Appendix A

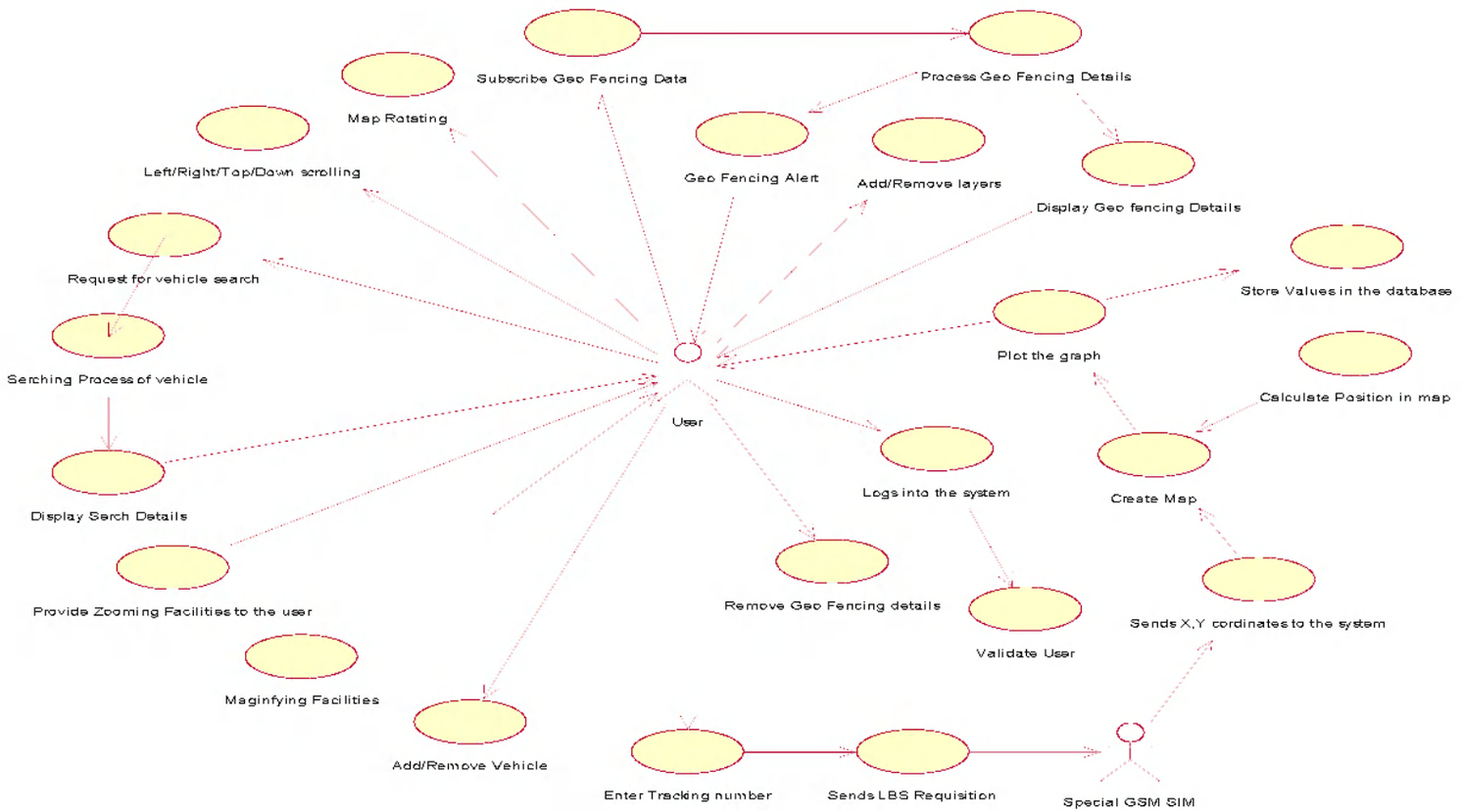
Required Java Libraries

alloy	gt2-epsg-hsql	jai_codec-1.1.3-alpha
batik-1.5.1	gt2-epsg-wkt	jai_core
batik-awt-util-1.1.1	gt2-experiment	jai_imageio-1.1-alpha
batik-bridge-1.5	gt2-export-wizzard	jai-core-1.1.3-alpha
batik-bridge-1.5.1	gt2-geomedia	jdom-1.0b10
batik-css-1.5.1	gt2-geotiff	jlfgr-1.0
batik-dom-1.5.1	gt2-gml	jsde_concurrent-9.0
batik-gvt-1.5.1	gt2-graph	jsde JTS-1.6
batik-rasterizer-1.5.1	gt2-image	junit-3.8.1
batik-svg-dom-1.5	gt2-indexed-shapefile	log4j-1.2.8
batik-svg-dom-1.5.1	gt2-legacy	mailapi-1.3
batik-svggen-1.1.1	gt2-legend	mlibwrapper_jai
batik-transcoder-1.5.1	gt2-main	mockrunner-0.2
batik-util-1.1.1	gt2-migrate	mysql-connector-java-3.0.9
batik-xml-1.5	gt2-mysql	mysql-connector-java-
batik-xml-1.5.1	gt2-oracle-spatial	3.1.11-bin
commons-cli-1.0	gt2-postgis	opengis-css-0.1
commons-collections-2.1	gt2-property	opengis-legacy-0.2
commons-jelly-tags-	gt2-sample-data	postgis-driver-1.0
velocity-20030303.205659	gt2-shapefile	postgresql-74.213
commons-jxpath-1.2	gt2-shapefile-renderer	rowset
commons-lang-2.0	gt2-svgsupport	units-0.01
db2jcc_dummy-8.2.1	gt2-tiger	vecmath-1.3
dom4j	gt2-utils	velocity-1.3
dummy_spatial-8.1.8	gt2-validation	wkb4j-1.0-RC1
geoapi-2.0	gt2-view	xalan-2.5.1
gt2-arcgrid	gt2-vpf	XDO-beta_jpe_sdk-9.0
gt2-arcsde	gt2-wfs	
gt2-db2	gt2-wms	
gt2-dir_ds	hsqldb-1.8.0.1	
gt2-epsg-access	jai_codec	

