

2 Starting CAD Plans

Two separate files should be created by the Signal Drafter/Designer to produce signal plans:

1. The Signal Base Map file.
2. The Signal Plan Sheet file.

The Signal Drafter/Designer is encouraged to find the most efficient way to use the drafting software, which may vary from the methods discussed in this manual. However, the basic drafting philosophy discussed in this manual should be followed:

- Using separate files for design work and for plan sheet detailing work (allows for proper use of Annotation Scale).
- Using separate models within your design files may be beneficial for using Annotation Scale.
- Using standard signal design drafting symbology.
- Using Annotation Scale.

2.1 CAD Naming Convention

Use the following file naming conventions for signal base map and signal plan sheet files. Using these file naming standards makes it easier for Traffic CAD users and other CAD users to know what a file will contain.

- Signal Base Map File: **12345tr_base.dgn**
 - 12345 = Project Key Number
 - tr = Traffic Section Plans
 - base.dgn = Microstation Base Map File
- Signal Plan Sheet File: **12345tr_sg1.dgn**
 - 12345 = Project Key Number
 - tr = Traffic Section Plans
 - sg1.dgn = Microstation Signal Plan Sheet File

If more than one file is needed for signal plan sheets, additional files can be created. Each additional plan sheet file would be named consecutively; sg2.dgn, sg3.dgn, sg4.dgn, etc.

If the project does not have a key number (i.e. maintenance state force work), use the highway number in the standard naming convention as shown below:

- Signal Base Map File: **Hwy10tr_base.dgn**
(Hwy10 = The ODOT highway number is where the work is occurring)

2.2 Signal Base Map File

This file contains all of the scalable signal design features, such as poles, signal heads, pedestrian heads, junction boxes, cabinets, conduit runs, detection, etc. The process for creating the signal base map file and starting the signal design is described in this section.

The signal base map file is created by starting a new 2D file in Microstation. The file should be named according to Section 2.1 and scaled at 100:1.

Other base map files from different disciplines (roadway, right-of-way, striping, etc.) are then referenced into the signal base map file. If the signal plans are part of a roadway construction project, these referenced base map files should be available from the roadway designer:

- Keynumber_A.dgn (proposed centerline alignment)
- Keynumber_D.dgn (proposed construction features)
- Keynumber_E.dgn (existing features)
- Keynumber_RW.dgn (existing and proposed right-of-way)

To maintain coordinate correct base maps, do not rotate, move or scale any elements in the referenced base map files from the original location within the Microstation Design Plane.

Do NOT change the orientation of the North arrow. Always use the most current version of each base map. This typically requires updating the referenced base map files as needed throughout the design phase of the project; good communication with the other disciplines is essential to ensure the correct base map files are used.

Each referenced base map file should be groomed. This is done because signal plans are printed at a different scale and must emphasize different design features than plan sheets produced for other disciplines. Grooming includes turning off any levels with extraneous information/elements not need for the signal design and modifying the design features to conform to the standard signal design symbology and line styles as shown in this guide. The tools to groom are found in the ODOT Tasks & Workflows under Signal Plans, Symbology, Lane Sym & RW tabs. Common elements that require grooming include:

- Turning off levels:
 - Signs
 - Landscaping, trees and brush
 - Buildings
- Modifying design features:
 - Curbs
 - Crosswalks
 - Centerline
 - Various lane use lines
 - Edge of travel lanes / edge of pavement
 - R/W lines

If a project does not have any base map files that can be referenced into the signal base map file (for example, small scale state force work with no roadway construction), a signal base map will need to be created from the most current data available; paper or electronic vicinity map, original plans or as-built plans. Paper copies can be scanned into Microstation and then retraced. This method is only used as a reference to begin drafting the base map; all information shall be verified in the field. A survey may be needed to verify travel lanes, equipment and R/W locations.

Construction plans and as-constructed PDF plans can be found and downloaded at:
http://www.oregon.gov/ODOT/HWY/TS/Pages/signals.aspx#Drawings_&_Database

This link will take you to Filenet, ODOT's Drawing Number Database that contains historical information on signals that have been constructed on Oregon State highways. Filenet will provide you with existing plan sheets that can be of use for future designs.

