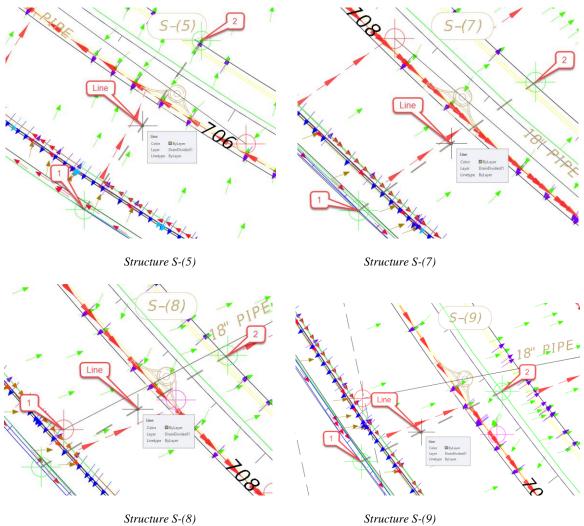
| S-(2)         | <b>S-(4)</b>  | <b>S-(5</b> ) | <b>S-(7</b> ) | <b>S-(8)</b> |
|---------------|---------------|---------------|---------------|--------------|
| <b>S-(9</b> ) | <b>S-(10)</b> | <b>S-(11)</b> | S-(13)        | S-(16)       |

2. Use the following diagrams to assist.



Structure S-(2)

Structure S-(4)

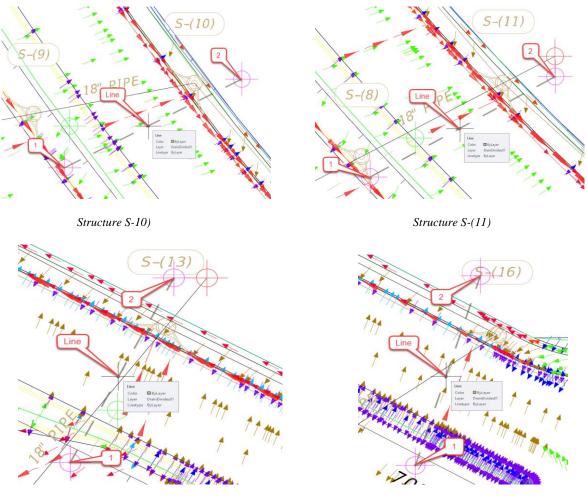


3. **Save** the *DRPRRD04.dwg* file:

Structure S-(9)

# > Next you will use the Magenta AutoCAD Points to draw the lines.

1. Use the following diagrams to assist.



Structure S-(13)

Structure S-(16)

- 2. Save and Close the *DRPRRD04.dwg* file:
- *Note* The geometry for the sub-basins has been determined. In the next chapter you will create closed polylines for each sub-basin. Afterward the polylines will be converted to Catchments and assigned to inlets.

# **16** DEFINING CATCHMENT AREAS

# DESCRIPTION

In this chapter, you will create catchment areas for the inlets in the closed drainage system for the pavement.

# **OBJECTIVES**

In this chapter, you will learn about:

- Creating Closed Polylines to Represent Catchment Area Geometry for Each Inlet
- Defining Catchment Areas from Polylines
- Assigning Inlets to Catchment Areas
- Labeling Catchment Areas

# CHAPTER SETUP

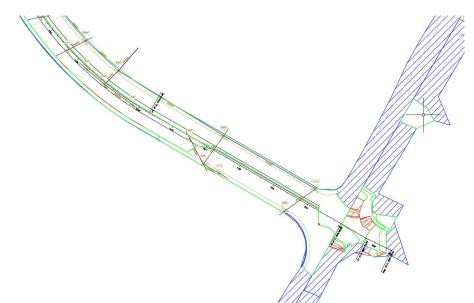
Run the Chapter 16 - 22049555201.exe file and restore all files to the C:\Civil 3D Projects folder.

Do not change the location in which the Practice Files are installed. Doing so can cause errors when completing the exercises in this training manual.

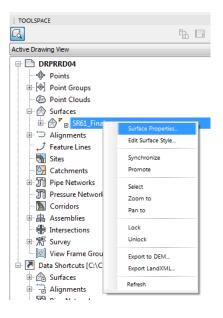
# **Exercise 16.1** Boundary Line Creation for Catchments

- 1. Start the FDOT Civil 3D State Kit and open the **DRPRRD04.dwg** located in the Chapter 16 dataset drainage folder.
- 2. As shown in previous steps, associate the drawing file to the 22049555201 Project by right clicking on the *data shortcut working* folder and selecting **Associate Project to Current Drawing**.
- 3. As show in previous chapters, **Unload** some *Xreferences* from the current file. On the *command line* Type **Xref** to open the Xref Manager.
- 4. **Unload** the following files: *DRMPRD01.dwg* and *DSGNRD01.dwg*. Hovering over the Filename right click to open the Shortcut Menu.

5. **Reset** *PDMODE* to **0**. On the *command line* Type **PDMODE** and change the setting to **0**. Press **ENTER** to exit the command. The drawing should look like image below.



