Major Comments:

- Explanations and methodology are so insufficient and lacking that it cannot be understood how the results were obtained and their significances in this research. Like, Solar Heating – How is it applied, in what way, for how many hours?

Only showing results is not logical for the reviewed paper to be published!!

- English must be corrected throughout the manuscript.

- Authors concluded that Scheme 3 i.e. with Solar heating is the best scheme. But authors did not show how this scheme is incorporated in this study, which parameters and their values are used. How the parameters are input in the numerical model.

In conclusions, "parameters have been set through calculations and measured data" is written. Then, it is compulsory to show those calculations and data that had been measured, and also how measurements are done.

- In Section "2.2 Experiment on heat transfer", it is stated that thermal response test is done for K2 borehole also. If so, why the results of K2 is not considered in Model verification? Only K3 and K4 are shown.

- Line 273

Please provide details of the Solar Heating? Explanations, Methodology, schematic diagrams, How is it connected to GSHPS etc. must be included in the paper.
Just by writing solar heating, no one can understand the condition of its application.
How did you apply Solar Heating in the simulation?
Why Inlet Temperatures for Scenario 1 and 2 are different?
How many hours per day, the system is operated?

- Figure 6

How did authors get this result? From simulation of Thermal Response Test? Should be explained in the text. Is this result calculated for heating or cooling? Or during Thermal Response Tests?

- Section 4.2.2

How did Authors compute heat influence radius? Details of methodology and logic behind it must be mentioned.

- Figure 7

Where are the results of other scenarios or schemes 2 and 3? Why did not authors show all the results?

- Figure 8

Simulation period is set of 10 years. But, Why the analysis is done for only 1 year for ground temperature changes at different depths? Temperature change also must be simulated for 10 years. Is not it important?

- Table 5

How the solar heating of Scheme (Scenario) 3 is set in the simulation? Is it used during winter only? These things are so unclear.

- Figure 9 (Section 4.2.5)

How did authors calculate thermal equilibrium? Analysis must be shown in detail.
Results of other schemes must be presented.

Additional comments:

1. Lines 2 to 5.
Title must be improved and rearranged with proper English.
This paper is about GSHP system. So it is better to use Shallow Geothermal instead of Geothermal only.

2. In the 1. Introduction Section, Authors must make clear about

- Objectives

- What is new as compared with the past researches that Authors have mentioned in this section?

- Why this research is important?

- Overall rationale or logic of this study.

Above factors are completely missing and readers of this paper cannot perceive what is the main purpose of this paper.

3. Line 115
Please show the location map.
Mention why this study area is selected for your research.

4. Lines 115 to 116
Where is the C3 borehole? Please show its location. It cannot be found in the paper.

5. Line 120 “The change of initial ground temperature with depth is not obvious”

What is the meaning of this sentence? Please clarify.

6. Please use “borehole” instead of “hole” in the whole paper to maintain consistency.

7. Lines 123 to 127 “Among them,……is ±0.5 ° C.”

Rearrange this sentence with proper English.

8. Is a single U-tube (U-shape channel) or double U-tube used for heat exchange? What is the U-tube made up of? Is it PVC or other? Please clarify.

9. Line 134
There are no C2, C3 boreholes in figure 1. Please Correct them.

10. Lines 139 to 140
Please give details about GH-12WT09 cabinet type tester. You can mention related Reference as well, if there is any.

11. Show the results of Thermal Response Tests at each boreholes in graphs.

12. Lines 140 to 145 “ The summer and winter……and K4 borehole.”
The sentence is very very long and its meaning is unclear. Please separate this sentence into 2 to 3 sentences so that it will be clearer for readers.

13. Why 6 kW and 9 kW were used?
From which stable heat flow Thermal conductivities are calculated? 6 kW or 9 kW.?
Are the thermal conductivities resulted from summer and winter same? This thing cannot be understood from the paper.

14. What is the method used for the calculation of thermal conductivities? Please mention.

15. Line 189 “ In this study, a numerical FEM software…….”
Which FEM software is used? It must be mentioned in the manuscript.

16. Line 200 “100m x 100m x 120m”
In figure 2, all the dimensions are 100m only. I could not see height of 120 m. Please confirm.

17. Lines 215 to 216
What is “given temperature boundary”? Please define boundary conditions clearly

18. Lines 218 to 219?
What do you mean by “given temperature boundary” and “given velocity boundary”? Define properly.

19. Why the thermal response test time is different for summer and winter, and also for K3 borehole and K4 borehole?