Once the signal base map file is created and base map files from other disciplines have been referenced in and appropriately groomed, the Signal Drafter/Designer can start the signal design work in the signal base map file. The signal design work includes placement of all the scalable signal design features, such as, signal poles, conduits, junction boxes, loops, etc.

Once all of the signal design work is completed, the signal plan sheet file can be created and work can begin on detailing the signal plan sheets.

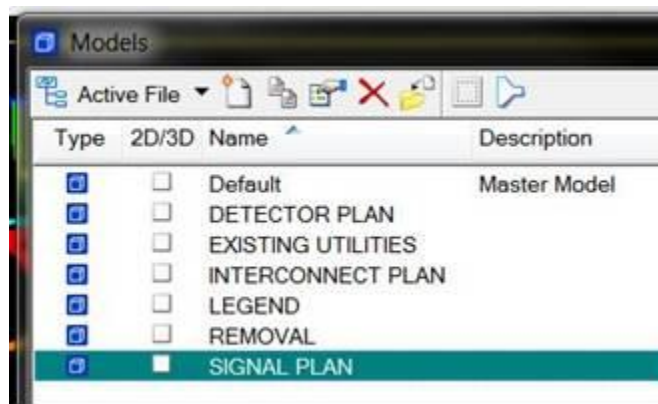
2.3 Signal Plan Sheet File

This file contains the plan sheet borders, bubble notes, and all other notes and details required for the plan sheet. The signal base map file is referenced, as appropriate, into each plan sheet border. The process for creating the signal plan sheet file and starting the plan sheet detailing work is described in this section.

The signal plan sheet files should be created by starting a new 2D file in Microstation. The file should be named according to Section 2.1. Within this file, create a new model for each type of plan sheet that will be needed on the project (see following list).

IMPORTANT: Set the scale of each model to the appropriate scale as shown in Table 1 before doing any work in the plan sheet file. This allows the annotation scale feature to work properly.

Figure 2-1 / Models



All of the common names of plan sheets that you may need are listed below. They are shown in the order that they will be placed in the signal plan set.

1. LEGEND
2. REMOVAL PLAN
3. TEMPORARY SIGNAL PLAN or TEMPORARY RAMP METER PLAN.
4. SIGNAL PLAN, or RAMP METER PLAN, or FLASHING BEACON PLAN, or FIRE SIGNAL PLAN, or PEDESTRIAN SIGNAL PLAN, or RED LIGHT ENFORCEMENT PLAN (Insert the type of plan you are designing on line 4).
5. DETECTOR PLAN
6. EXISTING UTILITIES
7. INTERCONNECT PLAN (if required)
8. DETAILS (one or more sheets – multiple intersections)

If there are multiple intersections or multiple types of installations on a project, the plans shall be arranged so that the signal plan sheets follow the same order as the roadway plan sheets. Roadway stationing should be followed, if available. If stationing is not available, follow mile points (lowest to highest).

Place multiple intersection signal plan sheets as follows:

1. LEGEND (All intersections)
2. REMOVAL PLAN (1st intersection)
3. TEMPORARY SIGNAL PLAN (1st intersection)
4. SIGNAL PLAN (1st intersection)
5. DETECTOR PLAN (1st intersection)
6. EXISTING UTILITIES (1st intersection)
7. REMOVAL PLAN (2nd intersection)
8. FIRE SIGNAL PLAN (2nd intersection)
9. EXISTING UTILITIES (2nd intersection)
10. REMOVAL PLAN (3rd intersection)
11. PEDESTRIAN SIGNAL(3rd intersection)
12. EXISTING UTILITIES (3rd intersection)

Continue with the remaining intersections then:

13. INTERCONNECT PLAN(S)
14. DETAILS (Pole Entrance Chart)
15. DETAILS Miscellaneous

See Table 1 below for various plan sheet scale.