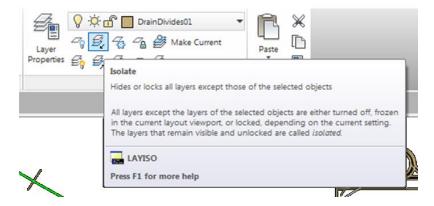
> Next you will change the final surface style to no display.



1. From the *TOOLSPACE > Prospector tab*, expand **Surfaces**, right click on **SR61\_Final** and select **Surface Properties.** 

| Surface Properties - SR61_Final          |                      |
|--|----------------------|
| formation Definition Analysis Statistics |                      |
| Name:                                    |                      |
| SR61_Final                               |                      |
| Description:                             |                      |
| Triangles •                              |                      |
| Default styles                           |                      |
| Surface style:                           |                      |
| Render Material:                         |                      |
|  |                      |
|  |                      |
|  |                      |
| Object locked                            |                      |
| Show tooltips                            |                      |
|  |                      |
|  | OK Cancel Apply Help |

2. From the Surface Properties – SR61\_Final dialog, select the Information tab. From the *Surface style: drop down list*, select \_No Display. Click Apply the click OK.



3. From the *Home tab in the Ribbon > Layer panel*, select the **Isolate** to flatten catchment polylines to an elevation of 0.

Expr LAYISO Select objects on the layer(s) to be isolated or [Settings]:

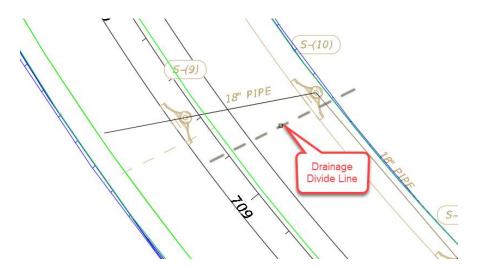
4. On the *command line* you are prompted to: *Select objects on the layer(s) to be isolated or [Settings]*. Select the **Settings** option.

Extractional strategy of the setting for layers not isolated [Off Lock and fade] <Off>:

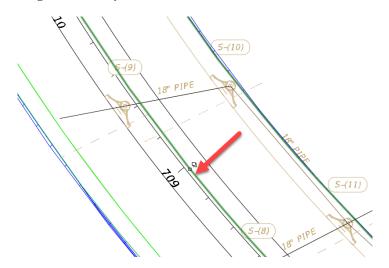
5. On the *command line* you are prompted to: *Enter setting for layers not isolated [Off Lock and fade]* <*off>*. Select **Off** to set the behavior of the command to turn off the unselected Layers when completed.

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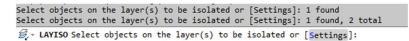
6. On the *command line* you are prompted to: *In paper space viewport use* [*Vpfreeze Off*] <*Vpfreeze*>. Select the *Viewport* setting **Vpfreeze** as the next option.



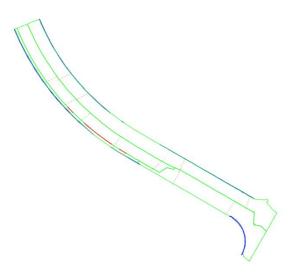
7. On the *command line* you are prompted to: *Select objects on the layer(s) to be isolated*. Select a line on the **drainage divide01** *layer*.



8. Select one of the green **3D Polylines**.



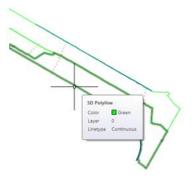
9. The *command line history* logs each selection made. Press **ENTER** to complete the command. The results are all layers are turned off except the selected layers as shown below.



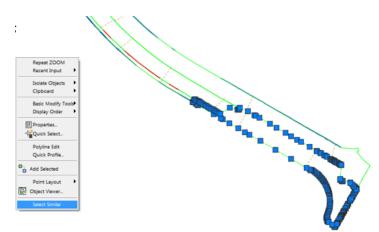
10. Hover over the **3D Polyline** to confirm you have the correct objects displayed. The 3D Polylines are at the terrain model elevations.

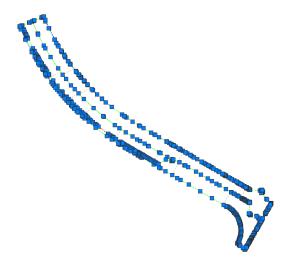
#### > Create 2D Closed Polylines Using the BOUNDARY Command

We want to create 2D closed polylines using the BOUNDARY command. The BOUNDARY command requires all objects to be at the same elevation. To do this we need change all the 3D polyline vertices to elevation zero (Z=0 at each vertex). The lines on layer DrainDivide01 are at elevation zero.



1. Flatten all objects before moving to Boundary Creation. Select a **3D Polyline**, right click and select choose **Similar**.

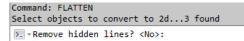




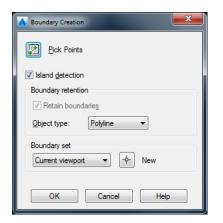
2. Notice that all **3D Polylines** are now selected.

