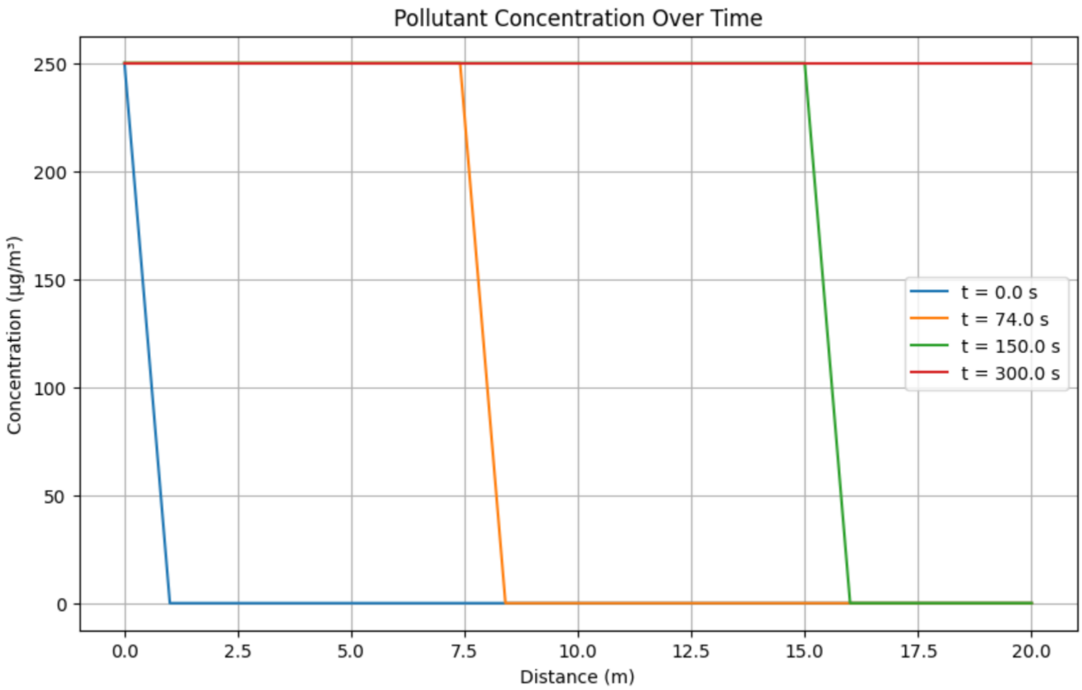
Test Case 1:

```
Enter end of time domain (s): 300
Enter temporal resolution dt (s): 10
Enter spatial resolution (m): 0.2
Enter the flow speed (m/s): 0.1
Enter the decay constant (1/s): 0
Enter the perturbation factor: 0
Upload your initial conditions CSV file:
```

Choose Files task 1 conditions.csv

task 1 conditions.csv(text/csv) - 155 bytes, last modified: 12/19/2025 - 100% done

```
Saving task 1 conditions.csv to task 1 conditions (2).csv
The CFL condition has been violated, temporal resolution has been adjusted to 2.0000 s
```



The resulting graph demonstrates that the concentration of the pollutant increases along the river as time increases, with the concentration remaining constant at $x = 0$. The boundary condition at the start is modelled as a constant inflow since no decay constant is provided in test case 1. After 5 minutes, 20 metres of the river downstream contains a pollutant concentration of 250 µg/m³.

