AutoCAD Civil 3D 2010
Education Curriculum Instructors Guide
Unit 3: Land Development

Lesson

2

Parcels

Overview

In this lesson, students learn how to work with sites and parcels in AutoCAD® Civil 3D® software. A site contains design objects such as alignments, parcels, feature lines, and grading groups. Often the site is analogous to the initial parcel from which all subsequent parcel design is generated. A special parcel, known as the right-of-way parcel, represents the parcel of land for a road, also known as a road allowance. Building parcels are subdivided according to design criteria such as minimum area or road frontage. The conceptual design of parcel and road layout forms the fundamental idea of the development. Multiple design alternatives are normally created and evaluated based on many criteria.

Objectives

After completing this lesson, students will be able to:

- Create a site.
- Create a ROW parcel.
- Describe parcels and their properties.
- Create parcels using layout tools.
- Create parcels from objects that already exist in the drawing.
- Edit parcels.

- Renumber parcels.
- Label a parcel and create a table.

Exercises

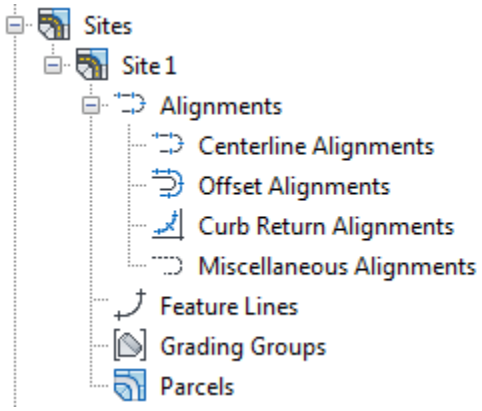
The following exercises are provided in a step by step format in this lesson:

1. Create a Site
2. Create a ROW Parcel
3. Create Parcels Using Layout Tools
4. Create Parcels from Objects
5. Edit Parcels
6. Renumber Parcels
7. Label Parcel Segments

About Sites

A site contains design objects such as alignments, parcels, feature lines, and grading groups. Using a site, you can organize design objects in a drawing. In many cases, this site is also the initial parcel from which all subsequent parcel design is generated. You create and maintain relationships among objects by grouping them together in a site.

The following illustration shows a site and the objects that make up a typical site.



When you create any of these objects, you must specify the site to which it belongs. If you create these objects before you create a site, a site with a default name (for example, Site 1) is created automatically, and the objects are assigned to it.

Sites are most often used to organize data. Sites also recognize topology, which refers to the spatial relationships among objects. Objects that are in the same site interact with each other.

More than one site can reside in the same geographic location, but the objects contained in the different sites do not interact.

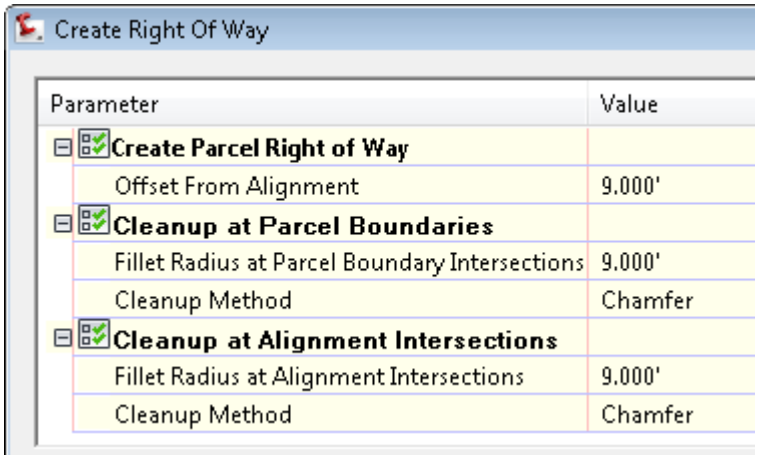
These are some general guidelines to use when working with sites:

- When working with large amounts of data in a site, use representative naming conventions to help you organize your data.
- For good data management practices, use sites to organize parcel, alignment, feature line, and grading group data either geographically or by project phase.
- If you want design objects to interact with each other, assign them to the same site.

About Right-of-Way Parcels

You create a right-of-way parcel as one of your first tasks for designing a residential subdivision. A right-of-way parcel represents the parcel of land for a road, also known as a road allowance. After the right-of-way is created, you can subdivide the adjacent land parcels into individual lots.

The following illustration shows the parameters for a right-of-way parcel.



Alignments and Right-of-Way Parcels

When an alignment is in the same site as a parcel, and it passes completely through the parcel, the parcel automatically subdivides into two parcels, one on either side of the alignment. You use the Create ROW command to create a right-of-way parcel adjacent to the alignment. You specify offsets and can use fillet or chamfer cleanup options at the alignment intersections and the parcel boundaries. For example, if you have a parcel that represents a boundary survey, and if that parcel is bisected with a road alignment object, the parcel splits

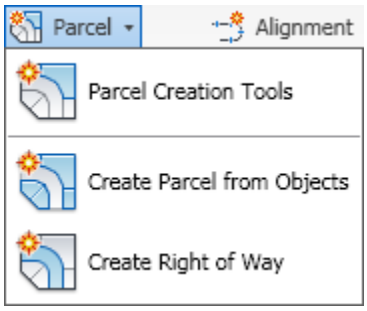
into two. The Create ROW command then creates a right-of-way parcel for the road allowance based on the user inputting the right-of-way width (offset from the centerline).