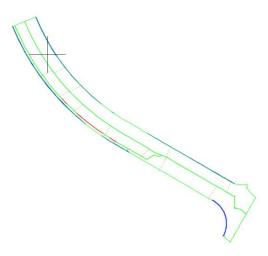
## > Use the FLATTEN Command to Set All Vertices

The BOUNDARY command used to create closed Polylines requires 2D Polylines. We will use the **FLATTEN** command to set all vertices of the selected 3D Polylines to elevation 0.

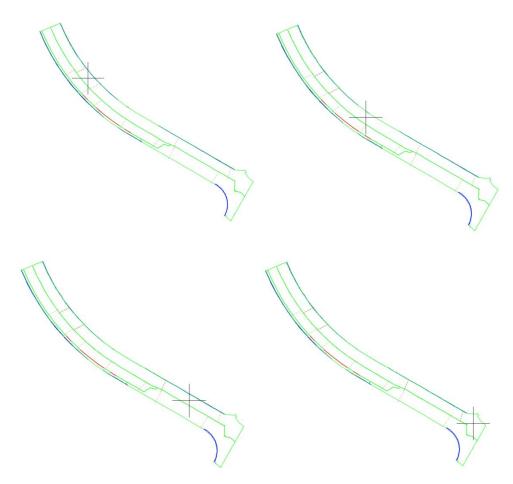


- 1. On the *command line* Type **FLATTEN**. The *command line* asks if you would like to: *Remove hidden lines*? Select **NO** and press **ENTER**.
- 2. Select a **3D** Polyline, right click and select **Properties**. The **Properties** palette displays. Notice the *Vertex Z value* is **0**. Close the **Properties** palette.
- 3. Press **ESC** to clear the grips.
- 4. **Zoom** to display all the **Watershed Geometry** on the screen. The **BOUNDARY** command requires all enclosed areas to be fully visible.
- 5. With all geometry now at *elevation* **0**, on the *command line* type **BOUNDARY**. Press **ENTER**. The Boundary Creation dialog displays. Click the **Pick Points** button.

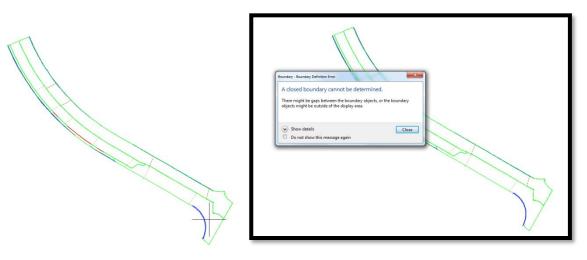




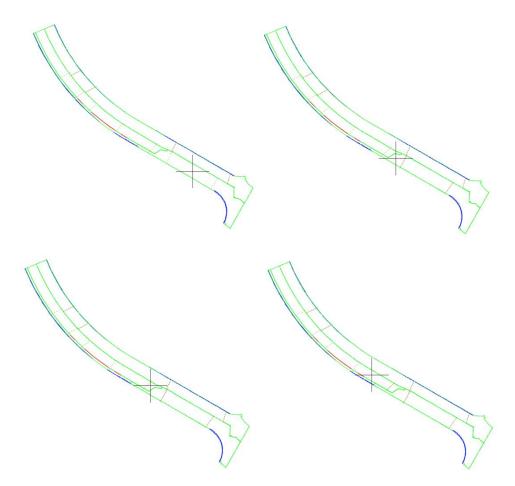
- 6. Start on **North Side** of *SR61 Alignment*. An *enclosed area* is visible and formed by the *3D Polyline* and a line on the *DrainDivide00* Layer. Click *inside* the **enclosed area** as shown above. The perimeter of the area selected will highlight.
- 7. Move your cursor over the next **enclosed area** and click.
- 8. Repeat the process for the remaining **enclosed areas** as displayed the following images. Notice the cursor placement in each one.

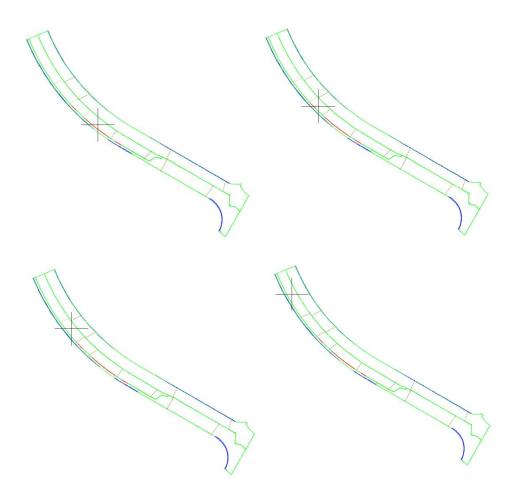






9. Click **Close** to close the Boundary - Boundary Definition Error dialog box. Continue creating Boundaries. We will correct this error later.



