

WHERE THE HELL IS THAT WELL?

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NAD83: Industry, Government and Regulatory Status – what are NAD27 and NAD83?

Mixing of data referenced to NAD83 with data referenced to NAD27 will result in positional errors of up to 250 metres that could result in dry holes. NAD27 has served the oil and gas industry very well for the last 80 years and it is still the survey reference system used by virtually all oil and gas companies in Alberta. We live in times of change and one change that many of you may or may not be aware of is the movement from our reference system of the past to a reference system of the future. This is not an easy, comfortable or necessarily welcome change to geoscientists. There is flux in industry practice, government directions and legislation, and regulatory demands. Over the next two to three years, industry must come to grips with these changes and become aware of what is happening, what the issues are, the potential for damage and the costs involved. The Alberta Energy and Utilities Board (AEUB) is moving its reference frame to NAD83 resulting in this initiative to start an awareness program through the Canadian Association of Petroleum Producers (CAPP), of which this paper is part. This paper addresses the current situation and plans for dealing with NAD83 issues.

“NAD” is an acronym for “North American Datum” which is the reference system for coordinates in Canada, the U.S., Mexico and Greenland. A datum is one component of how coordinate systems are defined or to what they are referenced. These coordinate systems to which we are referring are latitude and longitude or geographic coordinates and grid coordinate systems such as UTM northings and eastings. The other component for defining coordinate systems is the ellipsoid – or the mathematical model of the earth as defined by the length of its semi-major and semi-minor axes. NAD27 uses the Clarke 1866 ellipsoid. NAD83 uses the GRS80 ellipsoid. NAD83 corrects some of the inherent distortions in the NAD27 survey network that have accumulated over time and distance. NAD83 also has the advantage of being the native datum used by modern satellite surveying technologies such as the Global Positioning System (GPS) which is the primary tool used for acquiring surveys for seismic, wells, pipelines and facilities. With the advent of advanced technology such as computer workstations, geographic information systems (GIS) and massive spatial databases, coordinate referenced data has become the foundation for all geo-technical work done in our industry and it is critical that the coordinate integrity is maintained. There is a great deal of technical data interchange between companies and a mixing of differently referenced data poses a serious fiscal and physical risk. An example of the differences is indicated by the following values for the same point on the ground:

The local coordinates for both the values below are 219.6m south of the north boundary and 214.3m west of the east boundary of 26-25-02 w5.

	Latitude:	Longitude:	UTM northing:	UTM easting: (zone 11)
NAD27 value	51 10' 00.000" N	114 10' 00.000" W	5671957.28 m	698090.19 m
NAD83 value	51 10' 00.199" N	114 10' 03.584" W	5672179.18 m	698013.72 m
NAD27-NAD83	0.199" N	3.584" W	221.90m	76.47 m

Status of Governments

NAD27 is still the legal reference system for oil and gas activities on Canada Lands. The Canada Oil and Gas Land Regulations (COGLR) are still the guiding legislation for real property rights and boundary issues. This applies to the offshore east, west and northern coasts as well as the NWT and Nunavut. The Federal government (Legal Surveys Division) is recommending to those areas under Accord such as the Canadian Newfoundland Offshore Petroleum Board (CNOBP) and Canadian Nova Scotia Offshore Petroleum Board (CNSOPB) to move to a NAD83 based regulatory environment. It is hoped implementation will take place within two to four years.

The Canadian Council on Geomatics has adopted a resolution that each province and territory will adopt NAD83 as their reference datum. In Alberta B.C. and Saskatchewan survey control systems are all referenced to NAD83 or in transition, all newly produced maps are referenced to NAD83 and all their communication with the public uses NAD83 referenced coordinates. Many of the government bodies that deal with the oil and gas industry are transitioning to NAD83. Alberta Sustainable Resources Development

is hoping for a NAD83 based approval process for geophysical programs through its ADEPT initiative. Most Alberta based government agencies are targeting a broader based GIS for spatial information acquisition, retention, and dissemination. This GIS will use NAD83 as its reference datum.

Status of Regulatory Bodies

The AEUB issued General Bulletin GB2003-30 stating their intention to convert all its spatial data to NAD83 from NAD27. This is now done. This includes all datasets sold by the AEUB which are the General Well Data File, the Drilling Well Data File, the Pipeline Graphics File and the Coal Hole Data File. The AEUB has also implemented its Electronic Application Submission Plan (EAS) which requires latitude and longitude coordinates referenced to NAD83 for certain application submissions such as proposed wells. CAPP is working with the AEUB to minimize coordinate integrity issues. The AEUB has agreed to extend their March 4, 2004 deadline for disseminating NAD27 referenced coordinates for their data to at least December 31, 2005 while CAPP tries to evaluate the cost/benefit analysis related to any conversion from NAD27 to NAD83. In the meantime, in order to avoid corruption of their databases, CAPP is advising all its members to continue requesting their data from the AEUB and from their data vendors to be referenced to NAD27 as they have done in the past. CAPP also suggests that during the AEUB transition period and the implementation period of their EAS plan that members insure all data they receive from partners, their data vendors, the AEUB, and contractors is identified with its reference datum. If in doubt, contact a geomatics professional.

