3.1 Base Maps

Base Maps are the beginning of almost all ODOT design work. A Base Map is an electronic, three dimensional, topographic map of the project area as it is before construction. Base Maps can be developed by ODOT or Consultant Survey Crews. Survey Crews are dispatched to the project site to locate all features in a Northing, Easting and Elevation coordinate format. The equipment most used today is the Electronic Total Station. This instrument can obtain coordinates of ground features very accurately. These coordinates are then transferred into a computer at the office where a technician grooms the data into a map containing features, triangles and contours.

3.2 Horizontal Coordinates

The coordinate base for each project is generally State Plane coordinates, reduced to a local ground system, but can be assumed in some instances.

Before a major project is started, each Survey Crew checks their EDMs on a National Geodetic Survey (NGS) calibration baseline. This is to ensure that the distances measured are accurate to within ODOT Tolerances. (Tolerances are published by the Geometronics Section).

3.3 Vertical Datum

Vertical Datums can change from area to area. It can be based on the National Geodetic Vertical Datum of 1929 (NGVD 29), which is a **sea level based** datum, in feet. Most of ODOT's bench marks are based on this datum. Cities and counties can have variations of this datum.

The North American Vertical Datum of 1988 (NAVD 88) has recently been developed. This is a true metric datum and is not related to the NGVD 29 datum; it **is not based on sea level**. One cannot just apply the standard metric to English conversion to this datum and assume that it will match the NGVD 29 datum. If a conversion is needed, contact the Geometronics Section. It is critical to know where and how the datum for each project has been developed.

Each Base Map should clearly state the basis for Horizontal and Vertical control. If it does not, you should contact the office which developed the map and obtain this information.

The horizontal and vertical accuracies of each Base Map are directly proportional to the equipment used. Standards of accuracy have been developed by the Geometronics Section and are published in their Manuals. (Contact the Geometronics Section for the latest version.)

3.4 Included Information

Generally, the information included on, and the limits of each Base Map are a result of the project scope as defined by the originating project manager. Survey Crews are then sent into the field to obtain the necessary information to the accuracies required. These accuracies vary from project to project and can range from hundredths of a foot in critical areas, to feet in the rugged mountains of Oregon. It is necessary to be familiar with the accuracies of each project.

Tip

For level names and attributes, see Appendix D.

Each Base Map should include enough information to design the project to the limits as set forth in the project prospectus. Following is a list of items that are typically included in each Base Map:

Title Block

- EA Number
- Section (project name)
- Highway
- County
- City (if applicable)
- Project Manager
- Contact person
- Telephone number
- Date
- Horizontal datum
- Vertical datum
- Coordinate basis
- Grid Factor (if needed)
- Scale
  - Urban
  - Normal
  - Rural
- Computer file names

Tip

Symbols for basemap elements can be found in EXTG.CEL.

Small Scale Vicinity Map

Show enough of surrounding streets and landmarks to indicate project location

North Arrow

Existing R/W and/or Prior Construction Alignment

- Control point stations
- Station ticks
  - Major – Every 500’
  - Minor – Every 100’

3.4 Included Information (Cont'd)

Stationing

Major station – 500' intervals
Minor station – 100' intervals
North to south and east to west in 100' increments 0+00 – 1+00

Station Equations

Ahead and Back station labels

Curve Data

Total delta, radius, length, S angle, a value, semi-tangent length
Tangent bearings

Jurisdictional Lines

State
City
County
Zoning (if applicable)

Public Land Survey System

Section lines
¼ Section lines
Donation land claim lines

Boundary Information

Property lines
- Lot, block, subdivision numbers and names
- Showing all properties that are affected by the new design to Rear lot lines

Existing Right-of-Way lines
Easement lines
Ownership
- Names of each property owner, with instrument or deed number

Survey Control Points

Type and size set
Coordinates

Found Monuments

Description
Point Number
Coordinates
Map reference

Bench Marks

Description

3.4 Included Information (Cont'd)

Topography

Box Culverts

Length, width, height
End treatments
Condition
Special circumstances
Silted, plugged, scour, etc.

Contour Lines

Produced from a digital terrain model. Intervals are controlled by ground slope.
Flat terrain – small intervals
Steep terrain – large intervals

Culverts

Type
Size
Flow line elevations
End treatments
Condition
Special circumstances
Silted, plugged, scour, etc.