Table 2: List of Java Libraries

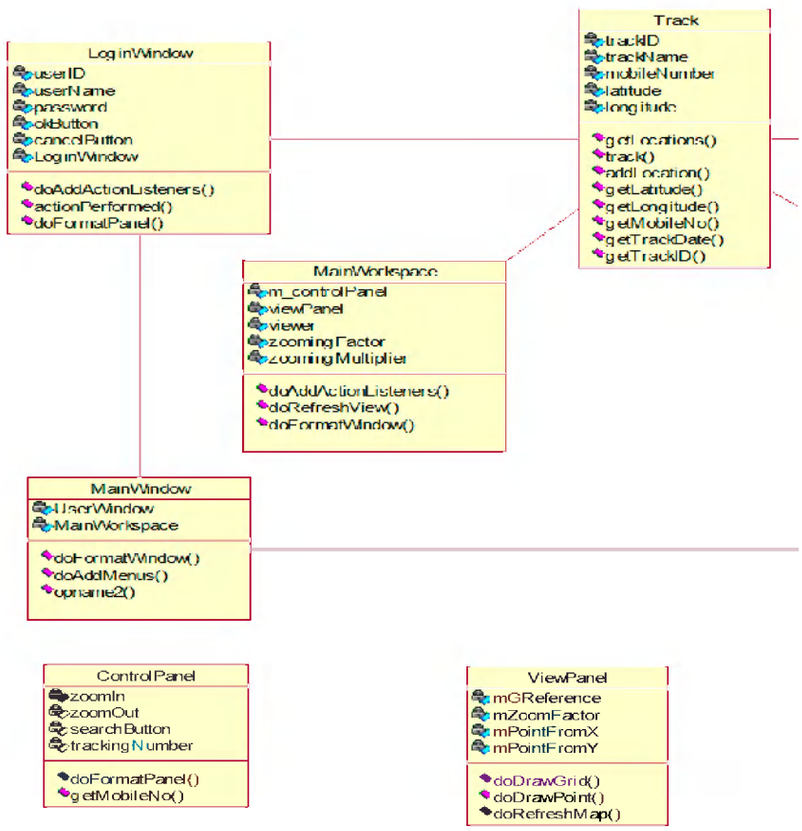
Appendix B-a

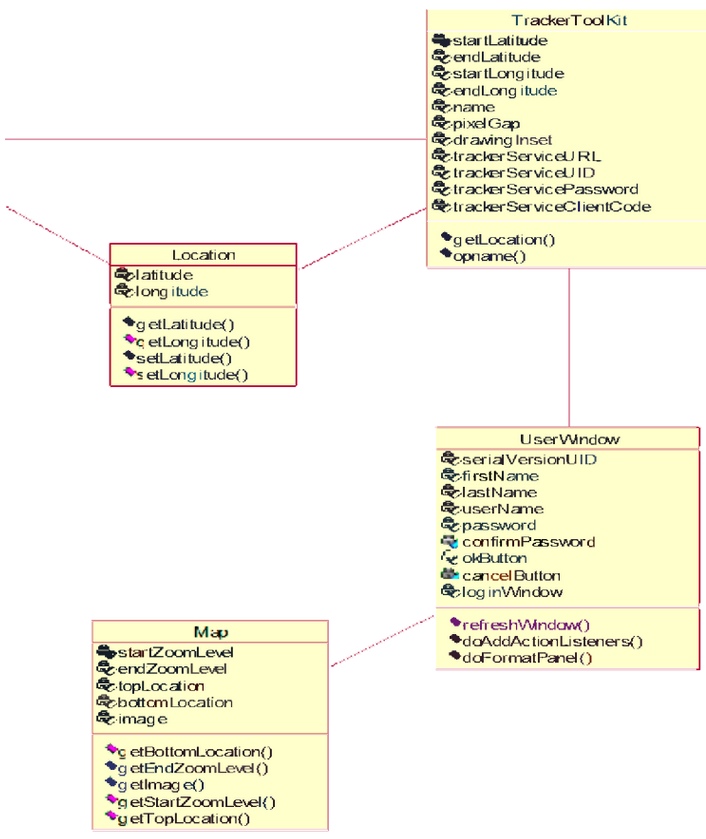
Main Use Case Diagram



Appendix B-b

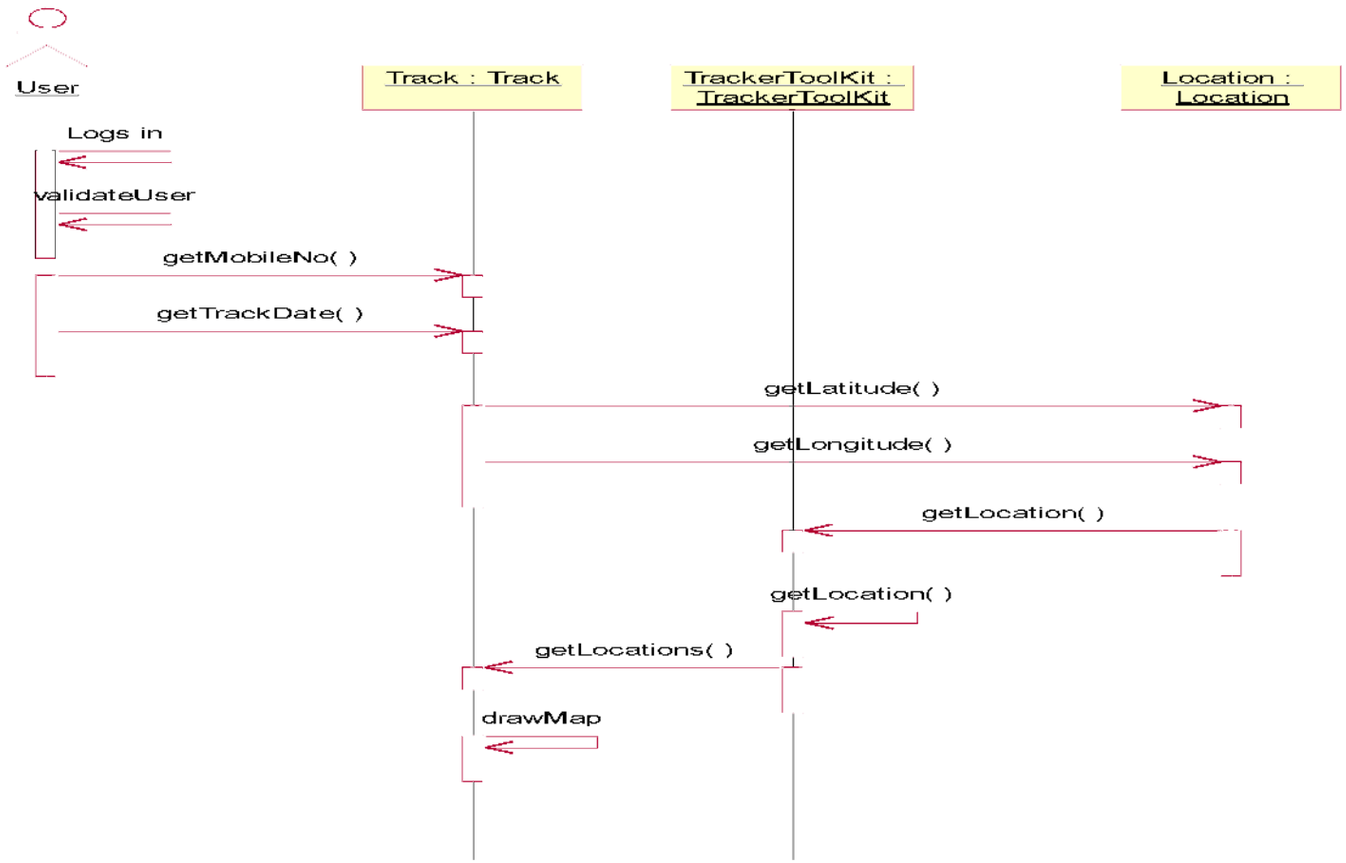
Class Diagram




TrackerToolKit
startLatitude
endLatitude
startLongitude
endLongitude
name
pixelGap
drawingInset
trackerServiceURL
trackerServiceUID
trackerServicePassword
trackerServiceClientCode
getLocation()
opname()
Location
latitude
longitude
getLatitude()
getLongitude()
setLatitude()
setLongitude()
UserWindow
serialVersionUID
firstName
lastName
userName
password
confirmPassword
okButton
cancelButton
loginWindow
refreshWindow()
doAddActionListeners()
doFormatPanel()
Map
startZoomLevel
endZoomLevel
topLocation
bottomLocation
image
getBottomLocation()
getEndZoomLevel()
getImage()
getStartZoomLevel()
getTopLocation()

