#1 Using the sandy soil properties and the fact that a thermal wave penetrates roughly a distance

$$\Delta x \simeq \sqrt{\frac{k}{\rho c}\Delta t} = \sqrt{\kappa}\sqrt{\Delta t} \quad \text{in time } \Delta t$$

we have

$$\kappa = 0.003\ \text{cm}^2\,\text{s}^{-1} \quad \left(\begin{array}{l}\text{or } 3\times10^{-3}\ \text{cm}^2\,\text{s}^{-1}\\ \text{or } 3\times10^{-7}\ \text{m}^2\,\text{s}^{-1}\end{array}\right)$$

If we use $\Delta t = 12\,\text{hr} = 43200\,\text{s}$

we get $\Delta x = \sqrt{0.003\,\text{cm}^2\,\text{s}^{-1}\cdot 43200\,\text{s}}$

$= \sqrt{129.6\,\text{cm}^2}$

$= 11.4\ \text{cm}$

If we had used 24 hr we would get a number $\sqrt{2}$ larger -ie 16.1 cm.

Since is just a rough estimate I won't worry about that difference. After all we havent specified exactly how much of a ΔT we're considering. But the sand must be roughly of no more than the depth where you "see" the underlying bedrock - but deeper than roughly this where you cannot see it.

#2. The amplitude of the T variations will be $\frac{F_0}{P\sqrt{\omega}}$ where F_0 is the amplitude of the net flux in and out of the surface (ie $F = 136\ \text{W}\,\text{m}^{-2}$),

$\omega = \frac{2\pi}{P}$ which is $\frac{2\pi}{24\,\text{hr}} = 7.27\times10^{-5}\,\text{s}^{-1}$

and $P = 0.024\ \text{cal}\ \text{cm}^{-2}\,\text{s}^{-1/2}\,{}^\circ\text{C}^{-1}$

To convert to SI units multiply by $4.18\ \text{J/cal} * (10^2\,\text{cm/m})^2$ (note $\Delta 1^\circ\text{C} = \Delta 1\text{K}$)

so $P = 1003\ \text{J}\,\text{m}^{-2}\,\text{s}^{-1/2}\,\text{K}^{-1}$ giving

$$\frac{F_0}{P\sqrt{\omega}} = 136\ \text{W}\,\text{m}^{-2} \Big/ \left(1003\ \text{J}\,\text{m}^{-2}\,\text{s}^{-1/2}\,\text{K}^{-1}\sqrt{7.27\times10^{-5}\,\text{s}^{-1}}\right) = 15.9\,\text{K}$$

note - using W = J/s all the other units cancel leaving just K, as they should.

The 15.9K is the amplitude of the cosine term for T, so the day-night difference is twice this, or 31.8K