Table 1 | Plan Sheet Scales

Scale	Signal Plan Sheet Type	Model Names
20:1	Signal Plan (may also be at 30:1 if necessary)	Same as plan sheet type
	Railroad Preemption Plan	
	Flashing Beacon Plan	
	Fire Signal Plan	
	Red Light Enforcement Plan	
	Existing Utilities (may also be at 40:1 if necessary)	
40:1	Detector Plan	Same as plan sheet type
	Existing Utilities (may also be at 20:1 if necessary)	
	Ramp Meter Plan	
	Temporary Ramp Meter Plan (may also be at 30:1 or 20:1 if necessary)	
	Temporary Signal Plan (may also be at 30:1 or 20:1 if necessary)	
	Automated Traffic Recorder Plan	
	Removal Plan	
80:1	Interconnect Plan	Same as plan sheet type
100:1	Legend	Same as plan sheet type
	Details	
	Miscellaneous	

In each model, place the number of plan sheet borders needed for the project. Sheet borders are available in the Tasks & Workflows under the “General” tab, then “Sheet Borders” tab. In each plan sheet border place the traffic signal title block. The traffic signal title blocks are available in the Tasks & Workflows under “Signal” tab, then “Title Blocks” tab.

In each plan sheet border, reference the appropriate area of the signal base map file by using Live Nesting and the reference clip boundary tool. When using the Annotation Scale, there is no need to scale the reference files; (Verify the reference is at a 1:1) they should automatically load at the correct scale (based on the scale that was specified for the model).

When laying out the signal plan sheets, always orient the signal base map file into the signal plan sheet file with the mainline stationing increasing from left to right across the page. This will match the orientation of the roadway plans. If no roadway construction will be accompanying the signal design, orient the mainline horizontally across the plan sheet, with stationing increasing from left to right. If centerline stationing is not available, orient the mainline horizontally across the plan sheet.

Once the signal base map file has been referenced into each plan sheet border as appropriate, the Signal Drafter/ Designer can start the plan sheet detailing work in the signal plan sheet file. The plan sheet detailing work includes all of the non-signal hardware items such as the bubble note, lane use arrows, and any text that is needed for the contract plan sheets. The tools for the plan sheet detailing work are found in the ODOT Tasks & Workflows, Signals and they have been designed to work with the Annotation Scale.

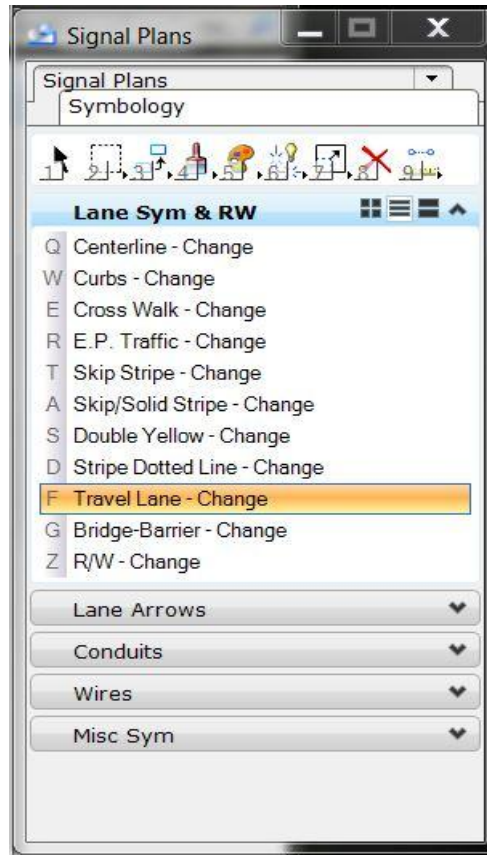
The development of signal plans normally occurs after the roadway design has been well established. Talk with the roadway designer before beginning any layout of the signal plan(s). If there are any anticipated changes, consider how this may impact your work flow.

Some of the items that may change your sheets and need to be considered are:

- **Signal Removal Plan** – for existing signals that are being modified or replaced,
- **Interconnect Plan** – interconnection between two or more signals,
- **Railroad Preemption Plan** – railroad in the immediate area. This Plan sheet is part of the Rail Crossing Order, NOT part of the contract plans.
- **Temporary Signal Plan** – to maintain signalization of the intersection during construction if there is an existing traffic signal.

See Figure 2-2 for the line styles found in the ODOT Tasks & Workflows under the Signal Plans, Symbology, Lane Sym & RW tabs.