About Parcels

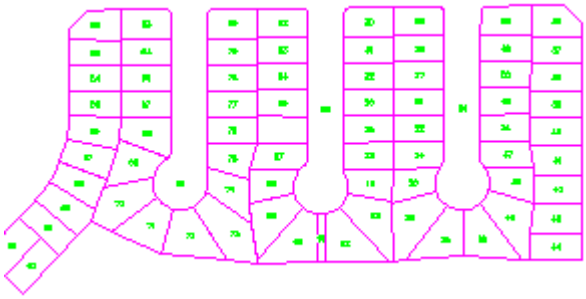
Parcels are created within a site. You use parcels to subdivide sites based on your project requirements, create lots to developer sizing specifications, or explore design alternatives. Parcel objects typically represent real estate parcels, such as lots in a subdivision. You can also use a parcel to represent any feature with closed boundaries, such as bodies of water or soil regions. Parcels are defined by parcel segments, which can be lines or curves.

When working with parcels, keep the following information in mind:

- Parcel objects in the same site are related topologically and are, therefore, dynamic. This means that a change to one parcel creates related changes to the other adjacent parcels in the site.
- When you create a parcel, parcel area labels are automatically created. Parcel labels typically include a parcel number and area, but can include other information such as perimeter and address.
- You can create parcels using the layout tools (Parcel Creation Tools) or from AutoCAD® objects.



The following illustration shows parcels created for a subdivision.



The dynamic nature of parcels in the same site enables you to quickly and efficiently make changes. For example, when you change the location of a parcel segment, any adjoining parcels automatically update. Or, if you create other parcel segments in the same site that bisect a parcel, the parcel subdivides into two other parcels. The new parcels contain labels appropriate to their location within the site and in the same style as the original parcel.

Methods for Creating Parcels

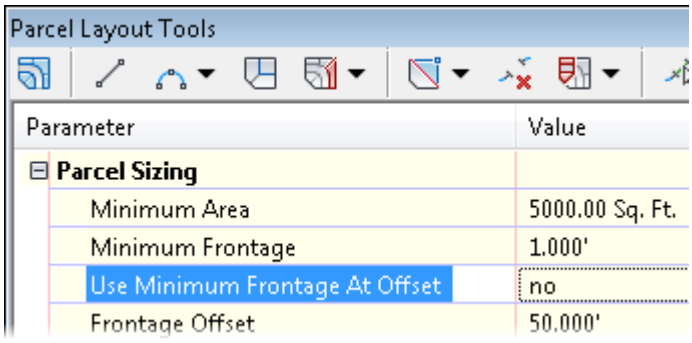
The first site is also the initial parcel from which all subsequent parcel design is generated. You can create parcels using the Parcel Layout Tools toolbar, or by using an object in your drawing. If you use the Parcel Layout Tools toolbar, you can select default style settings, create parcels by subdividing, resize parcels, and perform basic object editing.

Using Layout Tools to Create Parcels

You can use commands on the Parcel Layout Tools toolbar to automatically subdivide larger parcels into smaller parcels. The two primary criteria used in laying out parcels are minimum road frontage and parcel area. If you want to control the parcel sizing using the area, you need to set the frontage criteria to a very small value. If you want to control the parcel sizing using the frontage distance, you need to set the area criteria to a very small value. If you use minimum area to size parcels, a larger parcel is automatically subdivided into several smaller parcels so that they meet the default area parameter. If you use a minimum frontage length to size parcels, the parcel area is ignored and parcels are created to satisfy the minimum frontage length criteria.

When creating parcels you can also specify frontage offset values and calculate parcels based on using the minimum frontage at the offset location. For more information, see “Parcel Layout Toolbar” in Help.

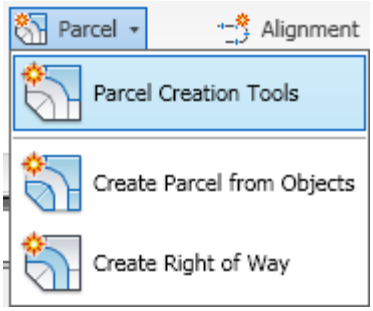
The following illustration shows the Parcel Layout Tools toolbar with the parcel sizing parameters for default area and minimum frontage. In this example, because the minimum frontage is small, parcels are sized based on the area.



