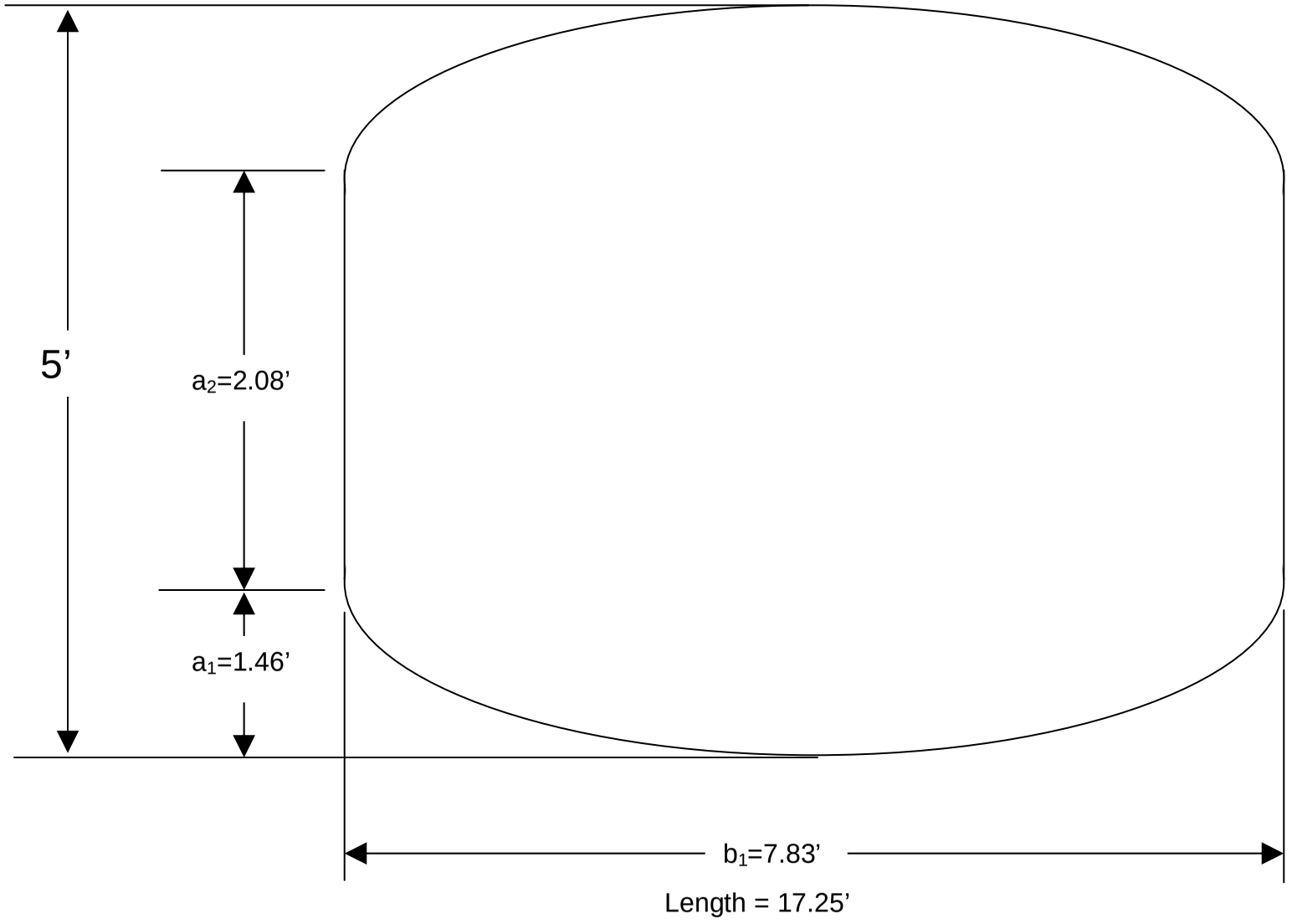
Appendix C

Water Truck Dimensions

_142__ Date_____



$A_1 = \pi \cdot a_1 \cdot b_1$
$= \pi \cdot (1.46) \cdot (7.83/2)$
$= 17.98$ SF

$A_2 = a_2 \cdot b_1$
$= (2.08) \cdot (7.83)$
$= 16.29$ SF

$A_1 + A_2 = 34.27$ SF

Volume = Area x Length
$= (34.27)\ (17.25)$
$= 591.16\ FT^3$

$1\ ft^3 = 7.48$ Gallons

Total Volume = 4421.9 gal

Total Volume = 4.4 MGAL

Truck Measure Agreement
Dated_____

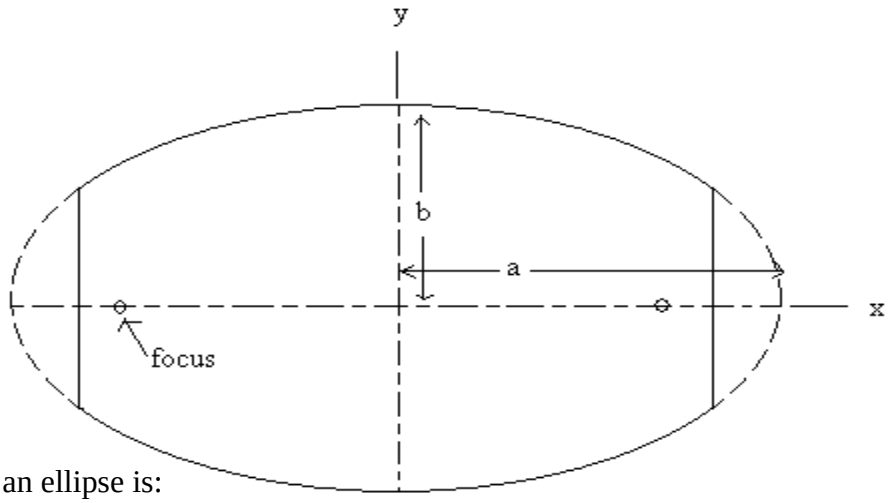
FHWA Representative

Contractor Representative

Water truck # 143 Volume Calculation

The cross section of the water tank was determined to be an ellipse with both ends of the major axes cut off vertically.

The foci were determined by taping two ends of a string to the tank such that a triangle could be formed at any point on the tank edge using a third point on the span of the string. The locations of the two string ends where this occurs are the locations of the foci.



The equation of an ellipse is:

$\frac{(x-h)^2}{a^2}+\frac{(y-k)^2}{b^2}=1$, point (h,k) represents the center of the ellipse (0,0)

$\therefore$ Through manipulation: $y=\pm b\sqrt{1-x^2/a^2}$

The area of the portion of the ellipse that represents the cross section of the tank can be expressed as:

$$A=\int_{x_1}^{x_2}\int_{y=-b\sqrt{1-x^2/a^2}}^{y=b\sqrt{1-x^2/a^2}} dy\,dx$$, and $|-x_1| = x_2$, $\therefore A=4b\int_0^{x_2}\left(1-x^2/a^2\right)^{\frac{1}{2}}dx$

TI 89 integration was used w/ measured values of a = 1.330m, b = 0.765m, x_2 = 1.230m

A = 3.12 m^2

The tank length was measured to be 4.67m

$\therefore \forall = A\times L = 3.12\times 4.67 =$ **14.57m^3** = **3846.5gallons**