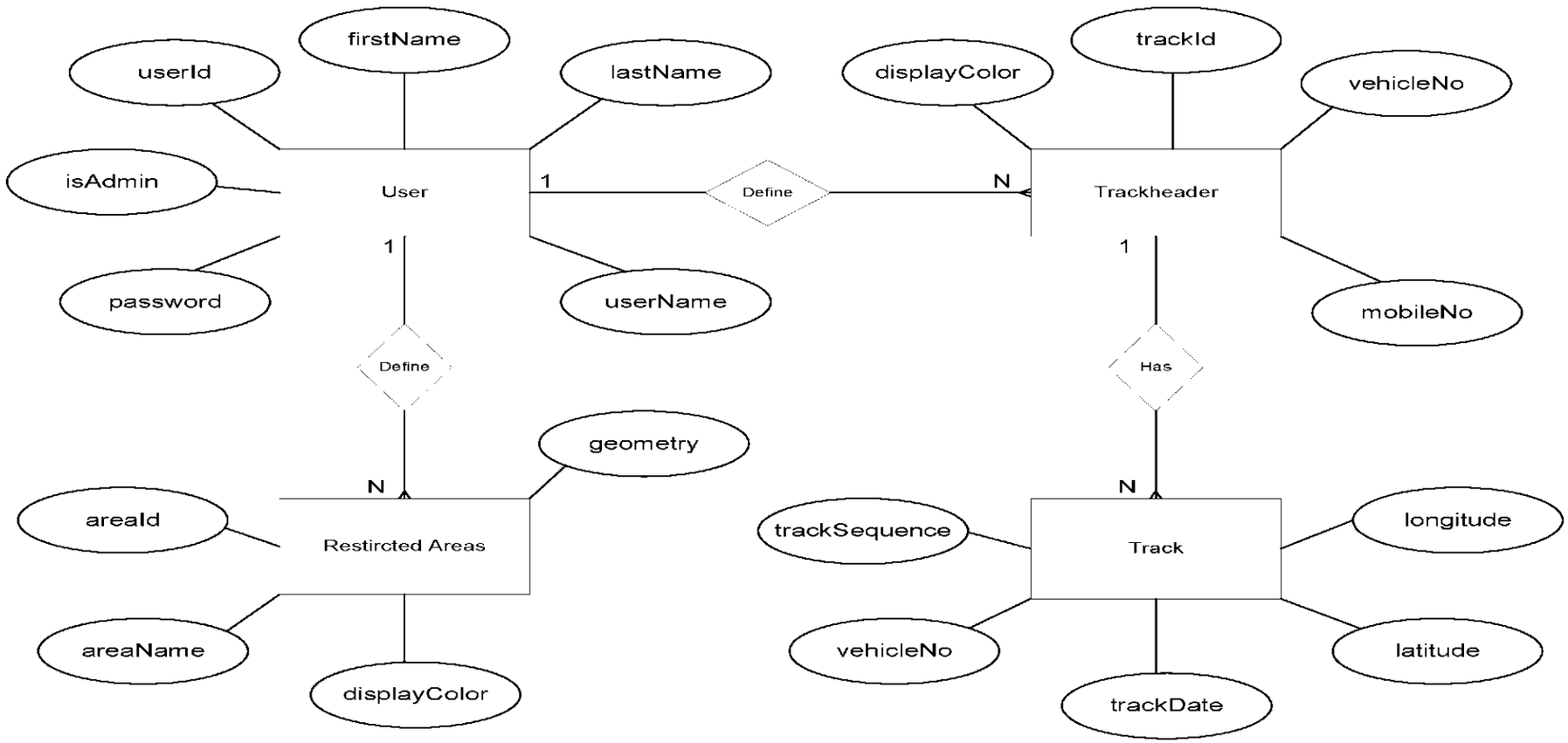
Appendix B-c

Sequence Diagram



Appendix C-a

ER-Diagram



Appendix C-b

Database Table Structures

Table restrictedarea

Field	Type	Null	Key	Default	Extra
areaId	int(11)	NO	PRI	NULL	auto_increment
areaName	varchar(100)	NO			
geometry	varchar(1000)	NO			
displayColor	int(11)	NO			

Table track

Field	Type	Null	Key	Default	Extra
trackSequence	int(11)	NO	PRI	NULL	auto_increment
vehicleNo	varchar(100)	NO			
trackDate	datetime	YES		NULL	
latitude	varchar(100)	NO			
longitude	varchar(100)	NO			

Table trackheader

Field	Type	Null	Key	Default	Extra
trackId	int(11)	NO	PRI	NULL	auto_increment
vehicleNo	varchar(100)	NO			
mobileNo	varchar(100)	NO			
displayColor	int(11)	NO			

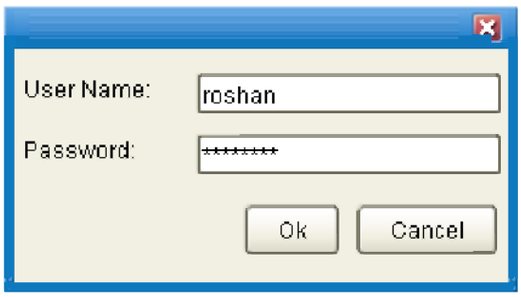
Table user

Field	Type	Null	Key	Default	Extra
userId	int(11)	NO	PRI	NULL	auto_increment
firstName	varchar(100)	NO			
lastName	varchar(100)	NO			
userName	varchar(100)	NO			
password	varchar(100)	NO			
isAdmin	varchar(1)	NO			

Appendix D

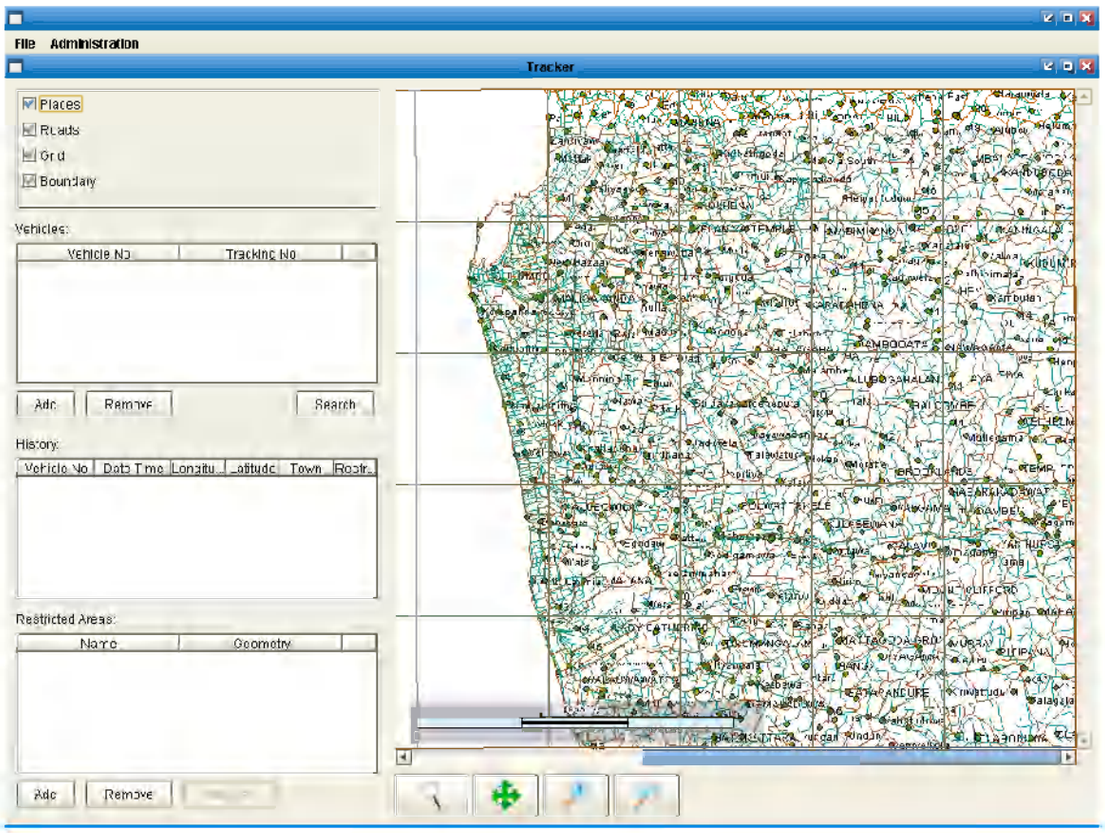
Vehicle Tracking System

Following is the initial login window for authentication. It is required tracking user to enter his/her valid username and password before going into the next screen.

