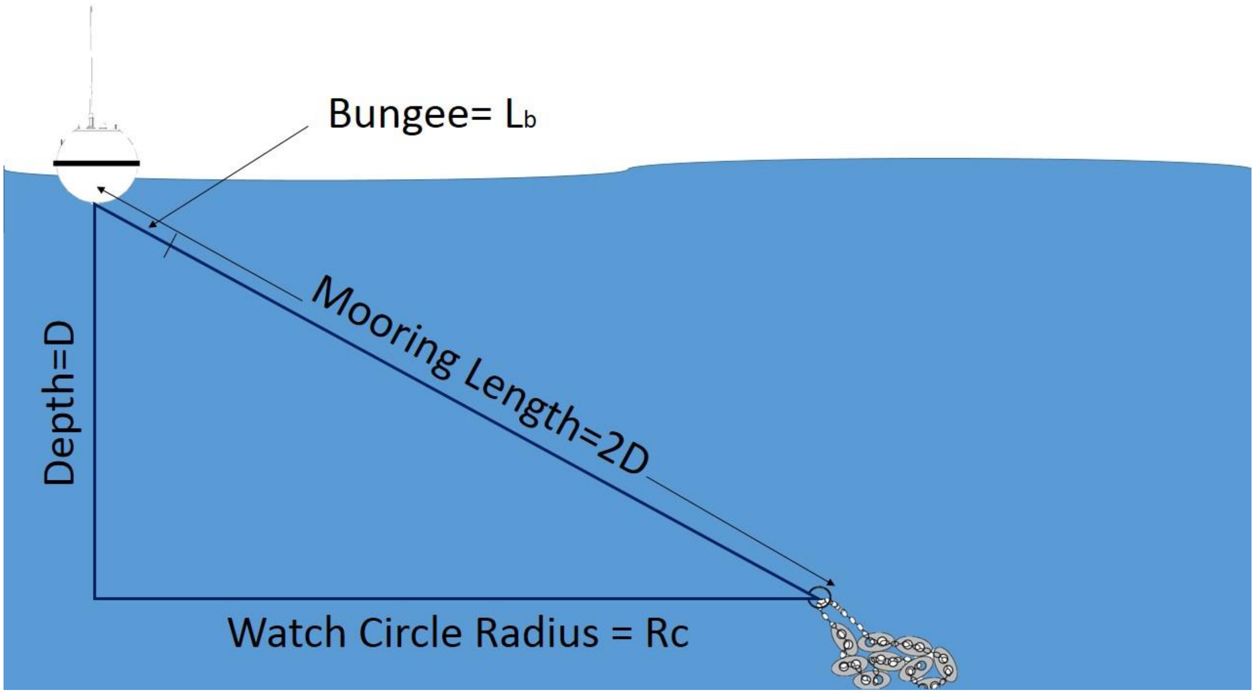
Calculating the Buoy's Watch Circle

The buoy is moored at the bottom by an anchor, followed by a mooring line, and a bungee. The total length of the mooring, during an un-stretched condition, is usually deployed as 2 times the depth of the deployment location. The 30 meter bungee can stretch up to 5 times its length. The watch circle radius, depth, bungee, and mooring, can be represented by:



We can also define the stretch factor for the bungee, as the variable S. For our purposes, S=5, since the bungee stretches to 5 times its original length. Therefore, for a 2:1 (Length: Depth) scope, the mooring length is represented by:

$$\text{Mooring Length} = 2 \cdot D = (S-1) \cdot L_b + 2D$$

Using the Pythagorean Theorem, the watch circle radius is represented by:

$$((S-1)L_b + 2D)^2 = D^2 + {R_c}^2$$

Solving for R_c:

$$R_c = \left| \sqrt{((S-1)L_b + 2D)^2 - D^2} \right|$$

For example, a buoy deployed at a 24 meter depth:

D=24m

S=5

Lb=30m

So:

$$R_c = \left| \sqrt{((5-1)\cdot 30 + 2\cdot 24)^2 - 24^2} \right| \cong 166.2 \text{ m}$$

For a buoy deployed at a 200 meter depth:

D=200m

S=5

Lb=30m

So:

$$R_c = \left| \sqrt{((5-1)\cdot 30 + 2\cdot 200)^2 - 200^2} \right| = 480 \text{ m}$$