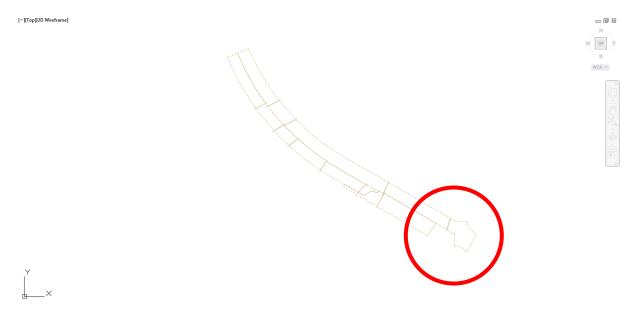


10. Press **ENTER** after clicking in the last **enclosed area**.



11. From the *Home tab of the Ribbon > Layer Properties panel*, select the **Unisolate** command.

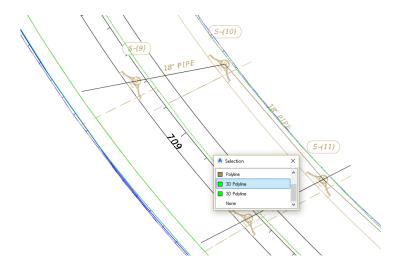
12. Isolate **DrainDivide01** *layer* so it is the only visible collection on the screen. Refer to steps above if you need a refresher. Your drawing should look like image below.



## > Try the Boundary Command Again for Errors

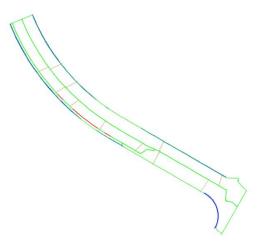
The objects on other visible layers are now off leaving only the 2D Polylines on layer DrainDivide01 visible. The area inside the red circle was where we received the error message when attempting to create a Boundary. Because we now have the surrounding boundaries created which may provide closed geometry, let's try the Boundary command again.

- 1. **Unisolate** the Drainage Layers.
- 2. **Isolate** *DrainDivide01* and *0* Layers to display geometry for remaining *Catchment Area*. For object select a line on the **drainagedivide01** *Layer*.



3. Select a green **3D Polylines** on the **0** layer.

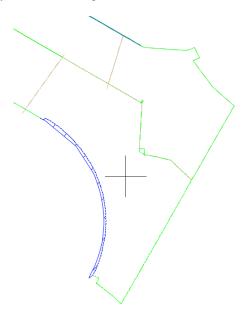
4. Press **ENTER** to complete the command. Your drawing should look like image below.



5. On the *command line* Type **BOUNDARY**. Press **ENTER**.

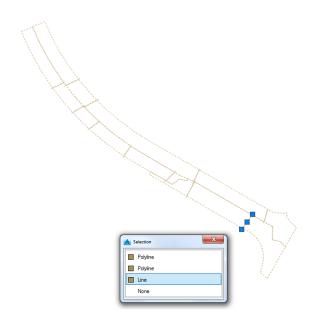
| A Boundary Creation                    |
|--|
| Pick Points                            |
| ✓ Island detection                     |
| Boundary retention                     |
| ✓ Retain boundaries                    |
| Object type: Polyline                  |
| Boundary set<br>Current viewport   New |
| OK Cancel Help                         |

6. From the Boundary Creation dialog box, click the **Pick Points** button.

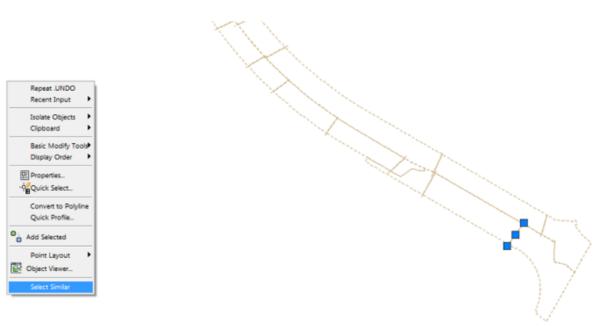




- 7. The *command line history* logs each selection made.
- 8. On the *Home tab of the Ribbon > Layers panel*, select the **Un-isolate** command. You can isolate just the DrainDivides01 Layer to verify the boundary is now created.

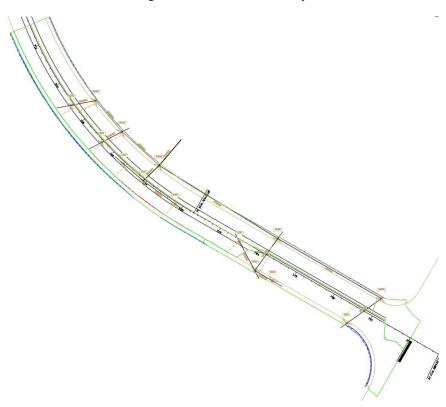


9. Erase the Lines drawn in the previous chapter that helped divide the Catchment Areas. As displayed in the image above, select one of the **lines**. With *selection cycling* On, a **Selection** dialog displays. Select **Line**.



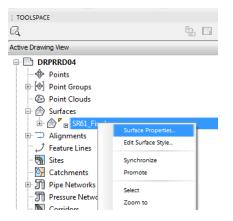
10. Right click to display the Shortcut Menu and choose Select Similar to select the other Lines.

- 11. With all of the Lines highlighted with grips, Press Delete.
- 12. Run the Unisolate command again to turn ON all of the Layers.