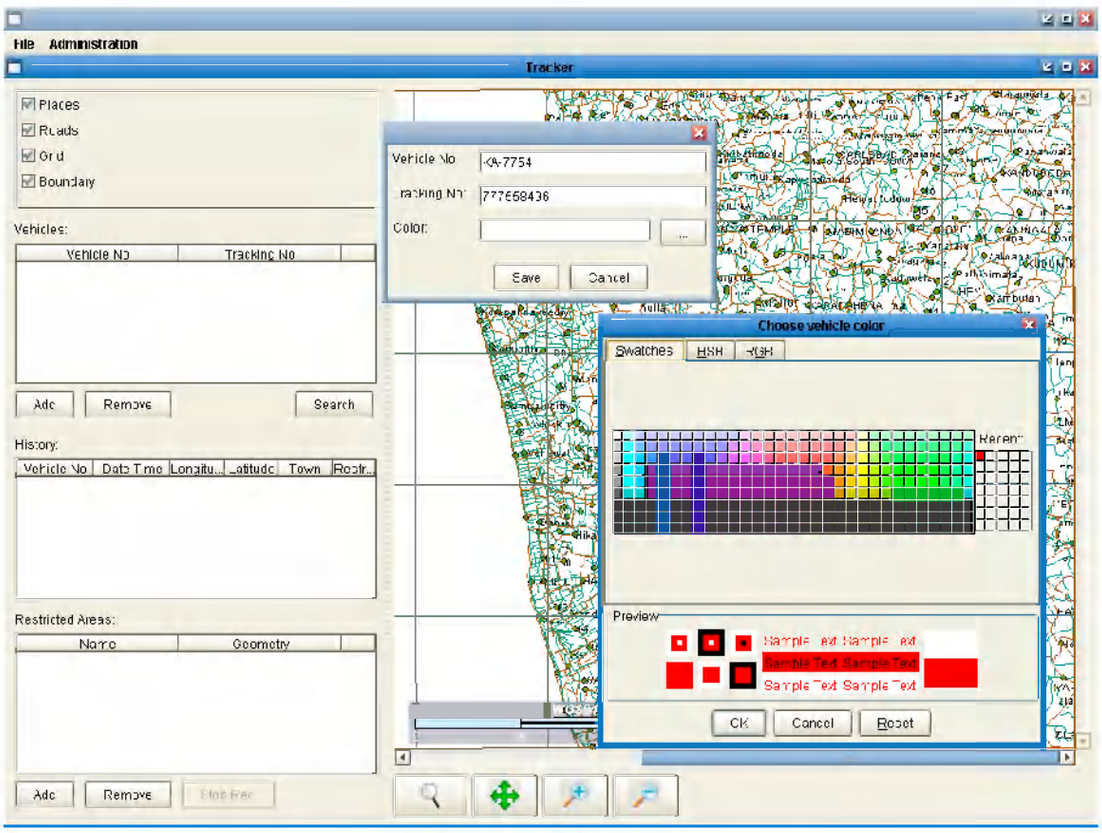


Screen-1 shows the main window of the vehicle tracking system. Basically it has two major parts on it. Control panel pane and the map pane are the two of them. It has all the controls which give you all the features on the left hand side of the window. Tracking user can add/remove map layers using check boxes. Tracking user can add/remove tracking vehicle into the system and geo areas as well.

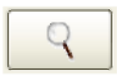
Screen-1



Screen-2



In the screen-2 it shows how to add a tracking vehicle into the system which is to be tracked by the system. The valid tracking user is given this facility. User can enter vehicle number, tracking number (mobile number assigned to the car unit) and he/she can introduce a color code to that particular vehicle, for easy identifying it on the map pane. The tracking user can add any number of tracking vehicles into the system using this method. He/she can also remove tracking vehicles from the system which has been already added in to the system. Followings are some control icons used in the control panel.