Figure 2-2 | ODOT Line Styles



For additional information on traffic signal tasks & workflows click on the following link: [MicroStation Users Guide](#).

2.4 Plan Sheet Examples

Figure 2-3 shows a sheet border with the base map referenced into the sheet. The only elements shown in the “12345tr_sgl.dgn” file are the sheet border, title block cell, and the intersection information in the upper right. The intersection and features shown are located in the reference file.

Figure 2-4 is an example of the same signal plan sheet border with the base map referenced into the "12345tr_sg1.dgn" file containing all bubbles, leaders, dimensions and other non-signal features.

Figure 2-4 | Base Map Referenced in with Bubbles, Leaders, Dimensions, and Other Non-Signal Features

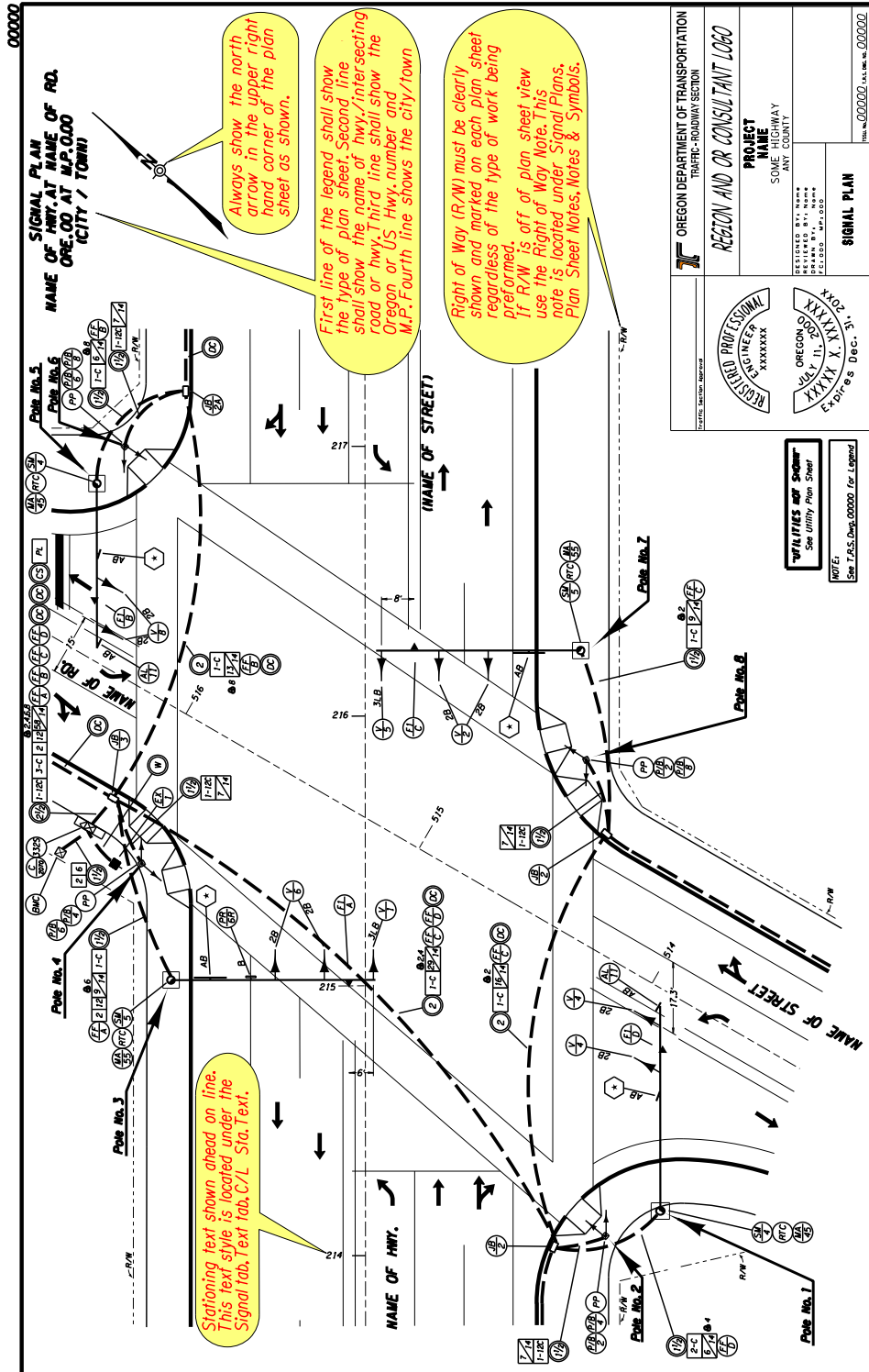


Figure 2-5 below shows an example of a signal plan sheet border with the base map reference file turned off. This illustration shows what is in the “12345tr_sg1.dgn” file.

Figure 2-5 | Bubbles, Leaders, Dimensions, and Other Non-Signal Features with Basemap Referenced Turned Off