## > Verify the Surface Style Set to \_No Display

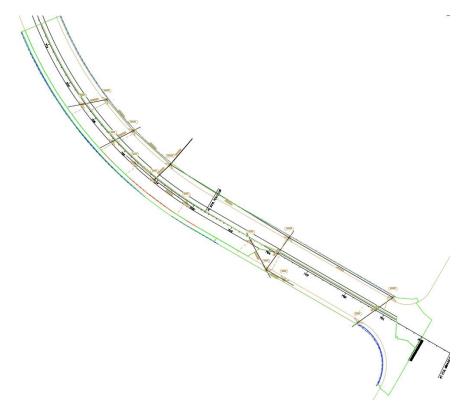
Prepare the display for selecting polylines and inlets by verifying the surface style is set to \_No Display.



1. On the *TOOLSPACE > Prospector tab* expand **Surfaces**, right click on **SR61\_Final** and select **Surface Properties**.

| nformation Analysis Statistics |         |
|--------------------------------|---------|
| Name:                          |         |
| SR61_Final                     |         |
| Description:                   |         |
| Triangles                      | ^       |
|                                | -       |
| Default styles                 |         |
| Surface style:                 |         |
| Border-Existing [Purple]       | - 💽 - 🖪 |

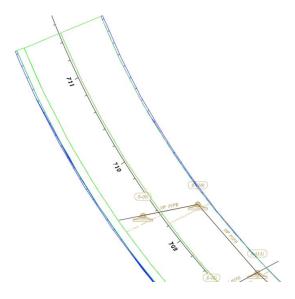
2. From the Surface Properties - SR61dialog box, select the Information tab. Make sure the Surface *Style* is set to \_No Display. Click Apply then OK to close the dialog box.



3. By setting the Surface Style to \_No Display the Watershed Boundaries will not get in the way of our selecting the polylines on the DrainDivide01 layer.

# **Exercise 16.2** Create Catchment Groups and Individual Catchments

Now you will Create Catchment Groups and populate them with the individual Catchments.



1. Zoom to the Northern end of our *area of interest* and begin creating *Catchment Areas*.



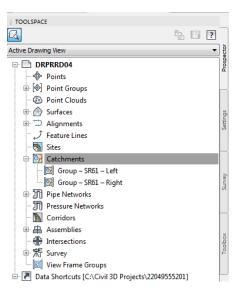
2. From the Analyze tab on the ribbon > Catchments pull down list, select Create Catchment Group.

| Catchment Group - Catchment Group - (1) |    |                   |
|---|----|-------------------|
| lame:                                   |    |                   |
| Group – SR61 – Right                    |    |                   |
| Description:                            |    |                   |
|   | *  |                   |
|   |    |                   |
|   | -  |                   |
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|   |    |                   |
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|   |    |                   |
|   |    |                   |
|   |    |                   |
|   |    |                   |
|   | ОК | Cancel Apply Help |
|   | OK | Cancer Apply Help |

3. From the Catchment Group dialog box, Type Catchment Group – SR61 – Right in the *Name* field. Click Apply then OK to close the dialog box.

| Name:                         |   |  |  |
|-------------------------------|---|--|--|
| Catchment Group - SR61 - Left |   |  |  |
| Description:                  |   |  |  |
|                               | ~ |  |  |
|                               | - |  |  |
|                               |   |  |  |
|                               |   |  |  |
|                               |   |  |  |
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|                               |   |  |  |
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|                               |   |  |  |
|                               |   |  |  |
|                               |   |  |  |
|                               |   |  |  |
|                               |   |  |  |

4. Repeat the command to create Catchment Group – SR61 – Left.



5. Review the newly created *Catchments*.

#### > Create Catchments for Each Structure

Now you will create catchments for each Structure within the appropriate Catchment Group.

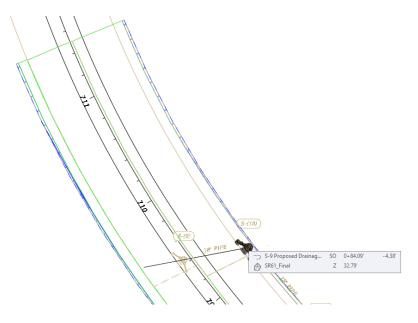
- Home Insert Annotate Modify Analyze Contour Check ¢ Flow Paths • Quick Visibility Drive Inter Survey Profile Catchments Check Catchment Area Groun Start Create Catchment Group TOOLSPACE [-][ Create Catchment from Surface tive Drawing Set Create Catchment from Object Drawing 920
- 1. From the Analyze tab on the Ribbon > Catchments drop down list, select Create Catchment from Object.