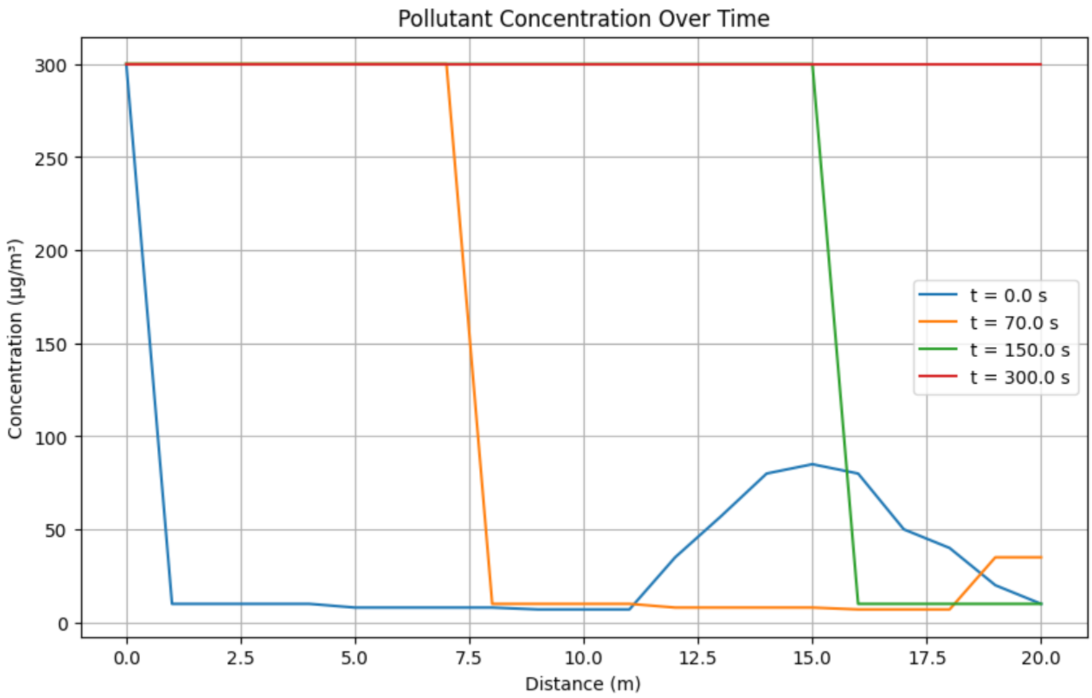
Test case 2:

```
Enter end of time domain (s): 300
Enter temporal resolution dt (s): 10
Enter spatial resolution (m): 1
Enter the flow speed (m/s): 0.1
Enter the decay constant (1/s): 0
Enter the perturbation factor: 0
Upload your initial conditions CSV file:
```

Choose Files initial_conditions.csv

initial_conditions.csv(text/csv) - 166 bytes, last modified: 11/26/2025 - 100% done

```
Saving initial_conditions.csv to initial_conditions (7).csv
```



The line graph shows the change in pollutant concentration over time along the river given a set of initial pollutant concentration along the river. After 70 seconds, almost 7.5 metres of the river reached a pollutant concentration of 300 µg/m³, whilst the previously contaminated segment (11m – 17.5m) has decreased in pollutant concentration. As time increases, the pollutant concentration becomes 300 µg/m³ for the whole 20 metres of the river, without a loss in pollutants due to the lack of decay constant.

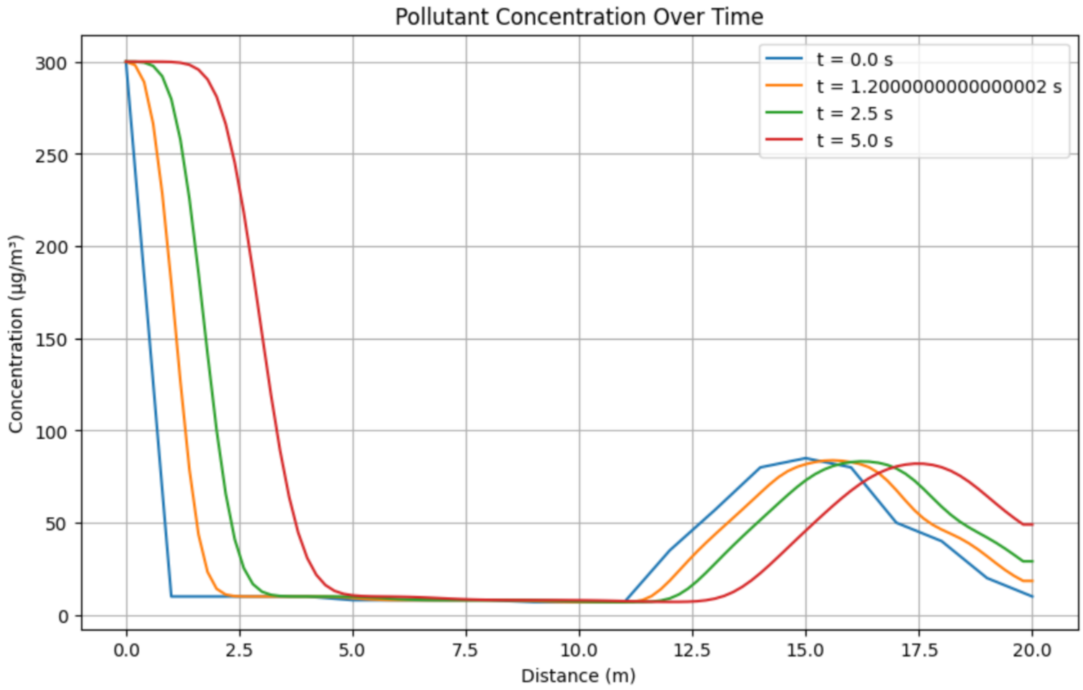
Test Case 3

```
Enter end of time domain (s): 5
Enter temporal resolution dt (s): 0.1
Enter spatial resolution (m): 0.2
Enter the flow speed (m/s): 0.5
Enter the decay constant (1/s): 0
Enter the perturbation factor: 0
Upload your initial conditions CSV file:
```

