

2001 Conference – Presentation Abstract

Subject: Survey Datums

Title: Am I Really Where I Think I Am? – An Introduction to Survey Datums, Map Projections and Coordinate Systems

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Abstract:

It is a common event for me to help an engineer decipher the vertical datum issues he has on any particular project. The most common question here in Southern California is “Why is your surveyed elevation 2.4 feet higher than the plan elevation for the same point?” This elevation difference is the local difference in elevation between NGVD’29 and NAVD’88. In addition, helping an engineer overcome his fear of grid coordinates is something I do on a fairly regular basis. I’ve always assumed that surveyors understand the concept of datums and projections. But I’m finding this isn’t necessarily true, especially for surveyors involved primarily with land development projects. The concepts of datums, projections and geodetic coordinate systems can be very confusing and intimidating to someone who hasn’t had to deal with them on a regular basis.

For the last ten years or so, I have been involved in those “long skinny” survey projects (i.e. transportation survey projects) that have allowed me the opportunity to learn the basics of datums, projections and coordinate systems. Highways, railroads, pipelines and other transportation projects require the use of grid coordinate systems and their associated geodetic datum. Acronyms such as WGS’84, GRS’80, NAD’83 and NAVD’88 have become common terms in my survey vocabulary.

These acronyms describe datums and coordinate systems that the surveyor must be aware of, and understand, as he/she moves into the world of survey and mapping information management. Hundreds of different datums have been used since Aristotle made the first estimates of the earth’s size. Datums have evolved from those describing a spherical earth to ellipsoidal models derived from years of satellite measurements. Referencing coordinates to the wrong datum can result in position errors of hundreds of meters. Different agencies use different datums as the basis for coordinate systems used to identify positions in geographic information systems, precise positioning systems, and navigation systems. The diversity of datums in use today and the technological advancements that have made possible global positioning measurements with sub-meter accuracy requires careful datum selection and careful conversion between coordinates in different datums. Today the surveyor must make informed decisions about the datum and coordinate system that will be used on any given project.

This presentation is my attempt to explain the basic concepts of datums, projections and coordinate systems in a very simple, non-mathematical format. We will discuss the most

common systems used by surveyors (both historically and currently) and the differences between them. In addition, we will discuss when to use a geodetic datum / coordinate system and when to use a simple plane survey.

Biography: Jeremy Evans is the Technical Director of Surveying and Geospatial Services for Psomas, a civil engineering / land surveying firm with offices in California, Nevada and Utah. He is licensed in California, Nevada and Arizona. Jeremy is in responsible charge of all control, boundary, and design surveying and mapping services performed by the Costa Mesa, California office. In addition, he is responsible for implementing procedures that allows the company to efficiently utilize the latest in electronic technologies.

Besides his corporate responsibilities, Jeremy is also an instructor in the GIS / Survey / Mapping Sciences program at Santiago Canyon College in Orange, California. He teaches the Advanced Problems in Surveying and Legal Aspects of Surveying courses. He is also involved in several Land Surveyor Exam Review courses.