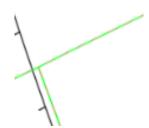


2. On the *command line* you are prompted to: *Select polyline for catchment area boundary*. With the *selection cycling* On, select the **Polyline Boundary** enclosing S-(10). Press **ESC** to skip selecting the Flow Path Polyline.

| A Create Catchment from Object     |
|------------------------------------|
| Catchment Name:                    |
| Catchment - (<[Next Counter(CP)]>) |
| Description:                       |
| *                                  |
| •                                  |
| V Exclusionary                     |
| Catchment Group:                   |
| 📴 Group - SR61 - Right 🔹 📑 👻       |
| Reference pipe network:            |
| Proposed Drainage - SR61           |
| Reference pipe network structure:  |
| S-(10)                             |
| Catchment Flow Path                |
| Catchment style:                   |
| 🚰 FDOT Catchment 👻 🌄               |
| Catchment layer:                   |
| DrainDivides00                     |
| Label Styles                       |
| Catchment label style:             |
| 🥳 FDOT Catchment Area 🔹 🌄 🔣        |
| Flow segment label style:          |
| 🖏 Standard 🔹 💽 🗖                   |
| Runoff Coefficient:                |
| 0.9                                |
| Erase existing entities            |
| OK Cancel Help                     |

- 3. The Create Catchment from Object dialog box displays. Make the following changes:
  - a. Set the Catchment Group to Catchment Group SR61 Right
  - b. Change the *Runoff Coefficient* to **0.90**
- 4. Click the **Select Reference Structure** button next to the *Reference pipe network structure:* option. The *command line* prompts you to: *Select Pipe Network Structure*. Select **Structure S-(10)**.
- 5. Click **OK** to close the dialog.





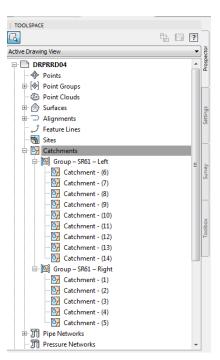
- 6. Notice the Area Label is centered in the *Catchment Area*.
- 7. On the *command line* you are still in the **Create Catchment** command. Repeat steps above for the following structures:

8. Change the *Catchment Group* to **Group–SR 61–Left** and repeat steps above for the following structures:

| <b>S-(1)</b> | <b>S-(</b> ) | 2) 8  | 5-(3) | <b>S-(4</b> | ) 5           | 3-(5) |
|--------------|--------------|-------|-------|-------------|---------------|-------|
| S            | -(6)         | S-(7) | S-    | (8)         | <b>S-(9</b> ) |       |

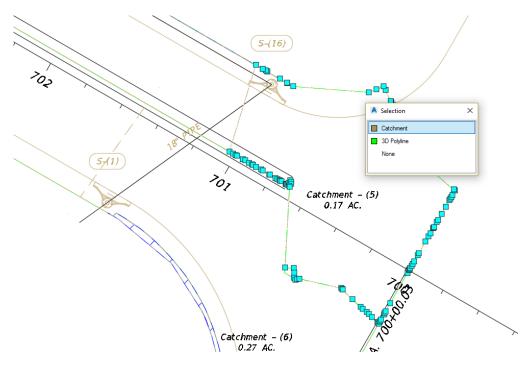
#### Review Catchments

Expand the Catchments collection in the Prospector to view the Catchment Groups and individual Catchment Areas. The name of the Catchments will renamed in the next exercise.



# **Exercise 16.3** Rename Catchments

Rename the Catchments to match the corresponding structure numbers.



1. Select the **Catchment Boundary** to activate the *Blue Grips* for **structure S-(16)** as shown above. From the **Selection** dialog select **Catchment**.

| 4. 🗅 🖻         | ≥ 🖥 😂 ५ • ๙ •                  | ြို့ Civil 3D        | •          | <b>1</b> =         |            |
|----------------|--------------------------------|----------------------|------------|--------------------|------------|
| C3D Home       | e Insert Annotate Mo           | dify Analyze View    | Manage     | Output Survey      | Autodesk 3 |
| Add Labels     | Inquiry Properties             | Catchment Properties | Flow Paths | 🔯 Move to Catchr   |            |
| abels & Tables | General Tools 👻<br>V Drawing1* | Edit Catchment       | Properties | y<br>+             |            |
|                |                                | Edit Catchment       | Style      | •]Top]]2D Wirafran | ne]        |

2. From the *Context Sensitive Menu > Catchment Properties drop down list*, select Edit Catchment Properties.

| Catchment Properties - Catchment | : - (5)   |  |  | × |
|----------------------------------|---|--|--|---|
| ormation Catchment Properties    |   |  |  |   |
| lame:                            |   |  |  |   |
| Structure S-(16)                 |   |  |  |   |
| escription:                      |   |  |  |   |
|                                  | ^   |  |  |   |
|                                  |   |  |  |   |
|                                  | $\sim$  |  |  |   |
| Default style                    |   |  |  |   |
| Catchment style:                 |   |  |  |   |
|                                  |   |  |  |   |
| FDOT Catchment                   | ~ 🏹 <b>-</b> 尾  |  |  |   |
|                                  | ~ <b>&gt; E</b>   |  |  |   |
|                                  | ~ <b>&gt; E</b>   |  |  |   |
|                                  | ✓ ▶ ■ ■   |  |  |   |
|                                  | - <b>.</b>  |  |  |   |
|                                  | - <b>-</b>  |  |  |   |
|                                  |   |  |  |   |
|                                  | ✓ ● ● ■   |  |  |   |
| E FDOT Catchment                 | <ul> <li>•</li> <li>•</li></ul> |  |  |   |

