1.a) 250 mrd / 1k = 250 mio blocks, which means 250 mio addresses saved in the table

b) 250 mio

c)log2(250.000.000) = 27.897
min 28 bit

d)every block needs to be saved in the table, therefore you have to subtract 28 for every blocks you have, which leaves you at a maximum of:

249 GB: 250gb - 250mio blocks * 28bit

2.a)It depends on how many addresses fit into one block. Supposing addresses are 32 bits big, 1024/32 = 32 addresses will fit into one block. now you have to know which power of 32 is nearest to 107834590, but not higher, in that way, you know in which block to start. Now you have to do the same with the rest of the position minus the specific power of 32 over and over:

107.834.590

32^5 = 33.554.432

107.834.590-33.554.432 = 74.280.158

32^5 = 33.554.432

74.280.158-33.554.432 = 40.725.726
...

this way you get nearer and nearer to the specific position.

b)
I guess you have to run down through all the addresses.

3.) If you have smaller blocks, you will need more pointers, which leaves you with a smaller maximum file size.

4.a)5.000.000.000/512 = 9.765.625 blocks
        log2(9.765.625) = 24 bit
        512/24 = 21 pointers in one block

b)