J-HORIZON: A VEHICLE ROUTING PROBLEM SOFTWARE

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The **J-Horizon** is java based vehicle problem software that uses the jsprit library to solve: Capacitated VRP, Multiple Depot VRP, VRP with Time Windows, VRP with Backhauls, VRP with Pickups and Deliveries, VRP with Homogeneous or Heterogeneous Fleet, TSP, mTSP and various combination of these types.

Download "**J-Horizon**" at: **https://sourceforge.net/projects/j-horizon/files/**

Citation:

Pereira, V. (2017). J-Horizon: A Vehicle Routing Problem Software (Computer Software). Retrieve from: <https://sourceforge.net/projects/j-horizon/files/>.

jsprit ##### Solver engine

Site: https://github.com/graphhopper/jsprit

jsxgraph ##### Cartesian Plane representation

Site: https://jsxgraph.uni-bayreuth.de

Leaflet ##### Urban Map representation

Site: http://leafletjs.com

K-Meleon ##### Browser

Site: http://kmeleonbrowser.org/

Run the program and wait until the "**Warming Up Engines**" is over. Then the Model Tab will open with the VRP model options.

Figure-01: Model Tab

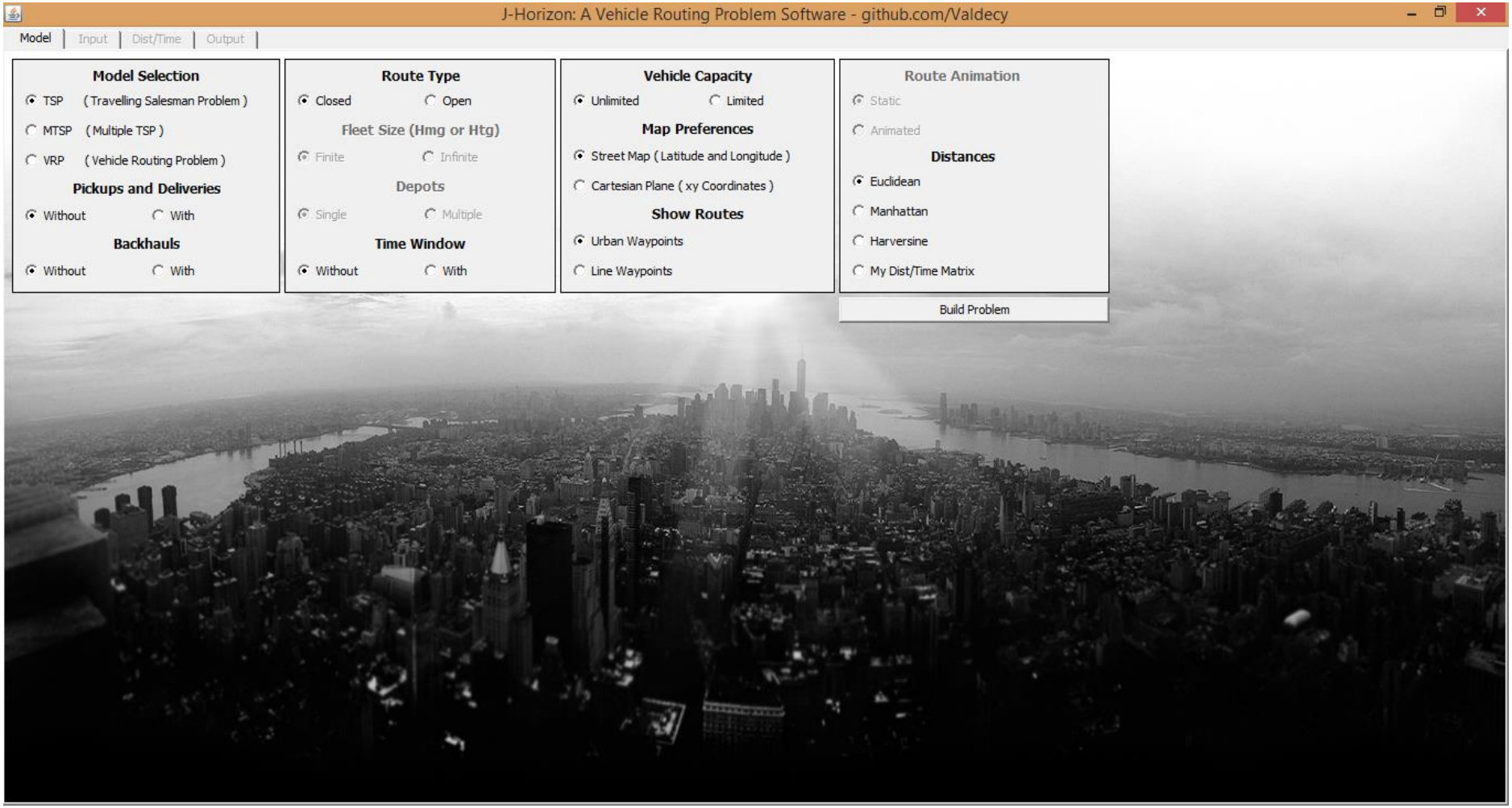
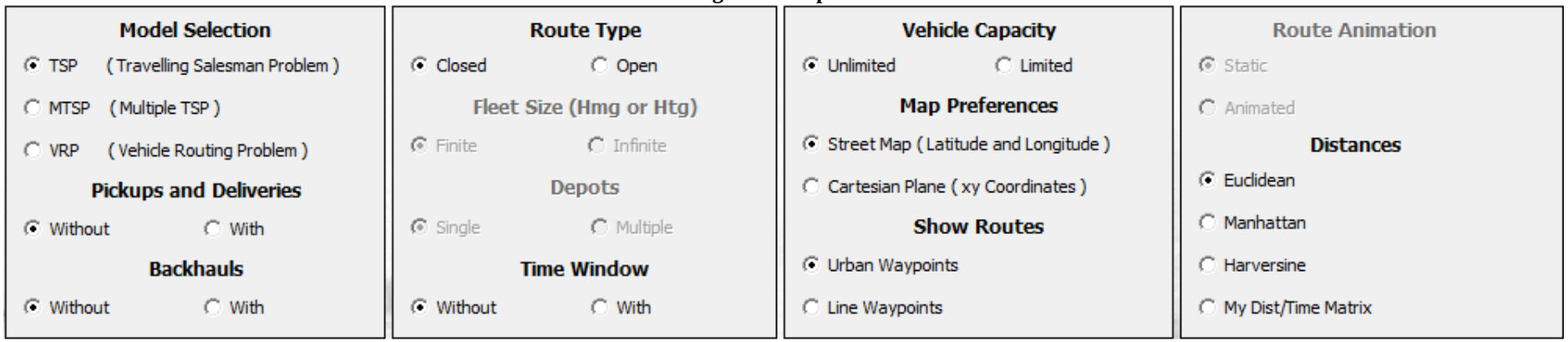