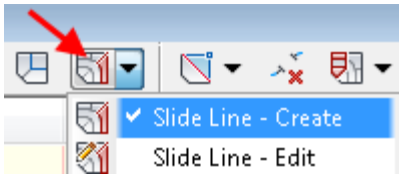
Process of Subdividing a Parcel

The following steps show you how to subdivide a parcel:

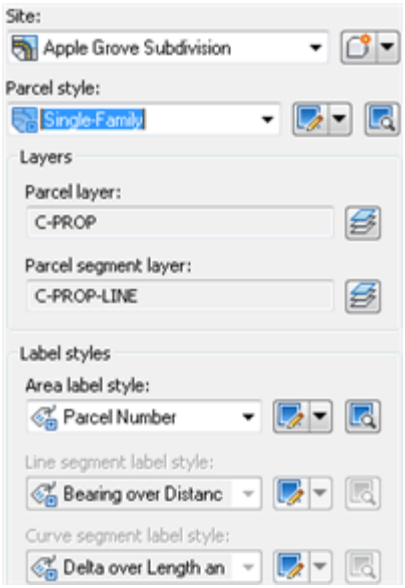
1. Open the Parcel Creation Tools toolbar.



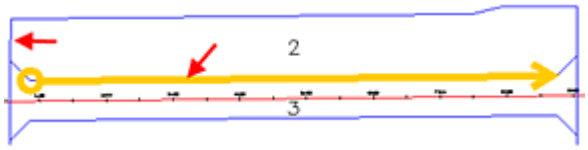
2. On the Parcel Layout Tools toolbar, click Slide Line - Create.



3. In the Create Parcels dialog box, select the site, parcel styles, and label styles.



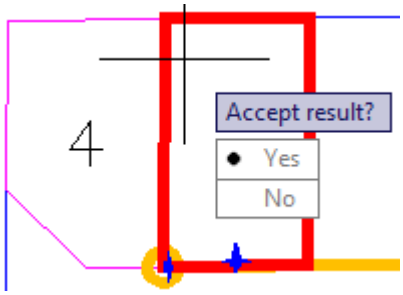
4. Specify the frontage line and parcel segment direction.



5. Configure the parcel parameters.

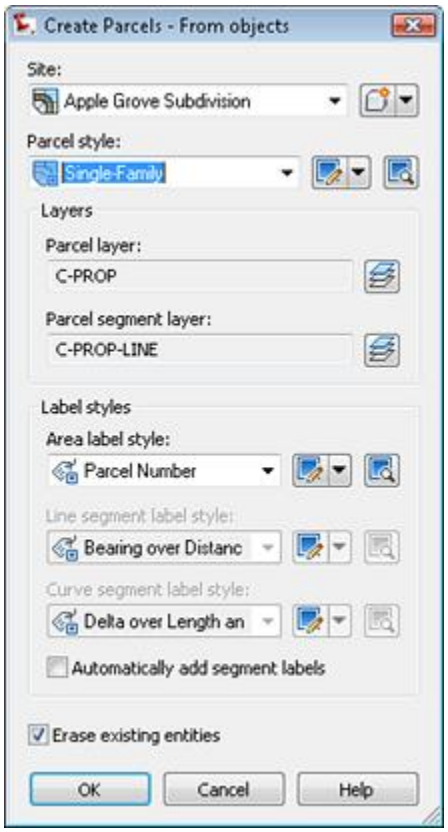
Parameter	Value
Parcel Sizing	
Minimum Area	5000.00 Sq. Ft.
Minimum Frontage	1.000'
Use Minimum Frontage At Offset	no
Frontage Offset	50.000'

6. Preview the parcels, accept the results, and create other parcels.



Using AutoCAD Objects to Create Parcels

You can use AutoCAD objects such as lines, arcs, and polylines that form closed areas to create parcel objects. For example, a third-party organization such as a developer may provide the parcel fabric to the engineering company as AutoCAD lines and arcs. You can then convert the lines and arcs to parcel objects and thus be able to easily automate parcel labeling and create parcel closure reports.



You launch the Create Parcels from Objects command from the ribbon, Home tab, Create Design panel.

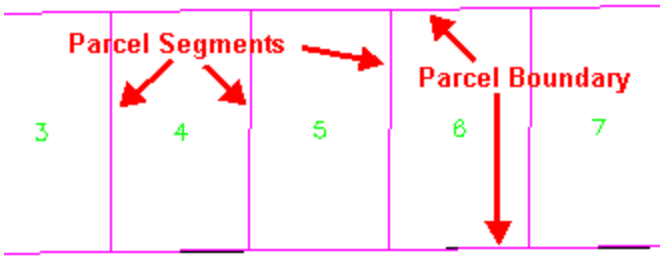
Parcel Guidelines

Keep the following guidelines in mind when you create parcels:

- AutoCAD lines, arcs, and polylines should be well formed and represent closed areas prior to converting them to parcels.
- In order to use commands on the Parcel Layout Tools toolbar to subdivide a parcel, you first need to create a larger parcel to subdivide.

You can create a subdivision based on an established property boundary. You create a parcel representing the property boundary either by selecting a drawing object that represents the property boundaries, or by using the Parcel Layout tools to create the individual boundary segments.