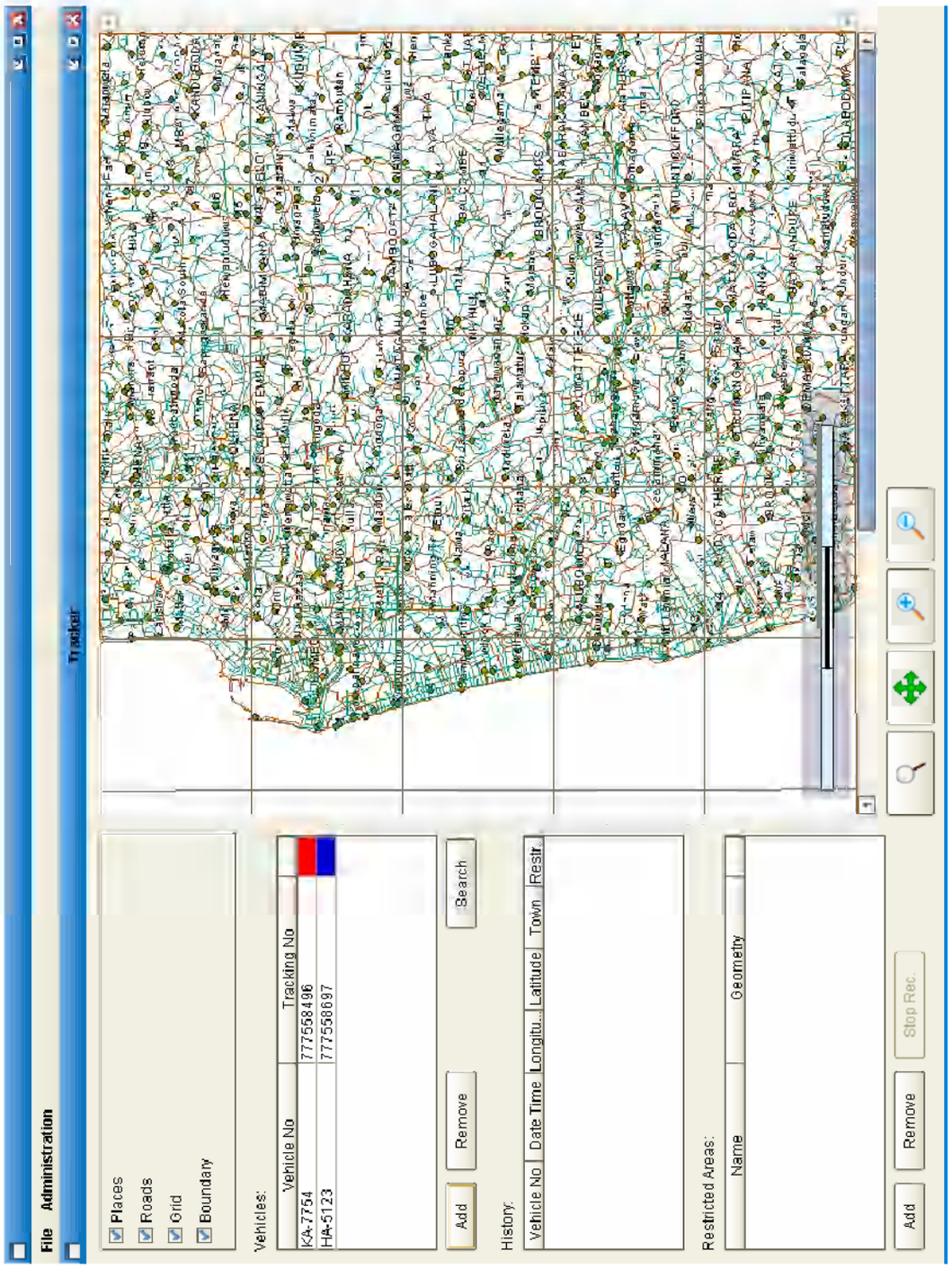
Zooming Magnifier

Reset map pane

Zoom In

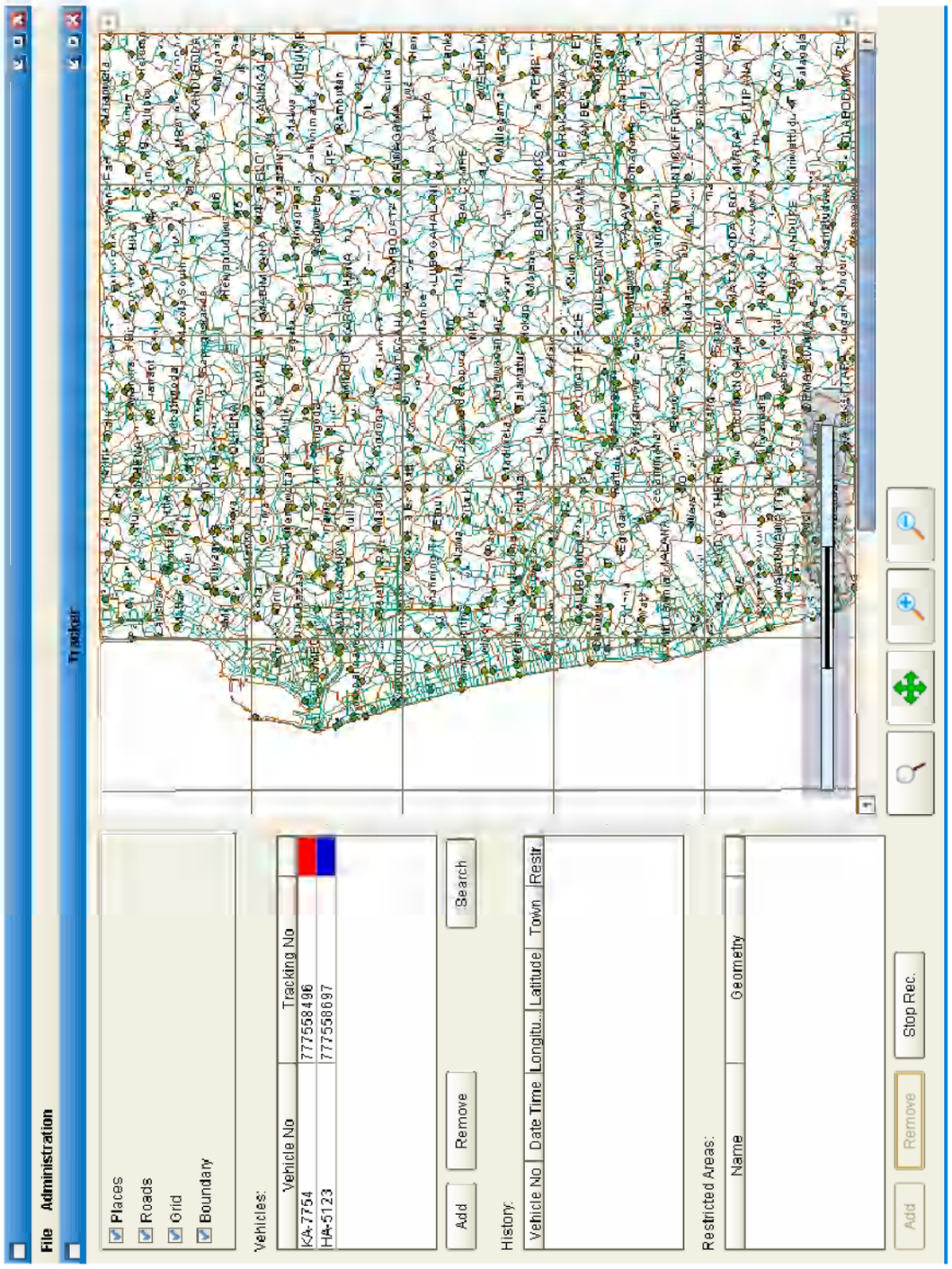
Zoom Out

Screen-3



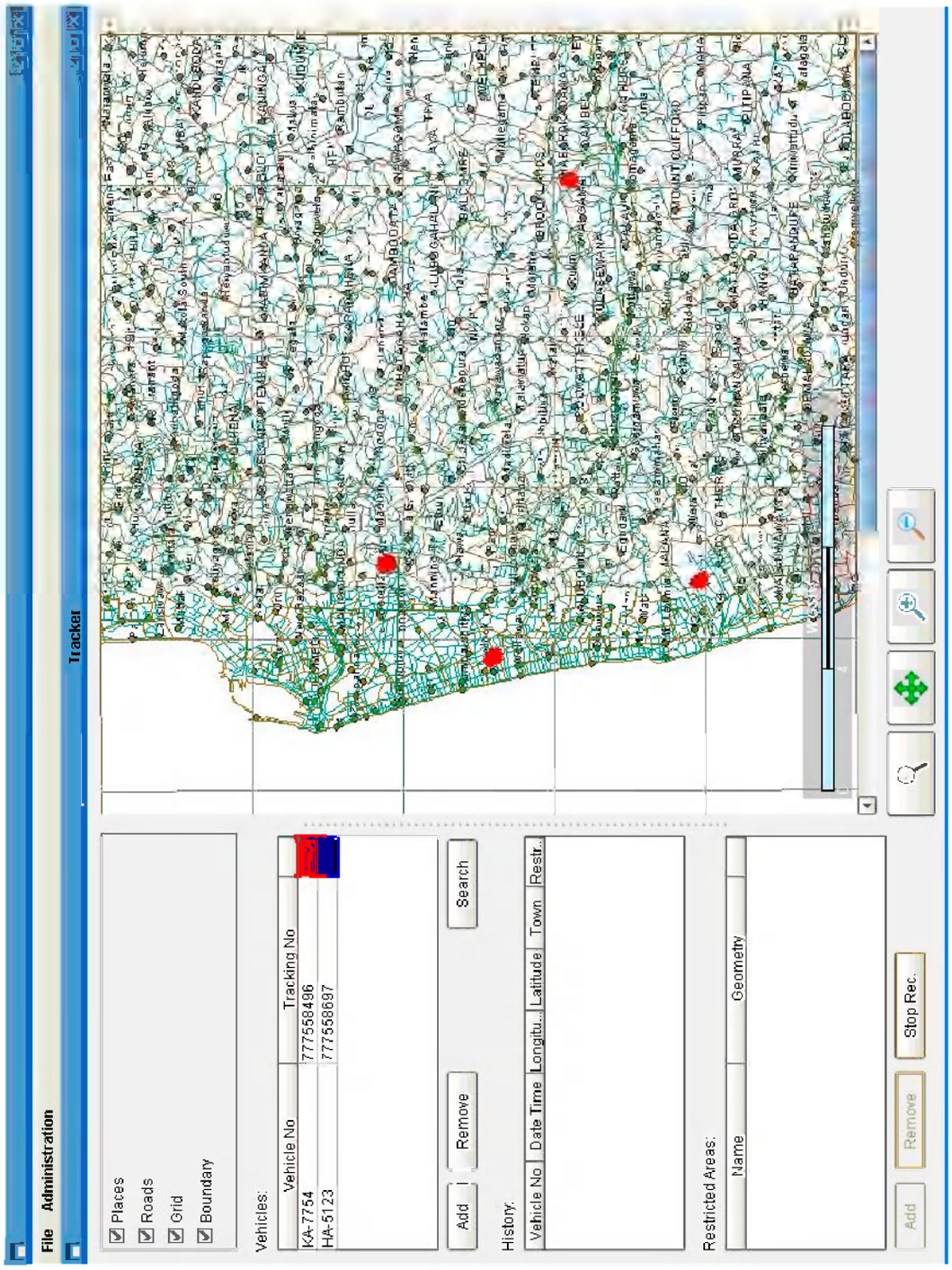
In the screen-3 it shows there are two tracking vehicles have been added to the system, which is to be tracked. Tracking numbers (MSISDNs) of those two vehicles are 777558496 and 777558497 respectively. One is in red color and other in blue. Now tracking user can press “Search” button for tracking of those two vehicles.

Screen-4



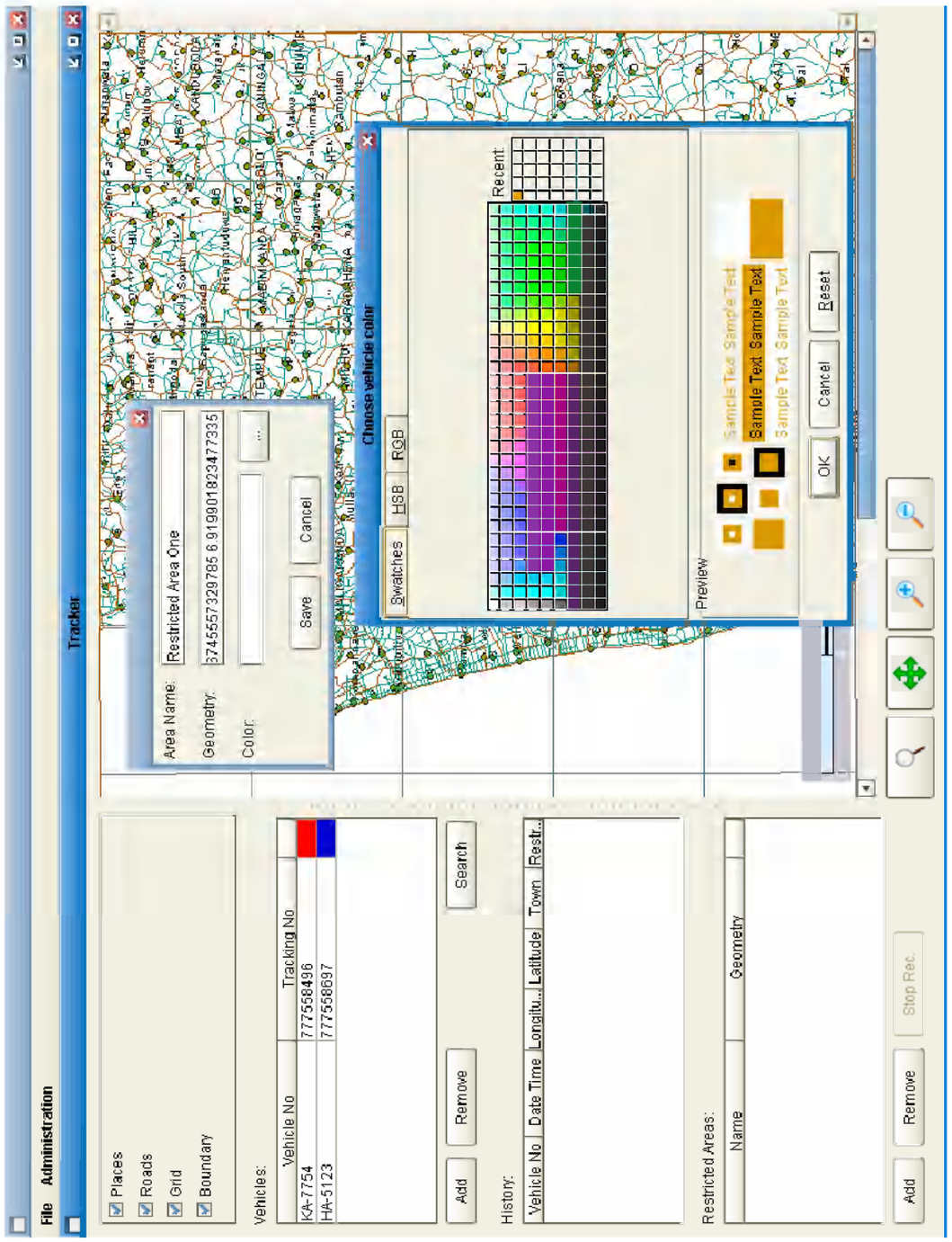
Tracking user can introduce GEO areas (Restricted areas) into the system. He/she can press "Add" button in "Restricted Areas" in order to record a new geo area. Once he/she clicks on the add button then a restricted polygon can be marked on the map by clicking (at least 3 points) on the map. Then user may stop recoding of the geo polygon.