Figure-02: Options



Model Selection

- TSP – Setup the Travelling Salesman Problem
- MTSP – Setup the Multiple Travelling Salesman Problem
- VRP – Setup the Vehicle Routing Problem

Pickups and Deliveries

- Without – Pickups and Deliveries are not allowed
- With – Pickups and Deliveries are allowed

Backhauls

- Without – Pickups and Deliveries can be served in any order
- With – All Deliveries are served first

Route Type

- Closed – The vehicles start and finish the route in the same location
- Open – The vehicles start and finish the route in the different location

Fleet Size (Homogeneous or Heterogeneous)

- Finite – The number of vehicles is finite
- Infinite – The number of vehicles is infinite

Depots

- Single – There is only one depot (vehicles start location)
- Multiple – More than one depot can be set (vehicles start locations)

Time Windows

- Without – Time Windows are not allowed
- With – Time Windows are allowed (for vehicles and jobs)

Vehicle Capacity

- Unlimited – Vehicles may carry any quantity of products
- Limited – Vehicles may carry a limited quantity of products

Map Preferences

- Street Map – A map will display the locations and routes (Internet connection is required)
- Cartesian Plane – A chart will display the locations and routes

Show Routes

- Urban Waypoints – Urban routes will be used the show the solution (Internet connection is required and about 300 points can be displayed)
- Line Waypoints – A line will be used to show the solution