Industry Status

Of the approximately 500 oil and gas companies operating in Canada, virtually all of them store their technical spatial data referenced to NAD27 as do most of their data suppliers. Most company's databases include wells, pipelines, facilities, seismic shot points, geophysical and geological interpretive information, land, township grids and cultural information. To load NAD83 referenced wells into this NAD27 environment would be a disaster. Companies should be encouraged to discuss their spatial data issues with their survey contractors and their data vendors. The survey companies servicing the oil and gas industry in Canada are generally very professional and are very aware of the NAD83/NAD27 issues and will be happy to provide advice or coordinates however the client would like them.

How is this handled in other countries? The U.S. based oil and gas industry ignores NAD83 and operates in NAD27. Australia chose to move all their oil and gas based data to be referenced to WGS84 (a near equivalent to NAD83 reference system). CAPP is still researching the success of this venture. European companies reference their geotechnical data to whatever local datum is prevalent in the area they are operating. They utilize a similar methodology to the U.S. although the problems and issues of multiple datums is more understood in Europe due to numerous bad experiences. North American Geoscientists have had the luxury of working in one datum for most of their careers. Many Europe based companies employ geomatics professionals to handle any positioning related issues. Many other Canadian industries such as mining, telecommunications and transportation are in or progressing toward a NAD83 environment.

So, the question is "Should the oil and gas industry remain an island utilizing NAD27 referenced data while the rest of Canadian industry and government moves to NAD83?" There is such a large amount of data exchange and partnered ventures that it is necessary that this decision be made as an industry rather than on an ad hoc basis. If converting to NAD83 is the option, it should take place over a set time frame with technical standards in place and with an accepted risk management program established.

The reasons for companies not to convert to NAD83: money, money, technology, risk and more money. Some Calgary based companies realized that the offshore east coast exploration and development programs would be better served by converting all their technical data to NAD83 prior to installation of gravity based drilling structures, intense development programs, pipelines, flowlines, and Floating Production Storage Offloading Systems. This proved two things; one that it was feasible to convert large amounts of data to NAD83 and secondly, that the process was difficult, time consuming and expensive. One large integrated company did their offshore conversion over a period of six months and at a cost of \$100,000. The western Canada basin contains at least an order of magnitude more data. Far and away the most difficult data to convert was the subsurface interpreted geophysical data. Fault polygons, picks, horizons, all had to be exported, transformed and re-loaded to the projects. Quality control had to be run and it was felt that there was about a 95% reliability rate on the accuracy of the re-loaded data. Also for the offshore we were dealing with approximately 300 wells, not the 500,000 in Western Canada and their accompanying subsurface information. Total cost to industry would be in the millions, if not tens of millions of dollars. All to move your data a few hundred metres. Some heavy oil projects and oil sand extraction engineering projects use NAD83 as their reference datum. This was

probably a wise decision since they are stand-alone projects with little need to integrate either with other companies or other exploration or development trends.

If a decision is made “not to convert to NAD83” there is a cost incurred with constantly converting NAD83 received data from third parties to NAD27 prior to loading to corporate databases and then again converting to NAD83 prior to submission to regulatory agencies, governments, accords, or boards. How much this cost would be to industry over a period of years is something that is yet to be ascertained. At some point it would equal the current cost of conversion but is that time period five, ten or fifty years out. There is a wide spectrum of opinion among CAPP members on how to deal with this issue. CAPP’s current position pending a cost/benefit analysis it is currently conducting is to convert to NAD83 in the offshore but to remain in NAD27 in western Canada due to the large infrastructure in place.

Standards

There is only one accepted standard by CAPP for transforming your data from NAD27 to NAD83 and back again and that is the National Transformation Version 2.0 (NTV2.0) which is available on-line from the federal government.

Conclusion

The CAPP Geomatics Committee has a technical working group doing a cost/benefit analysis of converting some, all or none of industry’s geotechnical data to NAD83. After this analysis is done, the Geomatics Committee with support from the CAPP Geophysical Committee and the Alberta Executive Policy Group (EPG) will seek a recommendation suitable for the Board of Governors regarding a solution for dealing with this issue. If any CSEG members or member companies would like to take advantage of participating in this cost/benefit analysis project, they are asked to contact the author. It is hoped that the audience is now better informed about these issues.