Screen-5



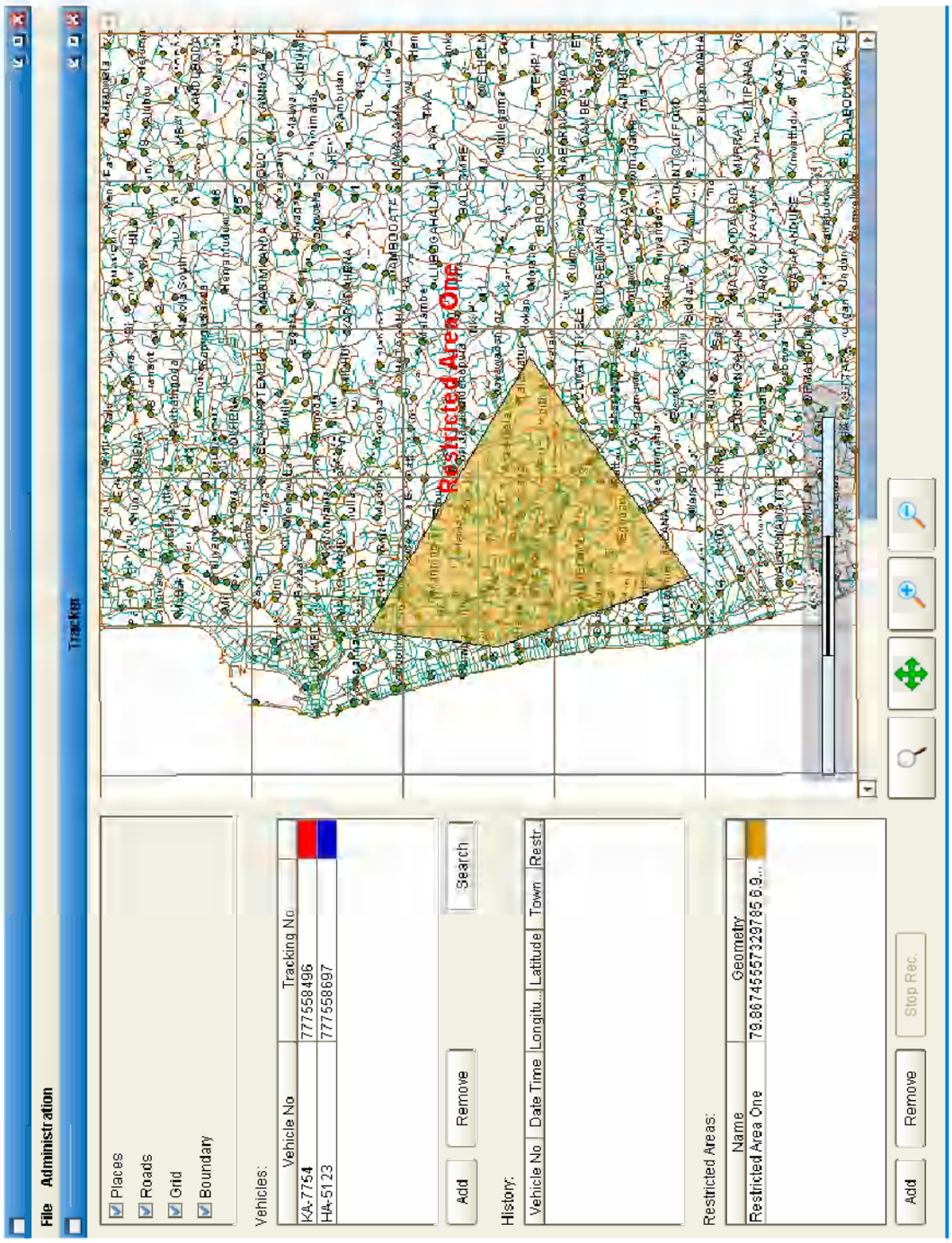
Screen-5 shows that tracking user has marked a polygon specifying four points. Then he must stop recording by pressing on the button named "Stop Rec" in the control panel.

Screen-6



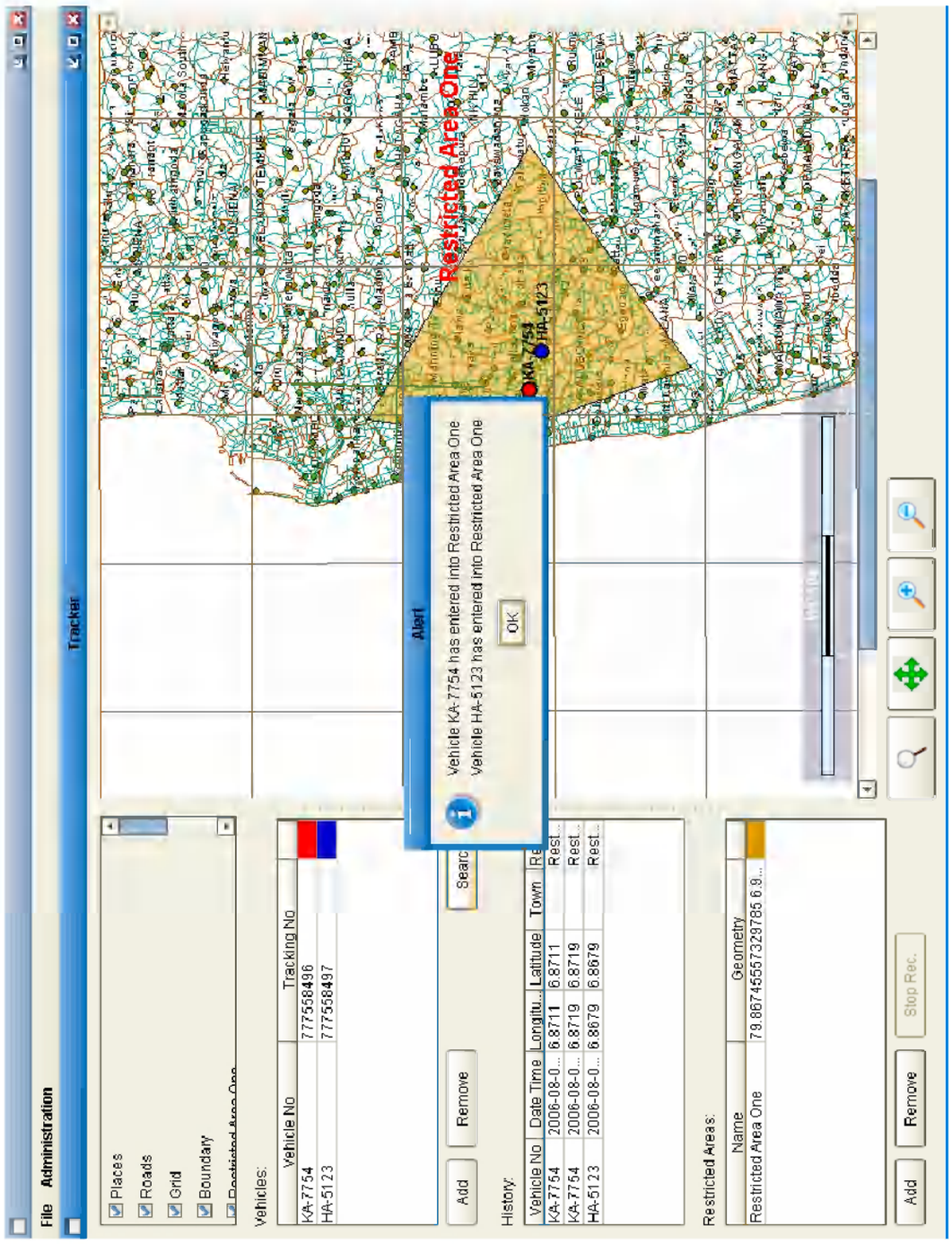
Screen-6 shows that the tracking user can give a name to this restricted area and system has automatically detected all the geometry values on the polygon which was recently marked. Then tracking user can introduce a preferred color for this restricted area.