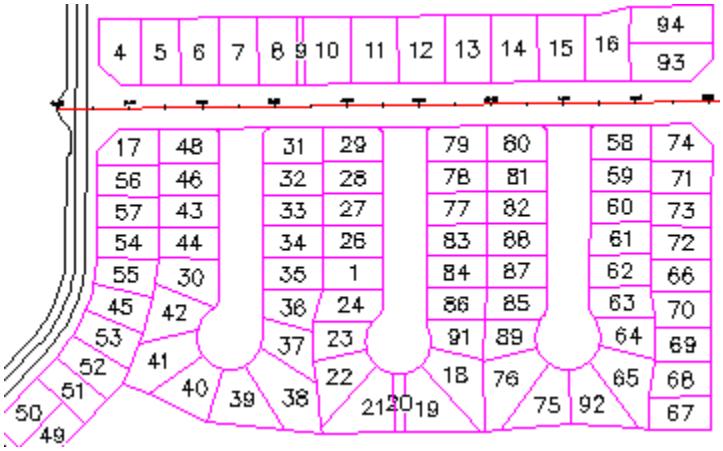
After you establish the initial parcel and other site elements, such as an alignment or right-of-way, new parcel segments, and therefore parcels, are automatically created when you use commands on the Parcel Layout Tools toolbar. The result is shown in the following illustration.



Editing and Renumbering Parcels

When parcels are created using commands from the Parcel Layout Tools toolbar, the segments for some parcels may need modification. Also, depending on the order in which parcels were created, you may need to renumber the parcels in the subdivision.

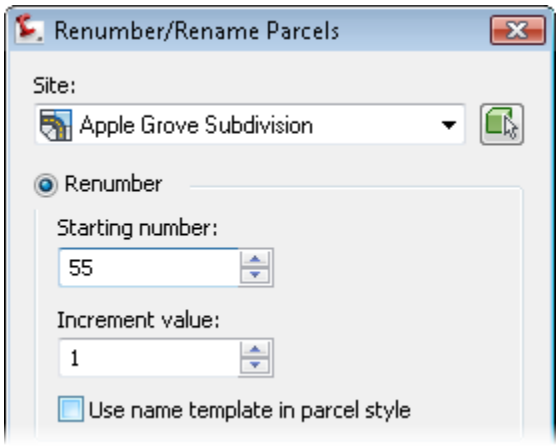
The following illustration shows a subdivision that requires editing.



Parcel geometry can be edited either graphically or by using commands on the Parcel Layout Tools toolbar. To modify parcel segment geometry graphically, you use the grips on the ends of the parcel segments.

You can also renumber parcels within a site. Parcel numbering is independent of the site in which the parcels are created. This is useful when working on a large, multiphased subdivisions design project. Additionally, you may have instances where parcel numbers need to be the same.

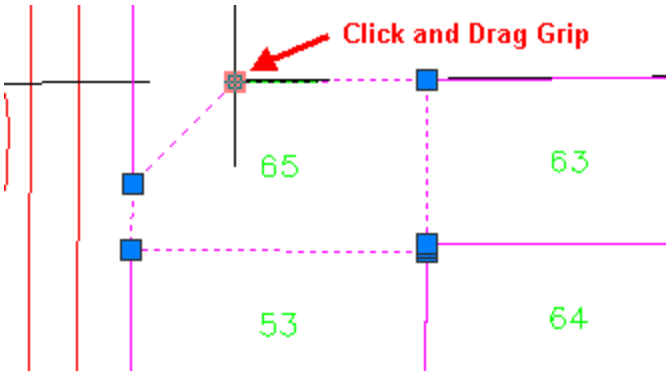
The following illustration shows the dialog box and settings enabling you to renumber parcels from the default scheme to the one required for the project.



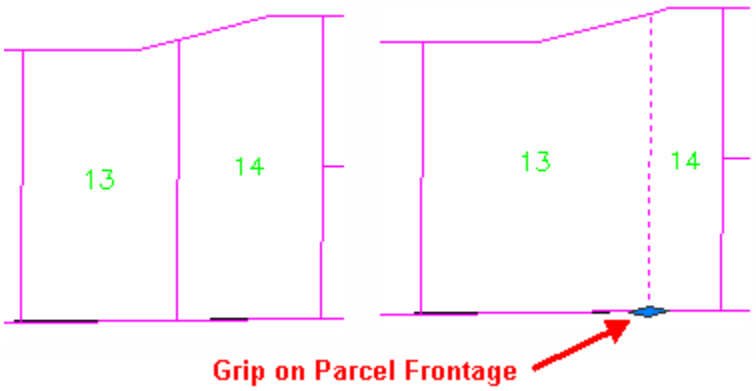
There are two ways you can edit parcel geometry: graphically, or by using the commands on the Parcel Layout Tools toolbar. Graphical edits are used when you do not need to consider parcel area and frontage criteria for parcel editing. Use commands on the Parcel Layout Tools toolbar to edit parcels using area and frontage criteria.

Using Grips

For parcels created from AutoCAD lines, arcs, and polylines, you can grip edit a parcel object just as you would grip edit a polyline. This is shown in the following illustration.