Choose Files initial_conditions.csv

initial_conditions.csv(text/csv) - 166 bytes, last modified: 11/26/2025 - 100% done

```
Saving initial_conditions.csv to initial_conditions (8).csv
```



Within a shorter time frame, the pollutant concentration increases slower as illustrated in the graph above. However, the general trend is similar to the previous task where the concentration slowly increases along the river and the initial concentration between 11m to 20m is being pushed further down in the river.

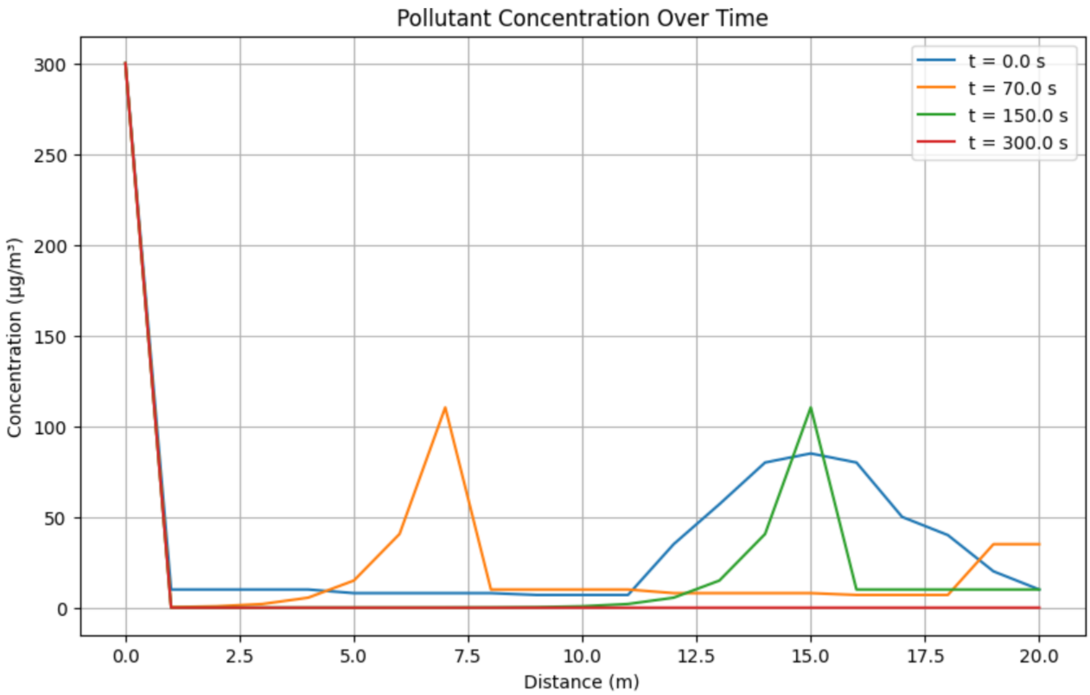
Test Case 4:

```
Enter end of time domain (s): 300
Enter temporal resolution dt (s): 10
Enter spatial resolution (m): 1
Enter the flow speed (m/s): 0.1
Enter the decay constant (1/s): 0.1
Enter the perturbation factor: 0
Upload your initial conditions CSV file:
```