Screen-7



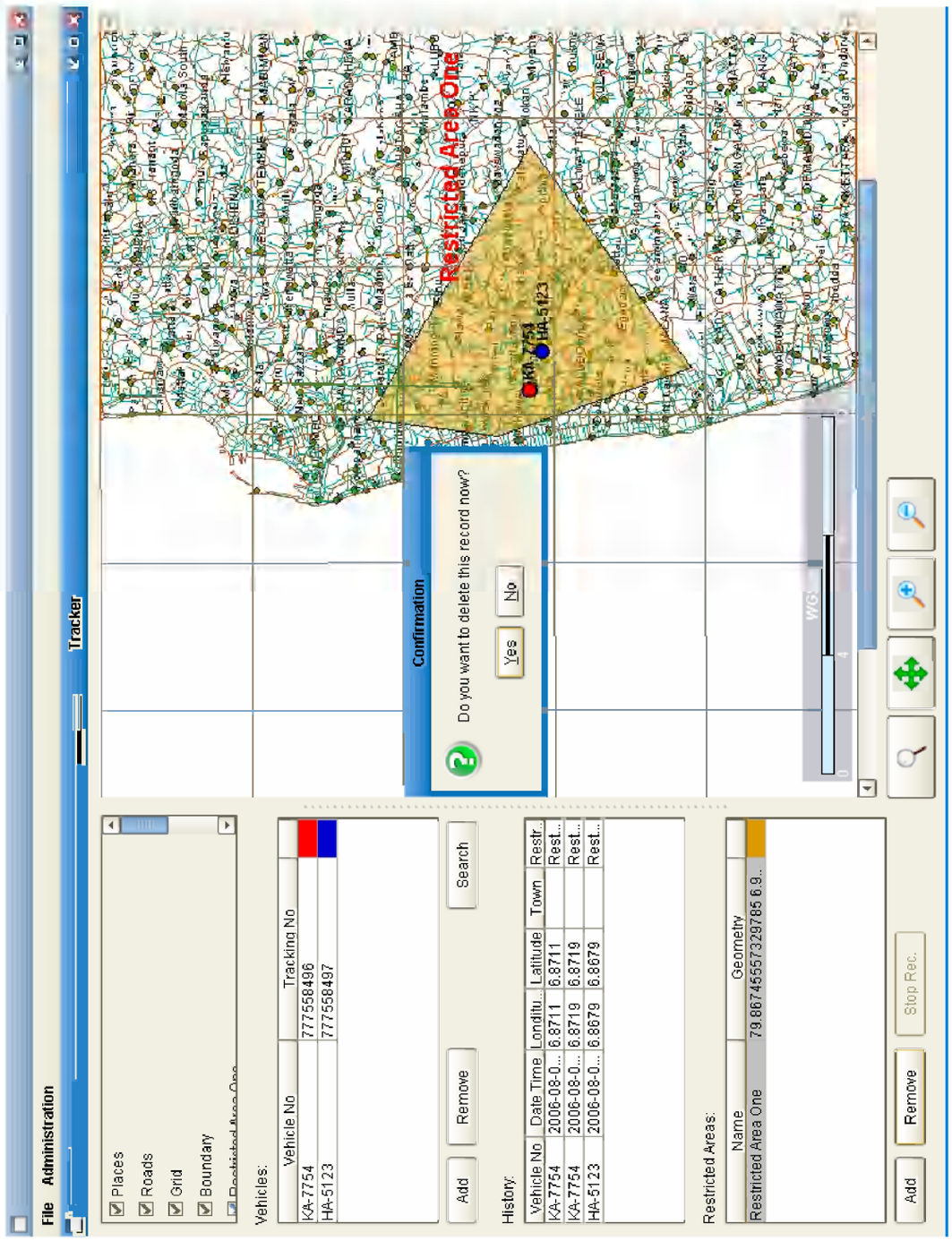
Screen-7 shows that one restricted area is created on the map. It also shows on the control panel. The tracking user may able to specify any number of restricted areas on the map. When a particular vehicle enters into one of those areas, the system will notify it to the tracking user by popping up a message window. The tracking user can remove those restricted areas at anytime from the system.

Screen-8



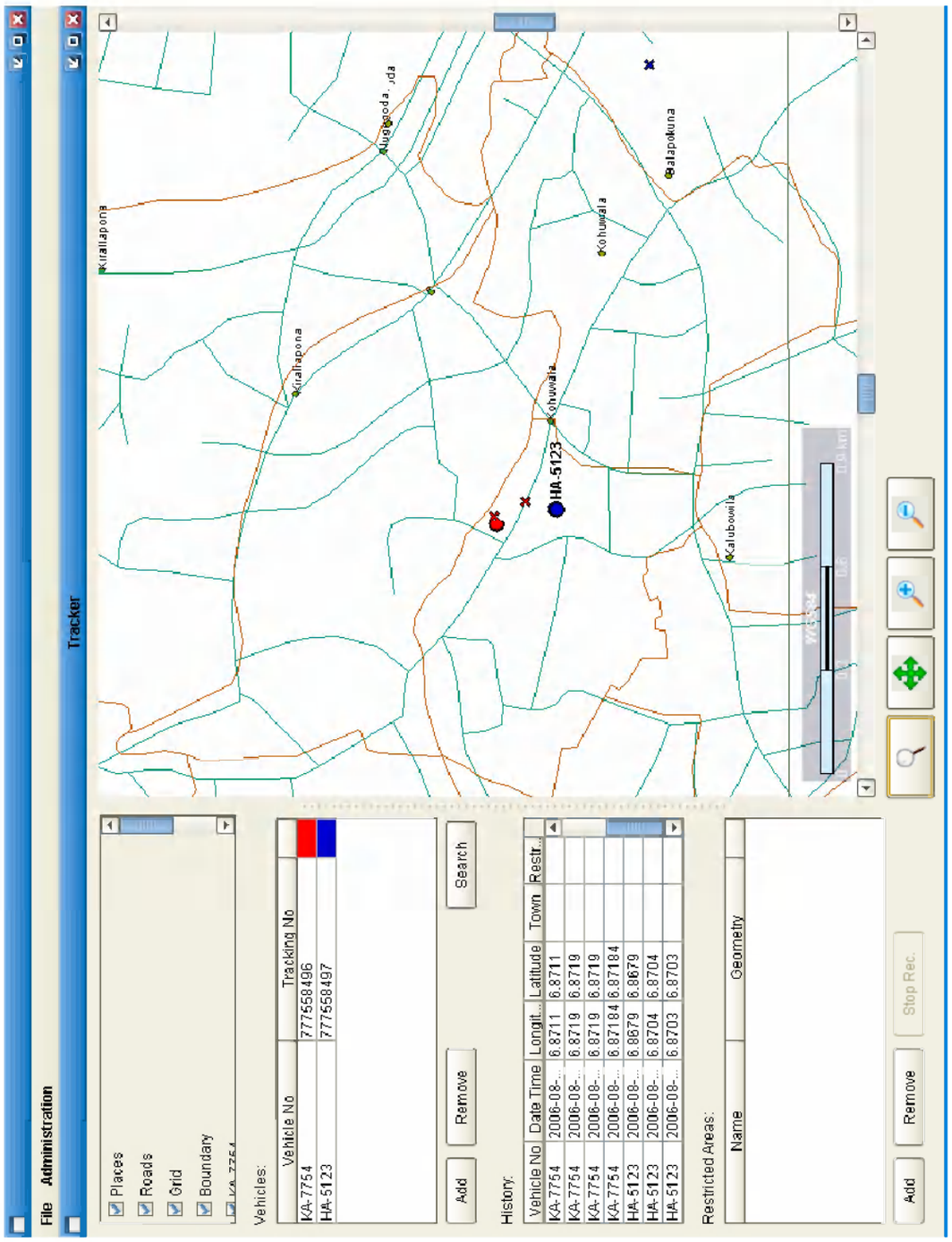
Here screen 8 shows that both vehicles reg. numbers KA-7754 and HA-5123 have entered into the "Restricted Area One" and the system gives an alert to the system user with the detail.