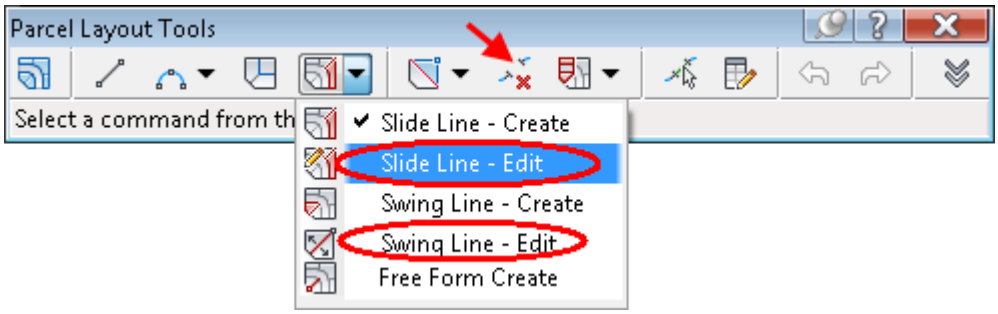
For parcels created using the layout tools, you can also use grips to modify parcel segments. However, the grips are slightly different from the previous example. Parcels segments created using commands from the Parcel Layout Tools toolbar have a grip on the parcel frontage. You can move the parcel segment, but not off the parcel frontage line. This is shown in the following illustration.



Using Layout Tools

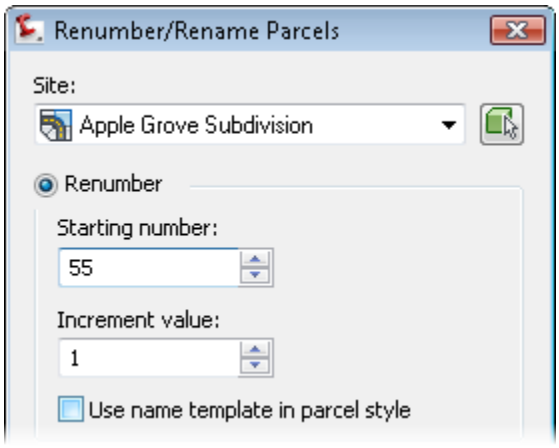
You can also edit parcels using the commands on the Layout Tools toolbar. Using the commands on the Layout Tools toolbar enables you to interact with the parcels at a higher level. For example, you can modify parcel segments to achieve a desired parcel area for an adjoining parcel.

Parcel editing commands on the Layout Tools toolbar are shown in the following illustration.



Renumbering Parcels

When parcels are created, they are assigned parcel numbers based on the order in which they were created. This can result in a parcel numbering sequence that is not suitable. You may also need to rename parcels. You can use the Renumber\Rename dialog box, as shown, to accomplish these tasks.



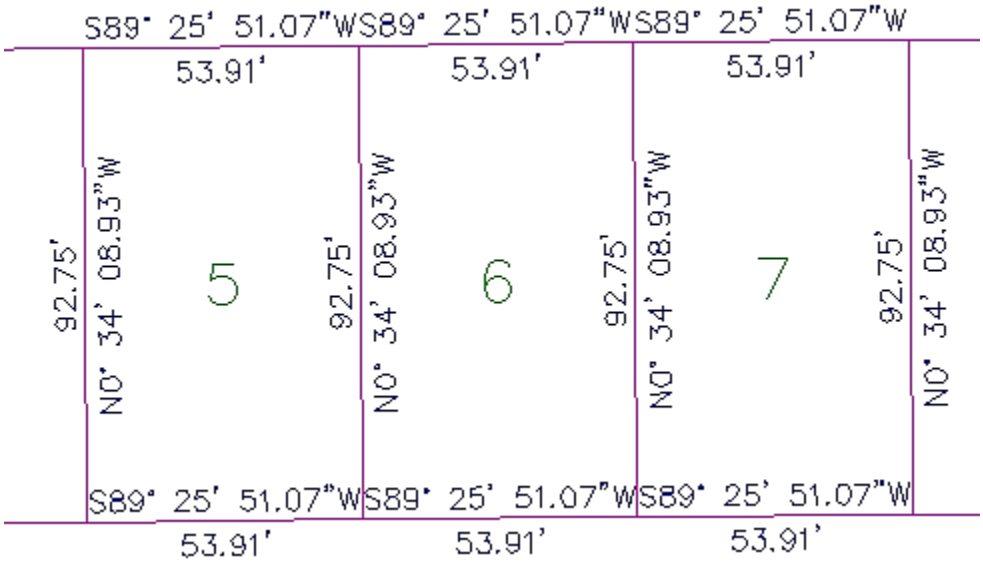
Keep the following guidelines in mind when you edit parcels:

- When graphically editing parcels, be aware of how the parcels were created. The grips you use for parcels created from objects are different from those for parcels created with commands from the Parcel Layout Tools toolbar.
- Use commands on the Parcel Layout Tools toolbar to edit parcels using design criteria such as parcel area and frontage.

Labeling Parcels and Creating Parcel Tables

Parcel segment labels, tags, and tables provide important information to the reader. You can add parcel segment labels when you create the parcel, or you can add them later. When you add parcel segment labels, you can add labels that show the segment geometry or you can add tag labels. If you add tag labels to the parcel segments, you would then show the parcel geometry data in an associated table. When parcel segment geometry changes, associated labels and tables automatically update.

