## **Comparison of Distances on Nebraska Page Baseline**

Earl F. Burkholder – May 27, 2015

## Note – this posting is defective. See instead www.globalcogo.com/NebBaseLineMay2015.pdf

The associated sheet shows:

- A. Position of Page NE Base and Page SW base. The latitudes, longitudes, geoid heights, and elevations were taken from the current NGS data sheets for those points.
- B. The geocentric ECEF coordinates were computed for:
  - 1. Point 1 Page Southwest Base
  - 2. Point 2 Page Northeast Base
  - 3. Point 3 latitude/longitude for Page SW on the ellipsoid, i.e., h = 0.0 m.
  - 4. Point 4 latitude/longitude for Page NE on the ellipsoid, i.e., h = 0.0 m.
  - 5. Point 5 latitude/longitude for Page SW, but at ellipsoid height of Page NE.
  - 6. Point 6 latitude/longitude for Page NE, but at ellipsoid height of Page SW.
- C. The definition of horizontal distance is taken to be a line whose ellipsoid height is the same at both ends called HD(3) in item #4 at <u>www.globalcogo.com/refbyefb.html</u>. (Note ASCE holds the copyright of that article and does not permit me to post it. But, if you ask me personally, I am permitted to send you a copy.)
- D. HD(3) is a chord distance and computed as:

$$Dist = \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2 + (Z_2 - Z_1)^2}$$
(1)

- E. In this case, the arc distance is longer than the chord by 0.0006 m. see on sheet.
- F. The "horizontal distance" was computed at the ellipsoid height of each end-point using equation (1). The "mean horizontal distance" is the dotted line = 8,251.7602 m.
- G. The reported measured distance in 1900 is 8,251.7569 m.
- H. The difference is 0.0033 meters in a distance of 8,251.76 m or 1:2,500,000, very close.
- I. As John Hamilton points out, the difference may be due to a number of reasons.

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EFB 05/27/2015 NEBRASKA BASELINE COMPARISON 50 8,251.7903 6 0 1. 5W END 2 NE END 5 3 NE 8,251.7301 3. SWON EUPSOID NE ON ELLIPSOID t. 3 4) 5. SWE ELEN NE NE @ ELEV SW 6.  $5\psi \phi = 42^{\circ} 25' 25.39941$ 0  $\lambda = 98^{\circ}26' 00.79833$ h = 626.231+ - 21.71=601.52m NE \$= 42°28'53.47527 7 = 98°22'13.99939 h= 580.1+-25.04= 555.06m a = 6,378,137.00 R = 6, 376,199. 397 m AGREES WITHIN e<sup>2</sup> = 0.006694380023 200'005 ARC & CHORD &= 2× SIN (2) L=RO  $L = 6,376,199.397 \times \left[ 51N \left( \frac{8251.0115}{(2)6,376,199.397} \right) \right]$ C ARC 15 ... = 8,251.0121m, LONGER BY 0.0006 M MEAN (DOTTED LINE) 8,251.7600 m WITHIN 0.0033m 69 MEASURED IN 1900 8,251.75% M