Choose Files initial_conditions.csv

initial_conditions.csv(text/csv) - 166 bytes, last modified: 11/26/2025 - 100% done

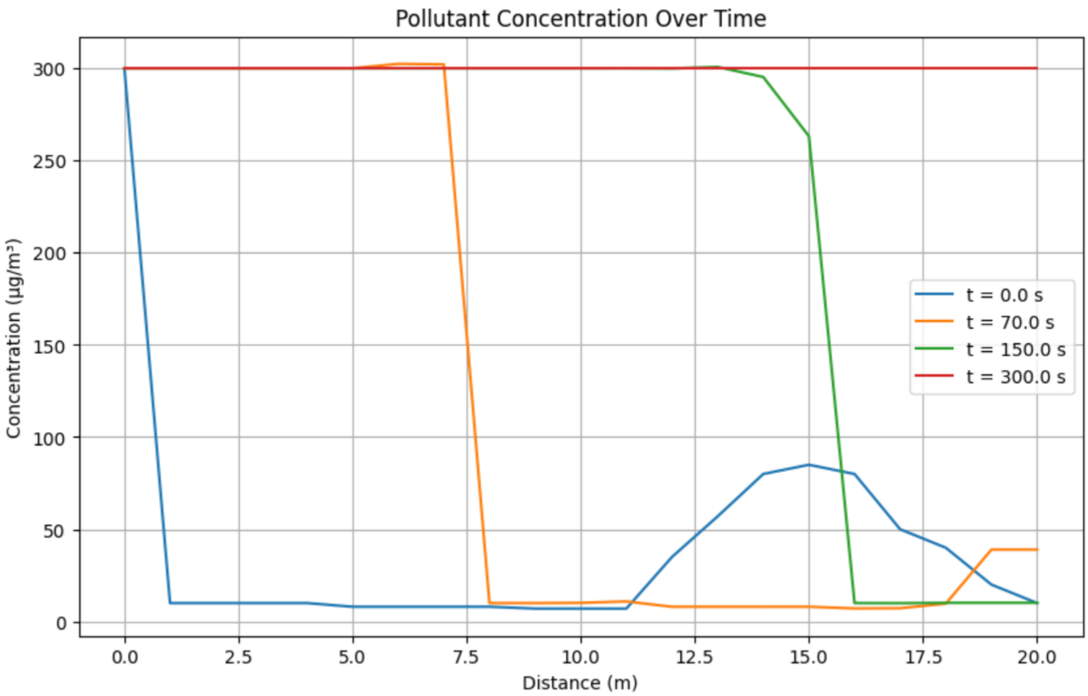
```
Saving initial_conditions.csv to initial_conditions (14).csv
```



By adding an exponential decaying constant of 0.1, the pollutant concentration decreases overtime along this part of the river, as the decaying constant removes pollutants. Whereas in test case 1, 2 and 3, the pollutants are transported downstream without loss. This is displayed on the graph as after 5 minutes, the pollutant concentration drops to 0.

Test case 5:

```
Enter end of time domain (s): 300
Enter temporal resolution dt (s): 10
Enter spatial resolution (m): 1
Enter the flow speed (m/s): 0.1
Enter the decay constant (1/s): 0
Enter the perturbation factor: 0.1
Upload your initial conditions CSV file:
Choose Files initial_conditions.csv
initial_conditions.csv(text/csv) - 166 bytes, last modified: 11/26/2025 - 100% done
Saving initial_conditions.csv to initial_conditions (15).csv
```



By adding a 10% perturbation factor, the river flow speed is no longer constant, but slightly modified in space and time. This changes how fast pollutants are transported and can also indirectly change how much decay they experience. The graph above shows a slight change in the concentration compared to the graph in Task 2. However, the general trend remains similar since no decay constant is introduced and all other conditions are kept the same.