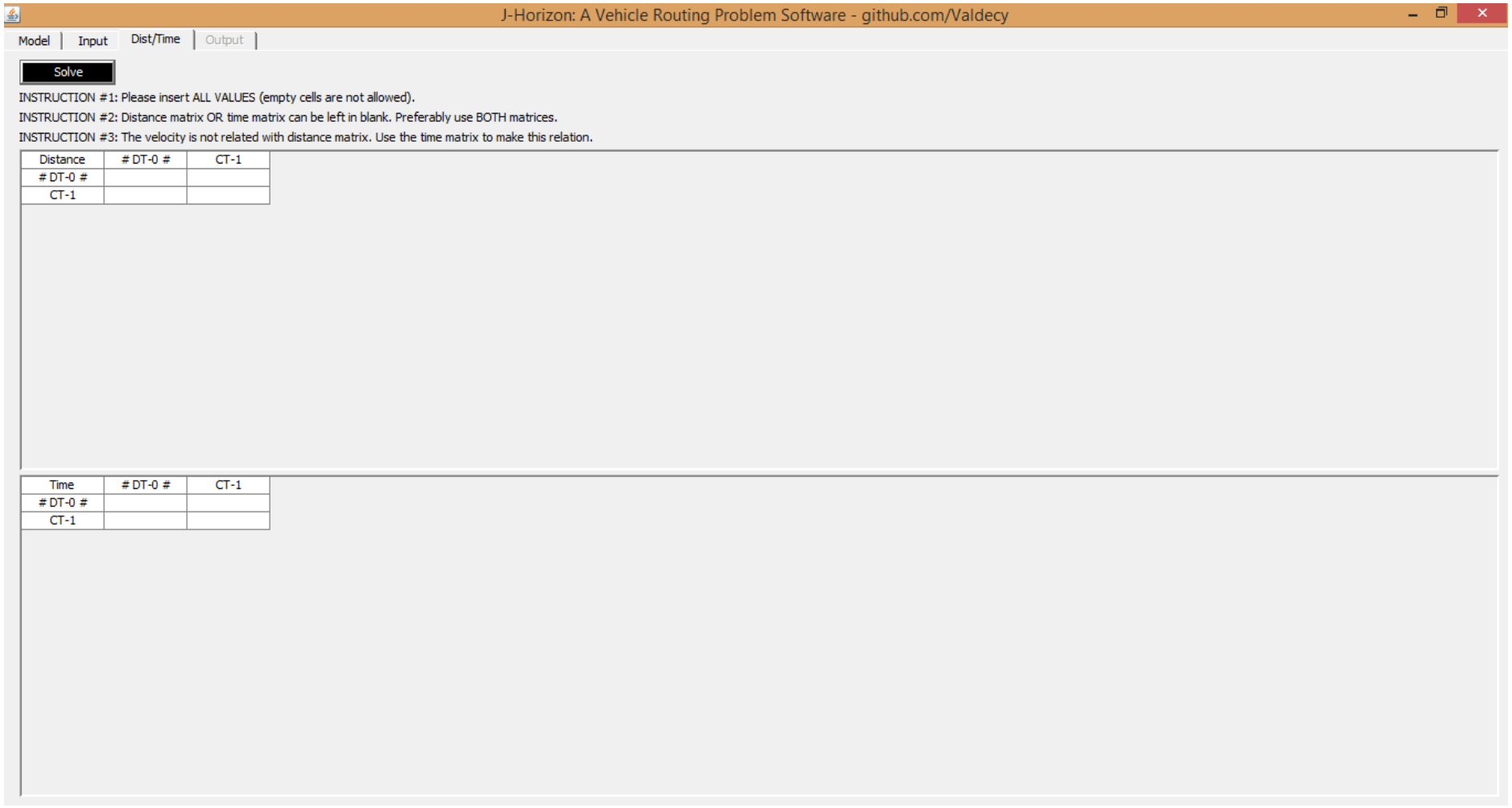
Route Animation

- Static – Routes are static
- Animated – Routes will be animated

Distances

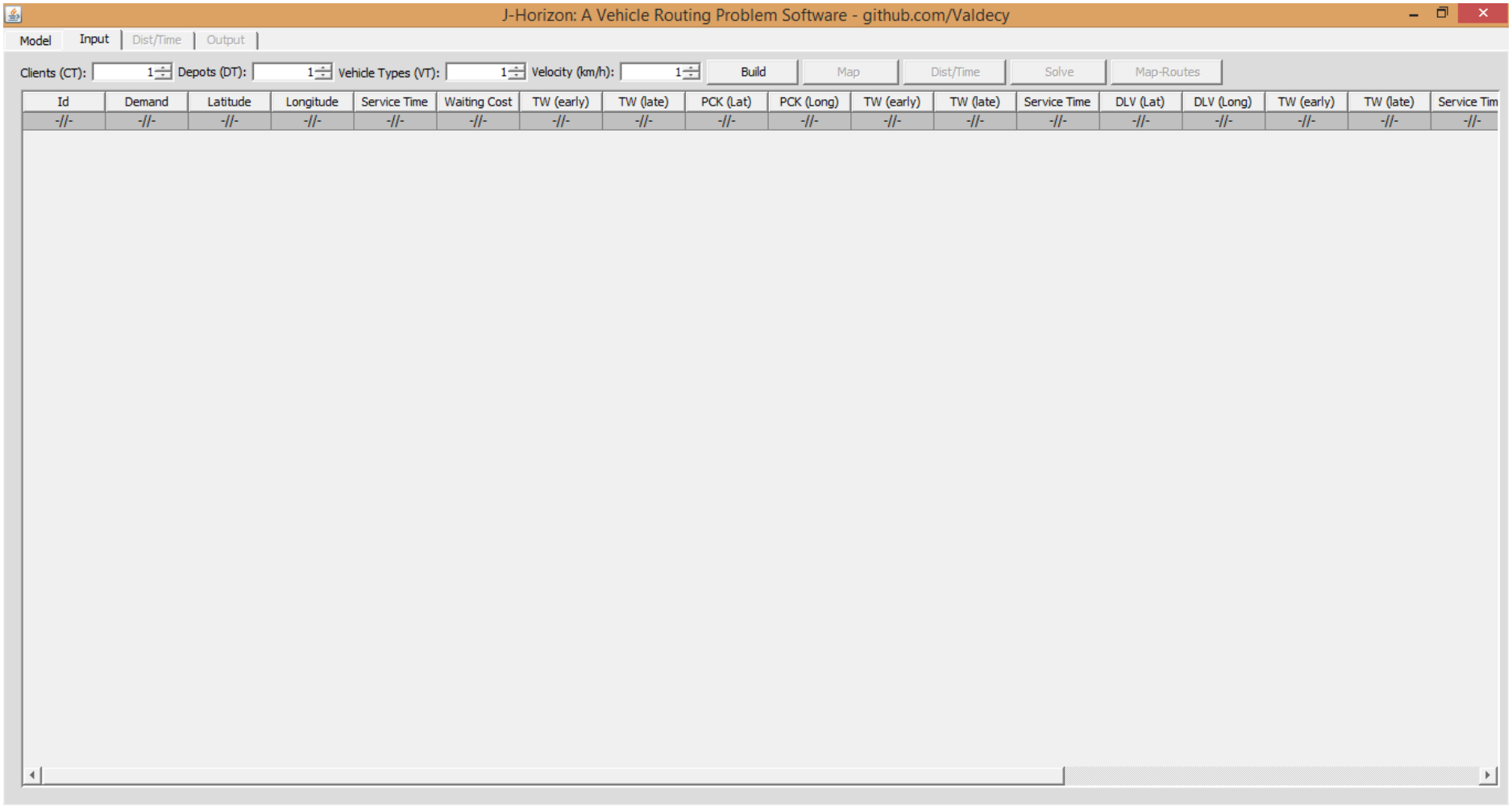
- Euclidean – The distance matrix is calculated with Euclidean Distance
- Manhattan – The distance matrix is calculated with Euclidean Distance
- Harversine – The distance matrix is calculated with Harversine Distance
- My Dist/Time Matrix – The distance and time matrices are given by the user in the Dist/Time tab (Figure-03)

Figure-03: Dist/Time Tab



After choosing the model preferences the Input tab is open.

Figure-04: Input Tab



Clients (CT) – Set the number of clients (Jobs)

Depots (DT) – Set the number of depots (vehicles start locations)

Vehicles Types (VT) – For the value of 1 all vehicles are the same (Homogeneous fleet). For values greater than 1, vehicles have different characteristics (Heterogeneous fleet)

Velocity (km/h) – Miles per hour can also be used. Velocity is used to calculate the time matrix for the Euclidean, Manhattan and Harversine cases. For the value of 1, the distance matrix is equal the time matrix. For values greater the 1, the time matrix is obtained by dividing the distance matrix by the inserted velocity value

Build – Create the Matrix with CT, DT and VT quantities.

Map – Map the area with the latitude and longitude or xy coordinates

Dist/Time – User own distance and time matrix (Figure-03)