Curbs

Type
Curb and Gutter (old Type A)
Standard Curb (old Type C)
Mountable Curb and Gutter (old Type D)
Low Profile Mountable Curb (old Type B)
Mountable Curb (old Type F)

Existing Drainage Features

Rivers, creeks, streams, lakes, canals, ditches (runoff), irriga tion ditches
Top of bank
Toe of slopes
Width
If near structures – profiles and sections up and downstream

Manholes (Sanitary and Storm)

Rim elevation
Flow line elevations
Sizes and directions of pipes
Note unusual conditions

3.4 Included Information (Cont'd)

Inlets (Storm)
- Type, grate size
- Top and flow line elevations
- Sizes and directions of pipes
- Note unusual conditions

Vegetation
- Trees 6" and larger (species)
- Landscaping – show watering system inside landscaped areas
- Wetland areas
- Orchards
- Pastures
- Cultivated land
- Timber land

Guard Rail
- Type
- End treatment
- Condition

Concrete Barriers
- Height
- Base width
- Type ("F" or Tall Barrier)

Surfacing
- Type
- Condition

Driveways
- Type
- Width

Edge of Pavement
- Concrete
- Asphalt
- Macadam

Edge of Gravel

Lane Lines
- Dashed
- Solid

Pavement Legends
- Arrows
- Bike Lanes

3.4 Included Information (Cont'd)

Sidewalk
- Condition
- Surfacing type

Back of Walk

Curb Ramps

Signal Poles
- Type
  - Wood (owner info), metal
- Luminaire
- Guy wires

Signal Heads
- Heights

Signal Loops

Junction Boxes

Control Boxes (various kinds)

Railroad
- Tracks
- Signal poles, other warning devices
- Stationing (if needed)
- Special vicinity map (if needed)

Buildings
- Walls
- Eaves
- Construction, wood, block, tilt up
- Awnings
- Docks
- Doors
- Stories

3.4 Included Information (Cont'd)

Structures

- Corners
- Footings
- Clearances (horizontal and vertical)
- Drains
- Joints
- Impact panels
- Guard rail connections
- Bridge Number
- As-Built plan reference
- Condition
- Columns

Walls

- Height
- Type
- Footings
- Width
- Conditions and any special features

Fences

- Height
- Type
- Gates – Uses
- Condition

Signs

- Size
- Type
- Post type
- Post size
- Legend
- Mounting type
- Conditions and pictures

Transmission Towers

- Footings
- Center of tower
- Direction of wires
- Identifying numbers or tags
- Condition and pictures

3.4 Included Information (Cont'd)

Poles

Type
Ownership information
Pole numbers
Map number
Direction of wires
Clearances (wire heights)
Guy poles and wires
Quantity of transformers
Luminaire
Underground connections (if any)
Condition

Transformers

Identifying features
Pad size

Vaults

Use
Catv, power, water, etc.
Size
Type of cover
Overhead connections (if any)

Gas Lines

Valves
Meters
Above ground features
Transmission facility, vents, risers, etc.

Water Lines

Meters
Valves
Control boxes (landscape areas)
Fire hydrants

3.5 Digital Terrain Models (DTM)

Terrain models of each project are generally included in the project submittal. These are generally separate .dgn files with the DTM loaded into the software and contours plotted. Terrain models are produced by calculating triangles between topographic shots taken in the field. This model is then used to produce contours, examine profiles, plot cross sections and compute quantities. When the original terrain model is combined with the design template, final project configuration and quantities can be examined and calculated. This final terrain model becomes the basis for the construction of the project.

3.6 Utilities

Utilities can be the most uncertain of all field items gathered. At the beginning of each project "Oregon Utility Notification Center" is contacted to have all underground utilities located on the ground. This consists of each company painting the location of their facilities on the ground surface. The methods of location can vary from visual inspection, using old, as built drawings, or electronic signals from tracer wires placed at the time of construction. The paint marks can only provide a 2 dimensional location of the underground utility. The third dimension (depth) can not be verified without pot holing the utility. If utility clearances become critical and cannot be moved, pot holing may be needed to verify its true location and depth.

Storm and sanitary manholes are considered "confined spaces" by OSHA (Oregon Safety and Health Administration) and cannot be entered by anyone without a permit and a specific certification. Most ODOT crews do not have such certification. If you see a notation "from as-built", the meaning is that the Survey Crew could not obtain the necessary field information safely and that what is on the Base Map is from "As Built" sources. If true depth of this utility becomes critical, it will be necessary to have entered by someone with the proper certifications.

3.7 Right of Way

Right of way and boundary information are typically included with each submittal. The right of way and boundary lines are determined through the analysis of existing monuments found throughout each project. The right of way information is generally submitted as a separate .dgn file.

Almost all projects require a recovery map to be filed with the County Surveyor's office in each county that the project is located. The purpose of this map is to preserve the location of any and all monuments that may be destroyed during the construction phase and is required by Oregon State Law. This map is usually produced by the locating office and is stamped and filed locally.

3.8 Conclusion

It should be noted that Base Maps do vary from Region to Region. You will find that information may be sized differently and possibly in different locations. This is due to the special needs of each project and the jurisdiction in which it is being proposed. Some Base Maps are viewed by many cities, counties and public groups before they ever get to final design, while others can move along in relative obscurity. However, all necessary information should be in the electronic file with the ODOT standard attributes. Levels may need to be turned on and off to suit your needs.

It rapidly becomes apparent that the original Base Map and associated information are the foundation of the entire project. Clear communication at the beginning of each project is critical. The Geometronics section of ODOT strives to keep the location Survey Crews well trained and equipped in order to provide accurate and complete data for the generation of the Base Map and terrain model.