The following illustration shows a parcel with all segments labeled.

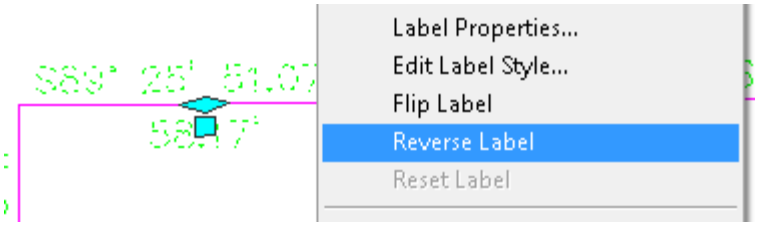


Parcel segment labels can provide useful information about a parcel including segment length, bearing, segment number, and coordinates. When you create a parcel, you can add labels to parcel segments automatically. You can also add labels to existing parcels. When you add a parcel segment label, you can choose to add a label to a single parcel segment or to all segments in the parcel. You can also set the style used for the segment lines and curves.

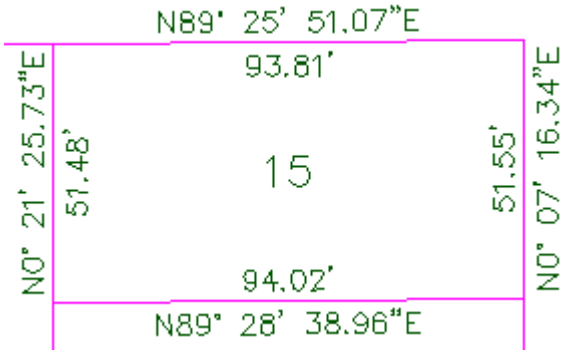
After you create parcel segment labels, you can perform the following tasks:

- Change the label style.
- Reverse the direction of bearing information.
- Change the position of label information.
- Reset the label to its original properties.
- Delete the label.

The following illustrations show two examples of the types of changes you can make to the appearance of parcel segment labels. The labels in the following illustration show south-to-west bearings and north-to-east bearings. You can use the Reverse Label command by right-clicking and accessing the shortcut menu if you want to change south-to-west bearings to north-to-east bearings.



You can also use the Flip Label command from the same menu to flip the positioning of the bearing and distance components so that all of the bearings are on the outside and all of the distances are on the inside. The resulting labels are shown in the following illustration.



Parcel Tags and Tables

Parcel tags and parcel tables enable you to organize data for a large number of parcels and parcel segments. They also help reduce the amount of clutter in your drawings.

Parcel tags are an alternative to parcel labels. Tags can be used for parcels and parcel segments. The parcel tag is cross-referenced in the accompanying parcel table. The tag value uniquely identifies the parcel or segment in the first cell of table rows.

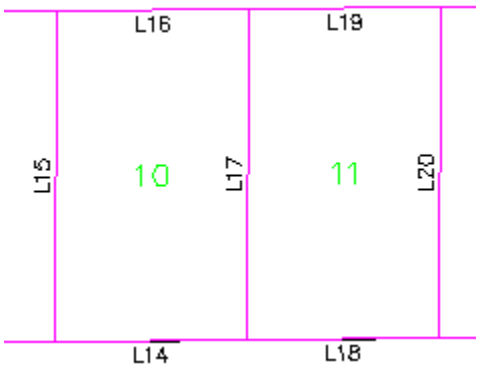
A parcel table is a list of consolidated parcel information used for annotating a drawing. Parcel tables show the data associated with the tag. You create a table and place the table in a drawing for annotation. A table can contain line, curve, segment, or area information. The table information is dynamic, and therefore, updates made to parcels are reflected in the corresponding tables.

Keep the following points in mind when working with parcel labels and tags:

- You can renumber parcel segment tag labels after they are created if you want to organize them sequentially.
- You can select individual labels in a drawing to include the label information in a table. You can also select label styles to use as tags and create a table containing information for all parcels and segments that use that style.
- You can show parcel data in a table as the design nears completion to make the diagram more readable.

- When you create tables, table tags that are part of the segment labels are made visible, and other information, such as the bearing, is hidden. You can use table tags to relate table information to objects in the drawing
- When you create a line, curve, or segment table, the labels are removed from the parcel segments and replaced with a tag.

Parcel segments with tag labels are shown in the following illustration.



The corresponding table showing the data for the tags is as shown ..

