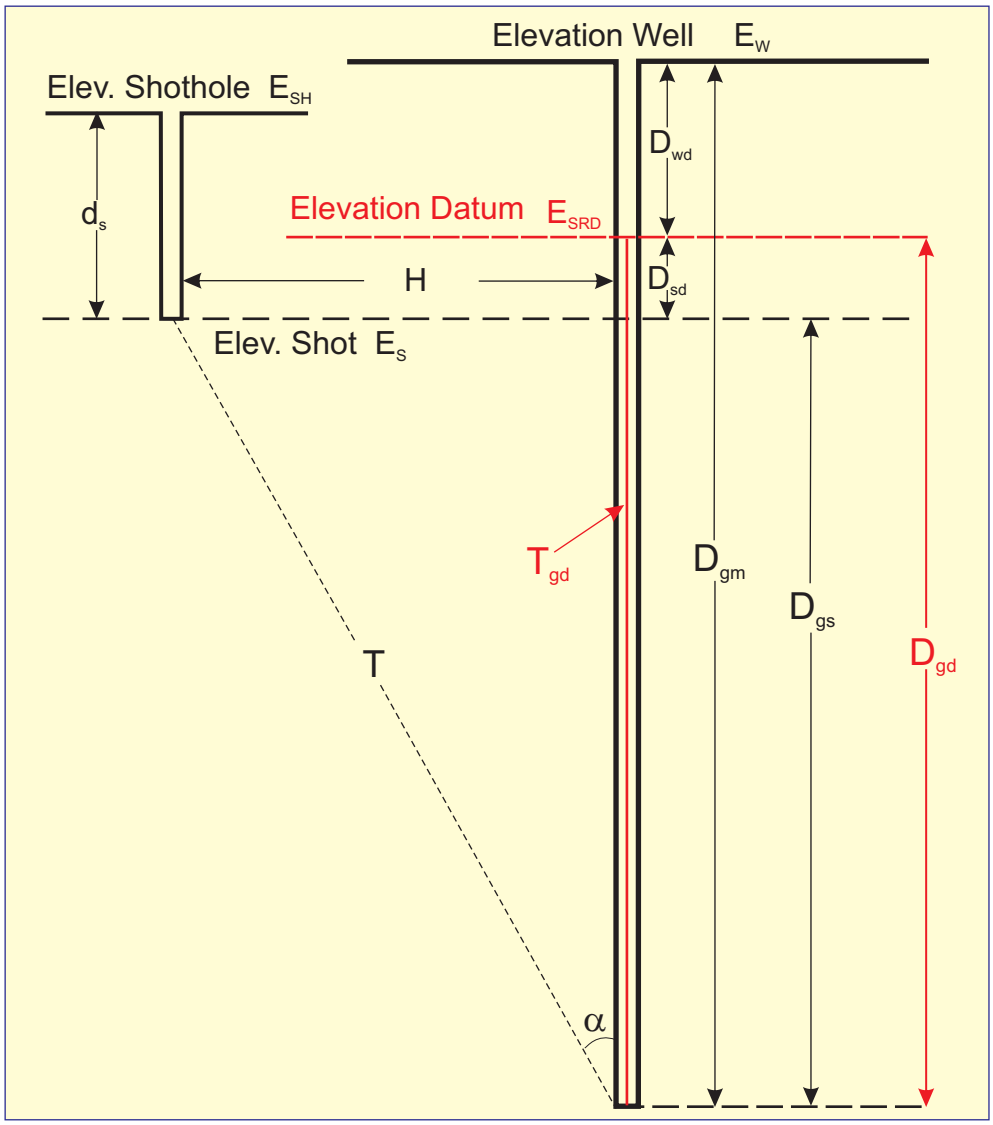

Vertical depth (D_{gd}) and vertical travel time (T_{gd}) from seismic reference datum (SRD) to geophone are calculated as follows:

$$D_{gd} = D_{gm} - (E_W - E_{SRD}) \quad (1)$$

$$T_{gd} = T\cos\alpha - D_{sd}/V_E \qquad \text{where} \quad \cos\alpha = D_{gs}/[(H^2 + D_{gs}^2)^{1/2}] \quad (2)$$

D_{gm} - geophone depth below well elevation
D_{wd} - difference between well elevation and elevation datum = E_w-E_{SRD}
D_{gd} - geophone depth below elevation datum (SRD) = D_{gm} - D_{wd}
D_{gs} - geophone depth below shot elevation = D_{gd} + D_{sd}
d_s - depth of shot
D_{sd} - difference between shothole elevation and SRD = E_{SH} - d_s - E_{SRD}
D_{sd}/V_E - time correction from shot to SRD
E_{SRD} - elevation of seismic reference datum (SRD)
E_S - elevation of shot
H - horizontal distance from well to shothole
E_W - elevation of well with respect to kelly bushing
T - observed travel time from shot to well geophone
T_{gs} -vertical travel time for D_{gs} distance = T*cosα
T_{gd} - vertical travel time for D_{gd} distance = T_{gs} - D_{sd}/V_E
V_E - elevation correction velocity

Figure 3. Definition of terms for borehole seismic survey