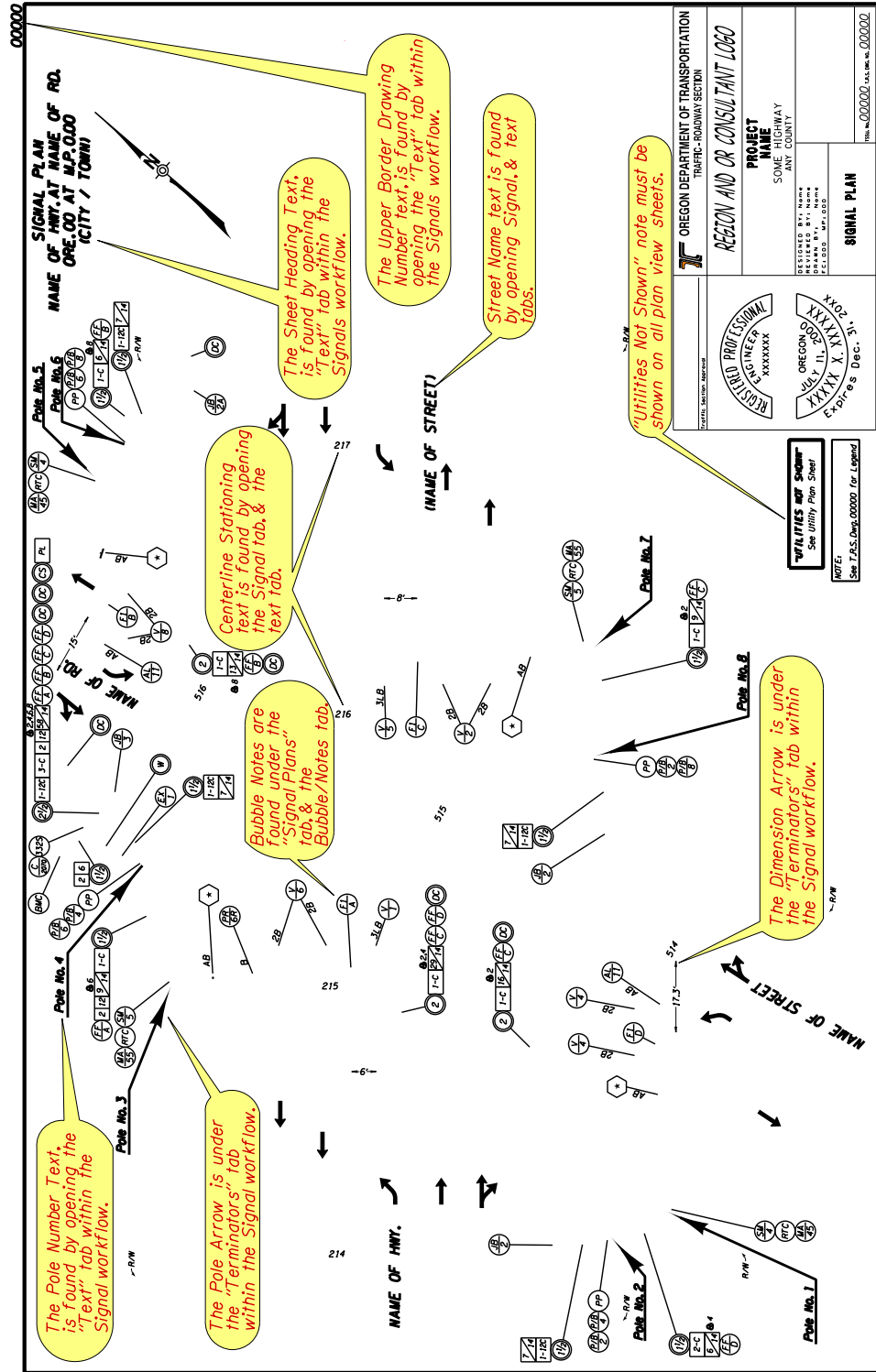


Figure 2-6 below shows a perspective view of a sheet border and its contents above a base map reference file. The contents of the plan sheet are shown in red for clarity. Note that all of the proposed construction is in the base map reference file and all of the bubble notes, pole arrows title block and other non-construction items are in the red plan sheet.