Parcel Line and Curve Table

Line #/Curve #	Length	Bearing/Delta	Ra
L24	42.51	S0° 21' 25.73"W	
L20	42.66	S0° 21' 25.73"W	
L13	19.23	S0° 21' 25.73"W	
L11	53.91	S89° 25' 51.07"W	
L8	54.66	S89° 25' 51.07"W	
L5	42.77	N45° 08' 21.02"W	
L4	28.43	S89° 25' 51.07"W	
L36	50.97	S89° 25' 51.07"W	

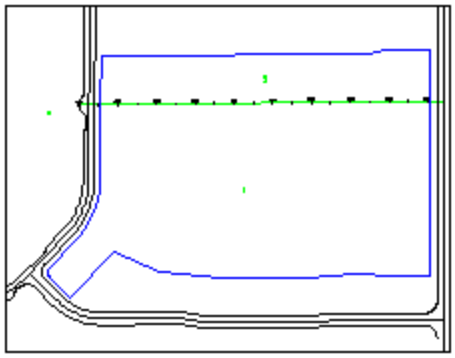
Key Terms

Site	A site contains design objects such as alignments, parcels, feature lines, and grading groups. Using a site, you can organize boundaries, alignments, and parcels in a drawing. Drawings can have multiple sites, each of which can have associated objects. Different sites can occupy the same geographic space.
Boundary Parcel or Block Parcel	This is the beginning parcel from which all smaller parcels are subdivided, often referred to as the site. This typically is the boundary of the property for the project.
Right-of-Way Parcels	A right-of-way (ROW) parcel is a buffer placed around a horizontal road alignment in order to provide legal access for the government outside of the actual roadway for utilities or improvements.
Road Frontage	The length of a parcel segment adjacent to the road. This is a commonly used design parameter for parcels.
Parcel, Lot	Parcel and lot are synonymous terms, used interchangeably in the land development business. Both refer to a legally-defined piece of land.
Parcel Area	The area of the parcel in imperial (acres, sq. ft.) or metric (hectares, m^2) units. Area is frequently the primary design parameter for parcels.
Parcel Tables	A parcel table can be used to organize information about lines or curves in the parcels. Line or Curve tags must be used as labels.
Tags	Tags, or tag labels, are a shorthand method of labeling lines or curves. A line label is normally L1, L2, and so on, and a curve label is C1, C2, and so on. Using tags reduces the amount of text directly around or inside the parcel, making the drawing more readable.
Topology	Topology defines the spatial relationship between objects. Topology can be thought of as a set of rules that enforce behavior among objects. For example, a subdivided parcel cannot extend past the boundaries of the parcel from which it was subdivided; it must be contained within the larger parcel.

Exercise 1: Create a Site

In this exercise, students create a site for parcels.

At the end of this exercise, the drawing displays as shown.

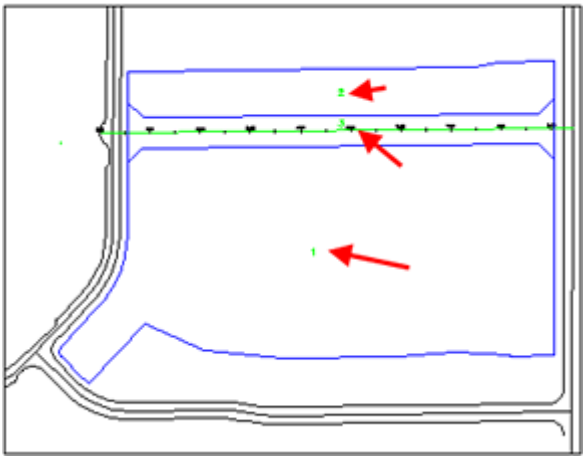


For this exercise, open …*I_Parcels-EX1.dwg (M_Parcels-EX1.dwg).*

Exercise 2: Create a ROW Parcel

In this exercise, students create a right-of-way parcel.

The completed drawing is as shown.

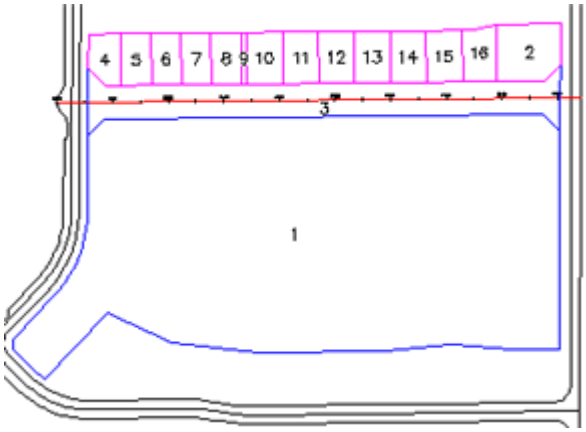


For this exercise, open …*I_Parcels-EX2.dwg (M_Parcels-EX2.dwg).*

Exercise 3: Create a Parcel Using Layout Tools

In this exercise, students create parcels using Layout tools. The two primary criteria used in laying out parcels are minimum road frontage and parcel area. If you want to control the parcel sizing using the area, you need to set the frontage criteria very small. If you want to control the parcel sizing using the frontage distance, you need to set the area criteria very small.

The completed drawing is as shown.

