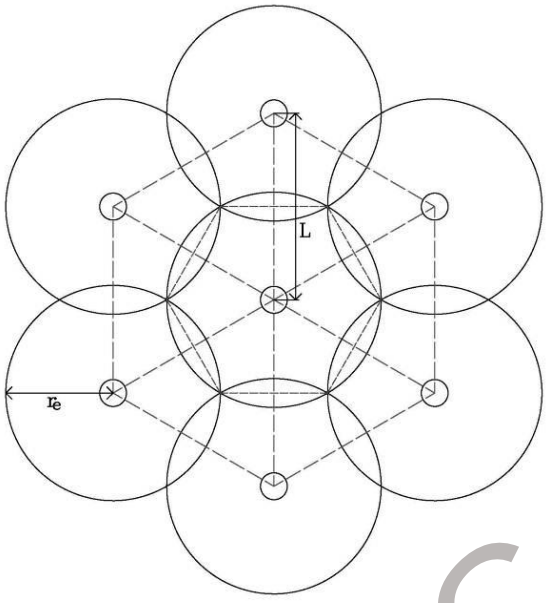

Figure 5-5 – Wells Located in a Pattern of Equilateral Triangles (Well Spacing $L=r_e\sqrt{3}$)

In a drainage well-field, there is a direct relationship between the discharge rate of the well, the recharge rate of the aquifer by percolation, and the area affected by pumping. The decline of the water level due to pumping is determined by the discharge rate of the well and the permeability and thickness of the aquifer. The discharge rate and the drawdown in the well are important factors in calculating the pumping costs of well drainage. In an unconfined aquifer, the steady-state flow through an arbitrary cylinder at a distance r (Qr) from the well is given by:

$$Q_r = \pi(r_e^2 - r^2)R$$

Where:

- r_e: radius of influence of the well (m)
- r : distance r from the well (m)
- R : recharge rate of the aquifer per unit surface area (m/d)

According to Darcy's law, Qr equals to algebraic product of the cylindrical area of flow and the flow velocity. Hence, the discharge at distance r from the well can also be expressed by:

$$Q_r = 2\pi r h K \frac{\delta h}{\delta r}$$

Where:

- K : hydraulic conductivity of the aquifer (m/d)
- $\frac{\delta h}{\delta r}$: hydraulic gradient in the aquifer at distance r (-)
- r : distance r from the well (m)
- h : height of water above the well at distance r

To calculate the drawdown in a well field when the wells are placed in a triangular pattern following equation can be utilized. From the Figure 5.5, it can be seen that the distance L between the wells is equal to $r_e\sqrt{3}$.

$$\Delta h_r = \frac{2.3Q_r}{2\pi KH}\log\frac{r_e}{r_w}$$