Figure 2-6 | Plan Sheet Perspective View

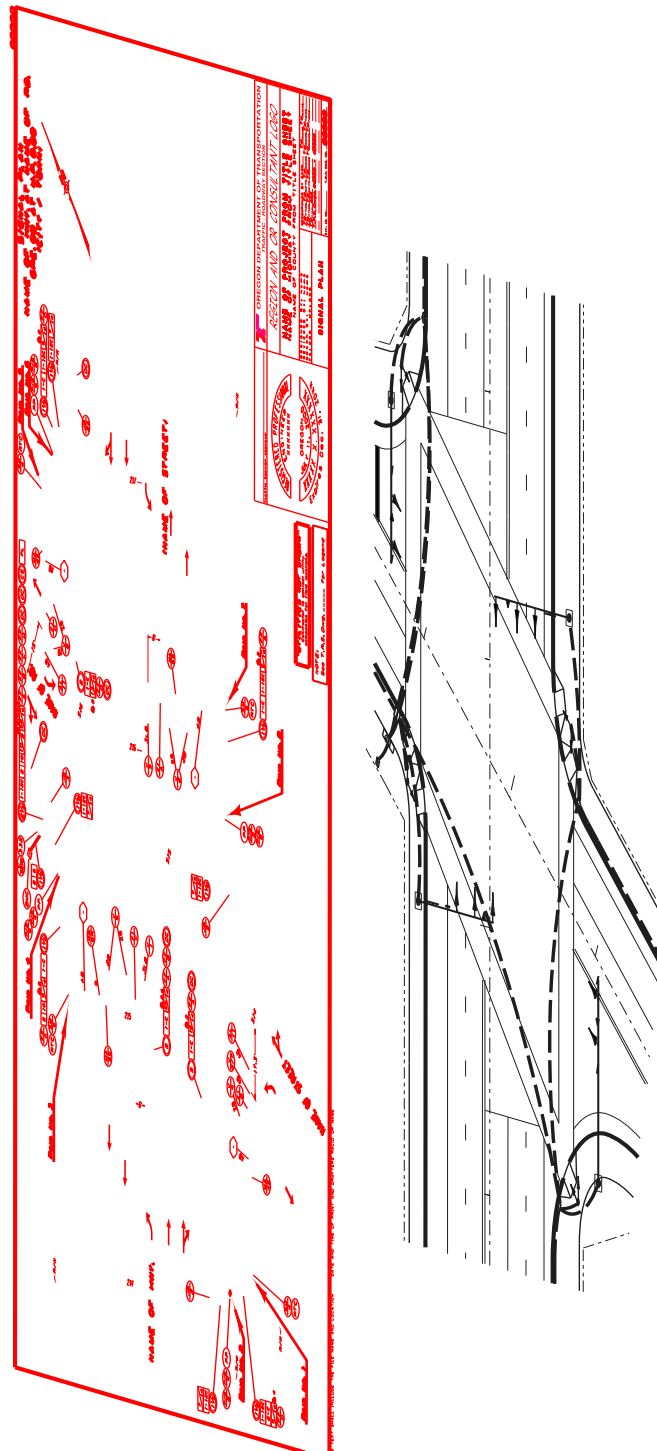
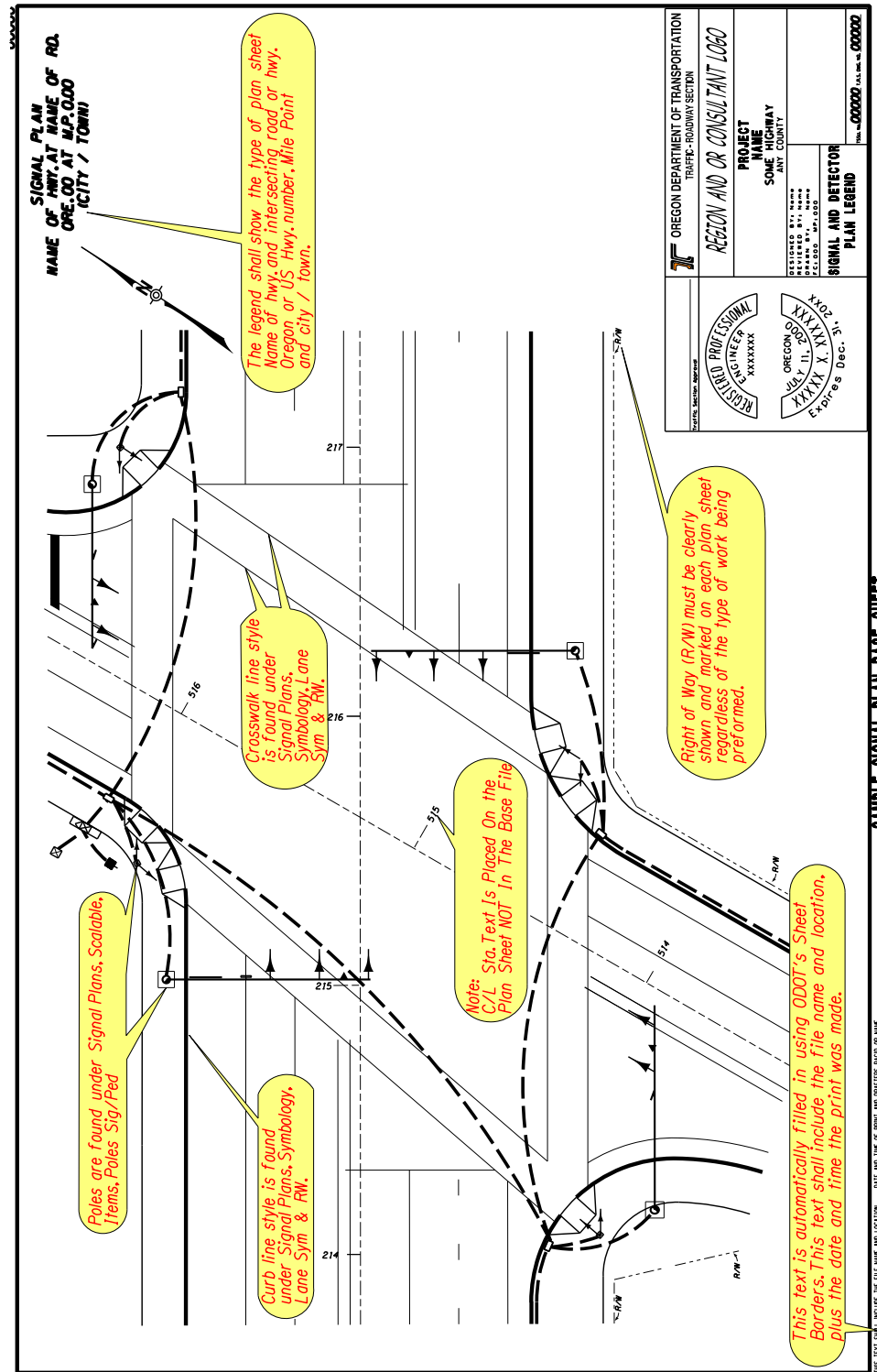


Figure 2-7 shows a base map which has been referenced into a signal plan sheet. The Plan sheet is scaled at 20:1. This sheet is ready to have bubbles and notes placed on it.

Figure 2-7 | Scaled Signal Plan Sheet



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