HW7: Facility Location Models

A county is deciding where to place police precincts in order to respond to potential emergencies. There are 10 locations which need police protection and 5 of them are candidates to place a police station. The county has a budget of $2,500,000 to place the police stations. You are given the following information:

- C is the set of locations that need police protection $C = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

- S is the set of potential locations to place a police station $S = \{1, 4, 6, 8, 9\}$.

- Each zone in C has a demand of 150. Additionally, the demand of each zone must be fully served by exactly 1 police station.

- Each potential location has a fixed cost to open and capacity. The table below gives these values:

Location	Fixed Cost	Capacity
1	$800,000	500
4	$750,000	450
6	$1,200,000	700
8	$1,000,000	600
9	$400,000	325

- Lastly, the distance between each potential police location and each zone in the city is given in the table below:

Station	1	2	3	4	5	6	7	8	9	10
1	0	7	6	2	2	5	3	4	7	9
4	2	3	4	0	6	5	7	9	1	3
6	5	4	3	5	2	0	1	8	6	5
8	4	3	5	9	5	8	3	7	9	9
9	7	4	6	1	9	6	4	9	0	1

Part 1: Formulate a concrete model whose solution would minimize the total distance traveled by the police officers while remaining within budget.

Part 2: Parameterize your model from part 1.