3. From the Catchment Properties dialog box, select the Information tab. The tab displays the *Name* of the Catchment and the *Catchment Style* used. Change *Name:* to Structure S-(16).

|    |   | Value                    |
|----|---|--------------------------|
|    | chment Properties                           | value                    |
|    | Catchment                                   |                          |
|    | 2D Area of Catchment                        | 7325 Sq. Ft.             |
|    | Discharge Point                             |                          |
|    | Exclusionary                                | True                     |
|    | Reference Pipe Network                      | Proposed Drainage - SR61 |
|    | Reference Pipe Network Structure            | S-(16)                   |
|    | Catchment Group Name                        | Group – SR61 – Right     |
|    | Reference Surface                           | <none></none>            |
|    | Hydrological Properties                     |                          |
|    | Runoff Coefficient                          | 0.90                     |
| •  | Sheet Flow                                  |                          |
|    | Sheet Flow Segments                         | 0                        |
|    | Total Sheet Flow Travel Time                |                          |
| •  | Shallow Concentrated Flow                   | ,                        |
|    | Shallow Concentrated Flow Segments          | 0                        |
|    | Total Shallow Concentrated Flow Travel Time |                          |
|    | Channel Flow                                |                          |
|    | Channel Flow Segments                       | 0                        |
|    | Total Channel Flow Travel Time              |                          |
| 01 | Time of Concentration                       |                          |
|    | Time Of Concentration Method                | TR-55                    |
|    | Time of Concentration                       | 0.000 hr                 |
|    | Hydraulically Most Distant Point            |                          |
|    | Hydraulically Most Distant Length           |                          |

- 4. From the Catchment Properties dialog box, select the Catchment Properties tab.
  - a. Notice the name of the *Reference Pipe Network Structure* is **S-(16).**
- *Note* The Reference Pipe Network Structure should always be the name of the catchment. If you try to use a duplicate name you will get an error message. All Catchments must have unique names. Using the Structure name in the Catchment name will avoid this conflict.
  - b. Verify that *Runoff Coefficient* is set to **0.90**.
  - 5. Click **Apply**, then **Ok** to close the dialog box.

| TOOLSPACE                       | [-][Top][2D \                  |  |  |
|---------------------------------|--------------------------------|--|--|
|                                 | •                              |  |  |
| Active Drawing View             | ector 🔺                        |  |  |
| DRPRRD04                        | Prospecto                      |  |  |
| - Points                        | "                              |  |  |
| 🖶 🕑 Point Groups                |                                |  |  |
| Point Clouds                    |                                |  |  |
| 🖶 🌧 Surfaces                    | s                              |  |  |
| Alignments                      | Settings                       |  |  |
|                                 |                                |  |  |
| - 🚮 Sites                       |                                |  |  |
| E Catchments                    |                                |  |  |
| 🖨 📴 Group – SR61 – Left         | rev (                          |  |  |
| 🚱 Catchment - (6)               | Properties                     |  |  |
| Catchment - (7)                 | Create Flow Path from Object   |  |  |
| Catchment - (8)                 | Create Flow Path from Surface_ |  |  |
| Catchment - (9)                 |                                |  |  |
|                                 | Move to Catchment Group        |  |  |
| Catchment - (11)                | Copy to Catchment Group        |  |  |
|                                 | Delete                         |  |  |
| 🔯 Catchment - (13)              |                                |  |  |
| Catchment - (14)                | Select                         |  |  |
| 😥 🔯 Group – SR61 – Right        | Zoom to                        |  |  |
| Pipe Networks                   | Pan to                         |  |  |
| Pressure Networks     Corridors | Refresh                        |  |  |

> Edit Name Using a Different (Quicker) Method

1. Working from the *TOOLSPACE > Prospector tab*, expand **Catchments**, expand **Catchment Group** - **SR61**-Left, right-click on **Catchment - (6)**, then select **Properties**.

| Cat | chment Properties                           | Value                    |  |  |
|-----|---|--------------------------|--|--|
|     | Catchment                                   |                          |  |  |
|     | 2D Area of Catchment                        | 11788 Sq. Ft.            |  |  |
|     | Discharge Point                             |                          |  |  |
|     | Exclusionary                                | True                     |  |  |
|     | Reference Pipe Network                      | Proposed Drainage - SR61 |  |  |
|     | Reference Pipe Network Structure            | S-(1)                    |  |  |
|     | Catchment Group Name                        | Group - SR61 - Left      |  |  |
|     | Reference Surface                           | <none></none>            |  |  |
| ΞI  | Hydrological Properties                     |                          |  |  |
|     | Runoff Coefficient                          | 0.90                     |  |  |
| Ξ.  | Sheet Flow                                  |                          |  |  |
|     | Sheet Flow Segments                         | 0                        |  |  |
|     | Total Sheet Flow Travel Time                |                          |  |  |
| Ξ.  | Shallow Concentrated Flow                   |                          |  |  |
|     | Shallow Concentrated Flow Segments          | 0                        |  |  |
|     | Total Shallow Concentrated Flow Travel Time |                          |  |  |
| Ξ ( | Channel Flow                                |                          |  |  |
|     | Channel Flow Segments                       | 0                        |  |  |
|     | Total Channel Flow Travel Time              |                          |  |  |
| Ξ   | Time of Concentration                       |                          |  |  |
|     | Time Of Concentration Method                | TR-55                    |  |  |
|     | Time of Concentration                       | 0.000 hr                 |  |  |
|     | Hydraulically Most Distant Point            |                          |  |  |
|     | Hydraulically Most Distant Length           |                          |  |  |
|     |   |                          |  |  |