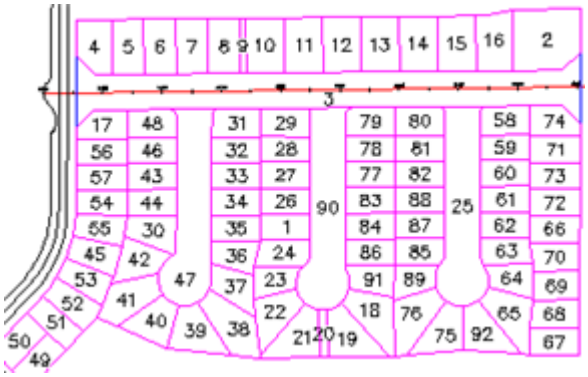


For this exercise, open …*I_Parcels-EX3.dwg (M_Parcels-EX3.dwg).*

Exercise 4: Create Parcels from Objects

In this exercise, students create parcels from objects that already exist in the drawing file. Designers often inherit a drawing that has existing objects that represent parcels. These objects can be lines, arcs, or polylines. For proper parcel analysis, labeling, and reporting functionality, you need to convert these to intelligent parcel objects.

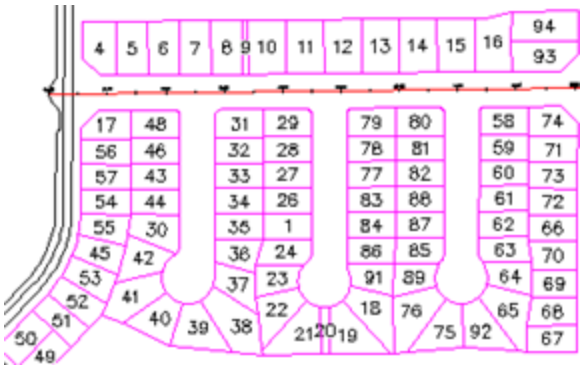
The completed drawing is as shown.



For this exercise, open …*I_Parcels-EX4.dwg (M_Parcels-EX4.dwg*).

Exercise 5: Edit Parcels

In this exercise, students edit parcel segments.
The completed drawing is as shown.



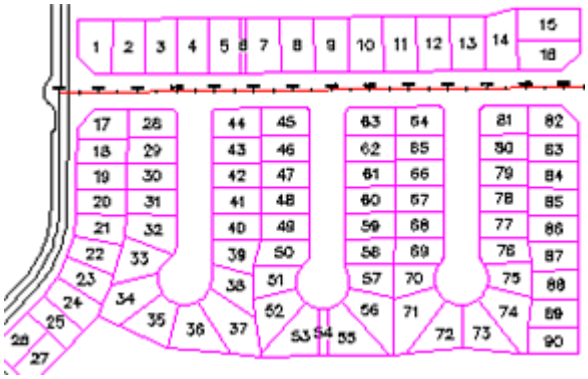
For this exercise, open …*I_Parcels-EX5.dwg (M_Parcels-EX5.dwg).*

First, students manually subdivide the larger parcel in the northeast section of the site.

Exercise 6: Renumber Parcels

In this exercise, students renumber parcels. Frequently, when you create parcels, the parcel numbers need to be rearranged so that they are numbered sequentially. To change the parcel numbering, you use the Renumber Parcels command.

At the end of this exercise, the drawing displays as shown.



For this exercise, open …*I_Parcels-EX6.dwg (M_Parcels-EX6.dwg).*

Reviewing the current numbering scheme, students see that the parcel numbers are out of sequence.

Exercise 7: Label Parcel Segments

In this exercise, students use a variety of labeling techniques for parcels. Creating a plat for the site requires that certain information about each parcel be displayed. These requirements vary depending on the jurisdiction, but generally the segment direction, lengths, and area of the parcels are required.

The completed drawing is as shown.

For this exercise, open …*I_Parcels-EX7.dwg (M_Parcels-EX7.dwg).*

Assessment

Challenge Exercise

Instructors provide a master or challenge exercise for students to do based on this lesson.

Questions

1. Using Civil 3D terminology, what objects are contained in a site?
2. When creating an alignment through a parcel, will the parcel always be subdivided? Explain.
3. What are the two most common controlling design factors for designing parcels?
4. Why are parcel tags and a parcel table commonly used?
5. Where would you change the default parcel style used with the Parcel Layout tools?
6. Describe how topology helps the process of parcel subdivision.

Answers

1. A site can contain alignments, feature lines, grading groups, and parcels.
2. When an alignment crosses an existing parcel, the alignment will subdivide the parcel only if both the alignment and the parcel are in the same site.
3. Road frontage and parcel area.
4. Text describing the parcel geometry can often end up looking crowded. A tag is much smaller and then a table of the parcel information can be created. This keeps the data organized and the drawing more readable.
5. In the Settings tab, expand the Parcels, Commands tree. Double-click the CreateParcelbyLayout command to edit the settings for the command.
6. Topology maintains rules about geometries and object interaction. When subdividing a parcel, the new parcel cannot extend over the larger boundary parcel. After completing the subdivision, all area inside the initial parcel is contained in a parcel; no area is unclaimed.

Lesson Summary

In this module, students learned how to work with the techniques for creating sites and parcels, editing parcels, and labeling parcels. First, a site was created and students moved an alignment to the site. Then a right-of-way (ROW) parcel was created around the alignment. Parcels were laid out using Layout tools and by converting closed polylines into parcels. Parcels were edited and renumbered, and then labeled using several styles including a parcel table.