Solve – Solve the problem

Map Routes – Show the routes of the obtained solution

Id – CT and DT identification

Demand – CT demand

Latitude – CT and DT latitude location. If the Map Preferences: Cartesian Plane is selected this column is renamed to **x**

Longitude – CT and DT longitude location. If the Map Preferences: Cartesian Plane is selected this column is renamed to **y**

Service Time – Time spent to serve a client (Job)

Waiting Cost – Cost proportional to the time spent waiting to serve a client (Time Window case)

TW (early) – Earlier time to serve a client

TW (late) – Deadline time to serve a client

PCK (lat) – Pickup latitude location. If the Map Preferences: Cartesian Plane is selected this column is renamed to **PCK(x)**

PCK(lon) – Pickup longitude location. If the Map Preferences: Cartesian Plane is selected this column is renamed to **PCK(y)**

DLV(lat) – Delivery latitude location. If the Map Preferences: Cartesian Plane is selected this column is renamed to **DLV(x)**

DLV(lon) – Delivery longitude location. If the Map Preferences: Cartesian Plane is selected this column is renamed to **DLV(y)**

VT_x: QT – Quantity of Vehicles Type “x”

VT_x: CT – Vehicle Type “x” Capacity

VT_x: FC – Vehicle Type “x” Fixed Cost

VT_x: VC – Vehicle Type “x” Variable Cost (cost per unit of distance)

Break(early) – Earlier time of vehicle break

Break(late) – Deadline time of vehicle break

Duration – Break duration