- 2. From the Catchment Properties dialog box, select the Catchment Properties tab.
  - a. Review the Reference Pipe Network Structure.
  - b. Verify the *Runoff Coefficient* is set to **0.90**.

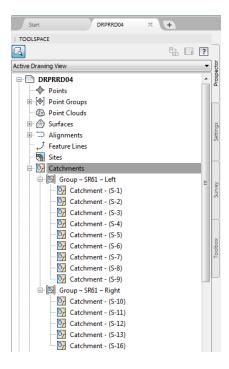
| formation Catchment Properties |  |
|--------------------------------|--|
| Name:                          |  |
| Catchment - (S-1)              |  |
| Description:                   |  |

3. From the Catchment Properties dialog box, select the Information tab. Change *Name:* to Catchment – (S-1). Click Apply then OK to close dialog box.

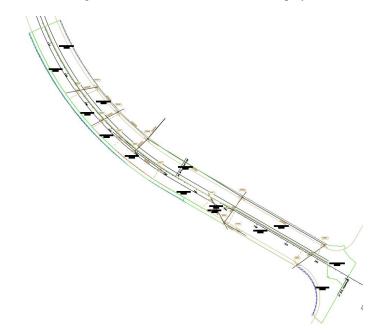
| TOOLSPACE                |          |           |
|--------------------------|----------|-----------|
|                          | . 2      | ٦         |
| Active Drawing View      |          | 5         |
|                          |          | Prospecto |
| DRPRRD04                 | <u>^</u> | 2<br>S    |
| ···· 🗇 Points            |          |           |
| Doint Groups             | r        | 4         |
| ···· 🐵 Point Clouds      |          |           |
| 🗄 💮 Surfaces             |          | ğ         |
| 🗄 🗇 Alignments           |          | Settings  |
|                          |          |           |
|                          |          |           |
| 🖃 📴 Catchments           |          |           |
| 🖃 🔯 Group – SR61 – Left  | E        | >         |
| 📴 Catchment - (S-1)      |          | nuve      |
| 🔯 Catchment - (7)        |          |           |
| 📴 Catchment - (8)        |          |           |
| 📴 Catchment - (9)        |          | ٦         |
| 📴 Catchment - (10)       |          |           |
| 📴 Catchment - (11)       |          | oolbo     |
| 📴 Catchment - (12)       |          | ĕ         |
|                          |          |           |
| Catchment - (14)         |          |           |
| 🖃 🔯 Group – SR61 – Right |          |           |
| Catchment - (1)          |          |           |
| Catchment - (2)          |          |           |
| Catchment - (3)          |          |           |
| Catchment - (4)          |          |           |
| Catchment - (S-16)       |          |           |
|                          |          |           |

4. Using the method above, **Re-Name** all of the *Catchments* to the appropriate structure number. Use the Re-Naming table below for reference:

| Catchment Group | Structure | Catchment Original Names | Final Catchment Names           |
|-----------------|-----------|--------------------------|---------------------------------|
| Left            | S-1       | Catchment - (6)          | Catchment - (S-1)               |
| Left            | S-2       | Catchment - (7)          | Catchment - (S-2)               |
| Left            | S-3       | Catchment - (8)          | Catchment - (S-3)               |
| Left            | S-4       | Catchment - (9)          | Catchment - (S-4)               |
| Left            | S-5       | Catchment - (10)         | Catchment - <mark>(</mark> S-5) |
| Left            | S-6       | Catchment - (11)         | Catchment - (S-6)               |
| Left            | S-7       | Catchment - (12)         | Catchment - (S-7)               |
| Left            | S-8       | Catchment - (13)         | Catchment - (S-8)               |
| Left            | S-9       | Catchment - (14)         | Catchment - (S-9)               |
| Right           | S-10      | Catchment - (1)          | Catchment - (S-10)              |
| Right           | S-11      | Catchment - (2)          | Catchment - (S-11)              |
| Right           | S-12      | Catchment - (3)          | Catchment - (S-12)              |
| Right           | S-13      | Catchment - (4)          | Catchment - (S-13)              |
| Right           | S-16      | Catchment - (5)          | Catchment - (S-16)              |



5. Review the end resulting list of *Catchments* which should display as above.



- 6. Notice when the task is complete *Area Labels* display in each *Catchment. Catchment Names* match the *Inlet Structure Name* so there is no need to label the names of the *Catchment Areas*.
- 7. Save and Close *DRPRRD04.dwg* file.