Screen-9



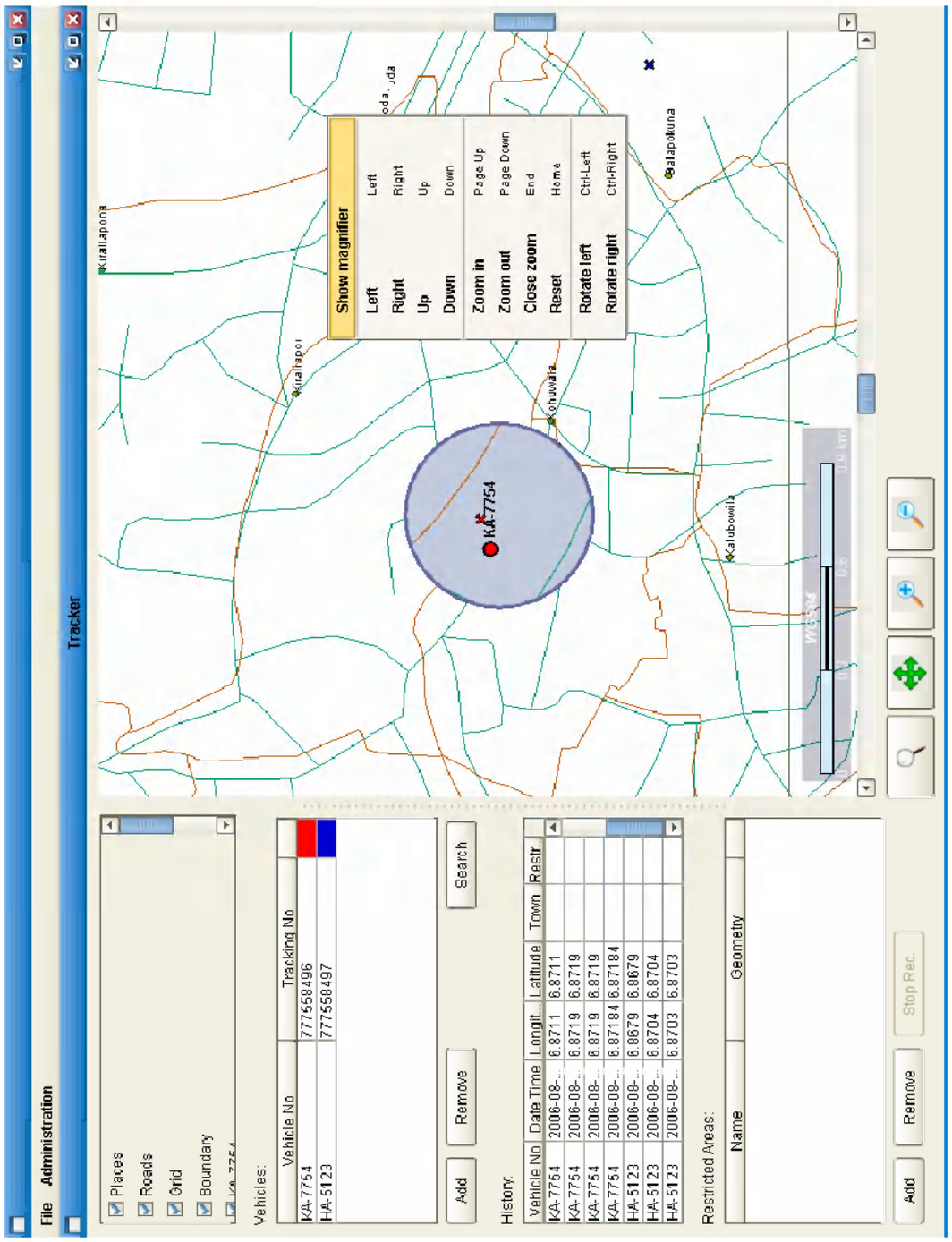
Here, the system user is going to delete particular restricted area from the map pane.

Screen-10



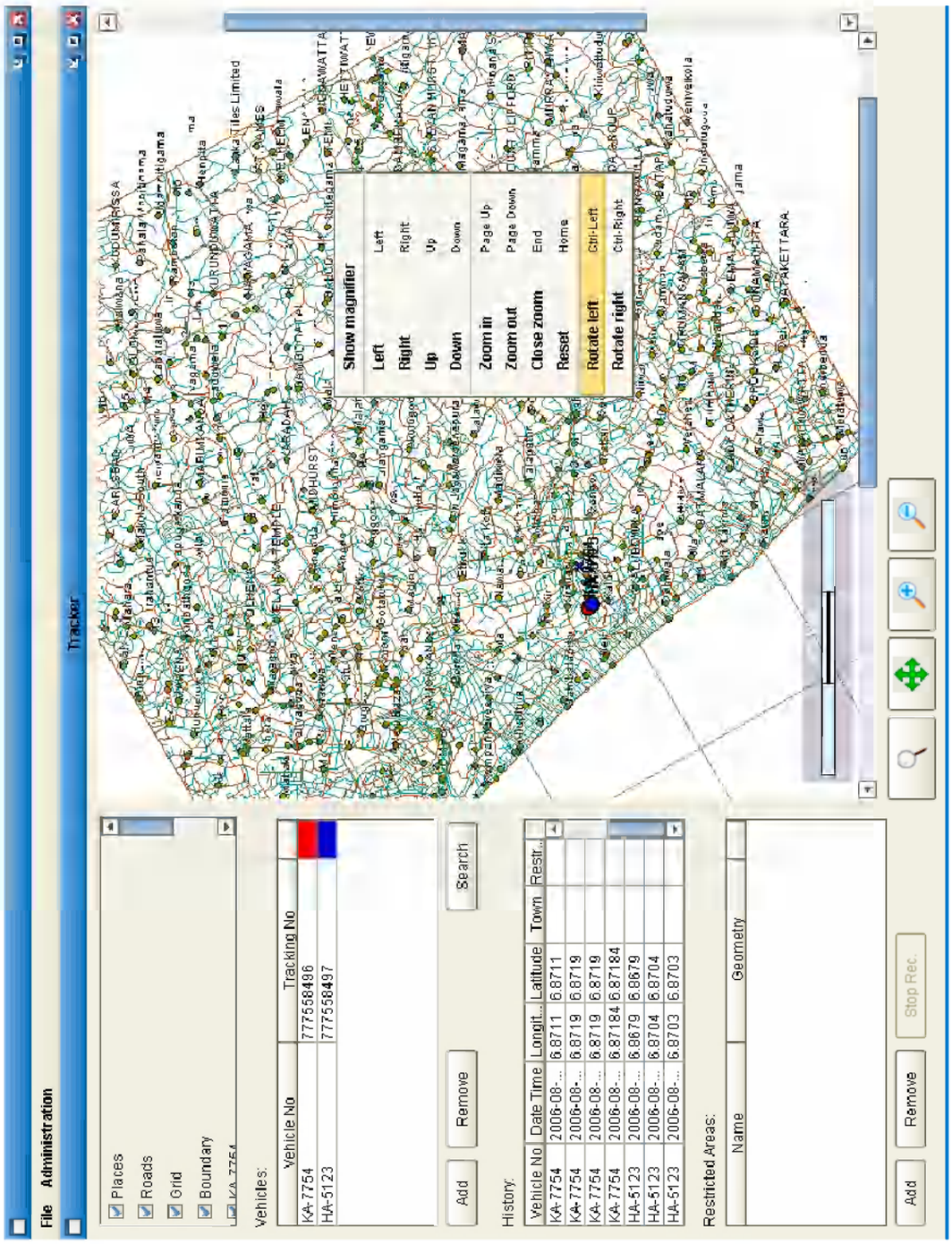
Screen-10 shows that, the system user (tracking user) has performed a search for two vehicles and he has got the reply on the map. According to the results appeared, both tracking vehicles can be found nearby ***Kohuwala Town***.

Screen-11



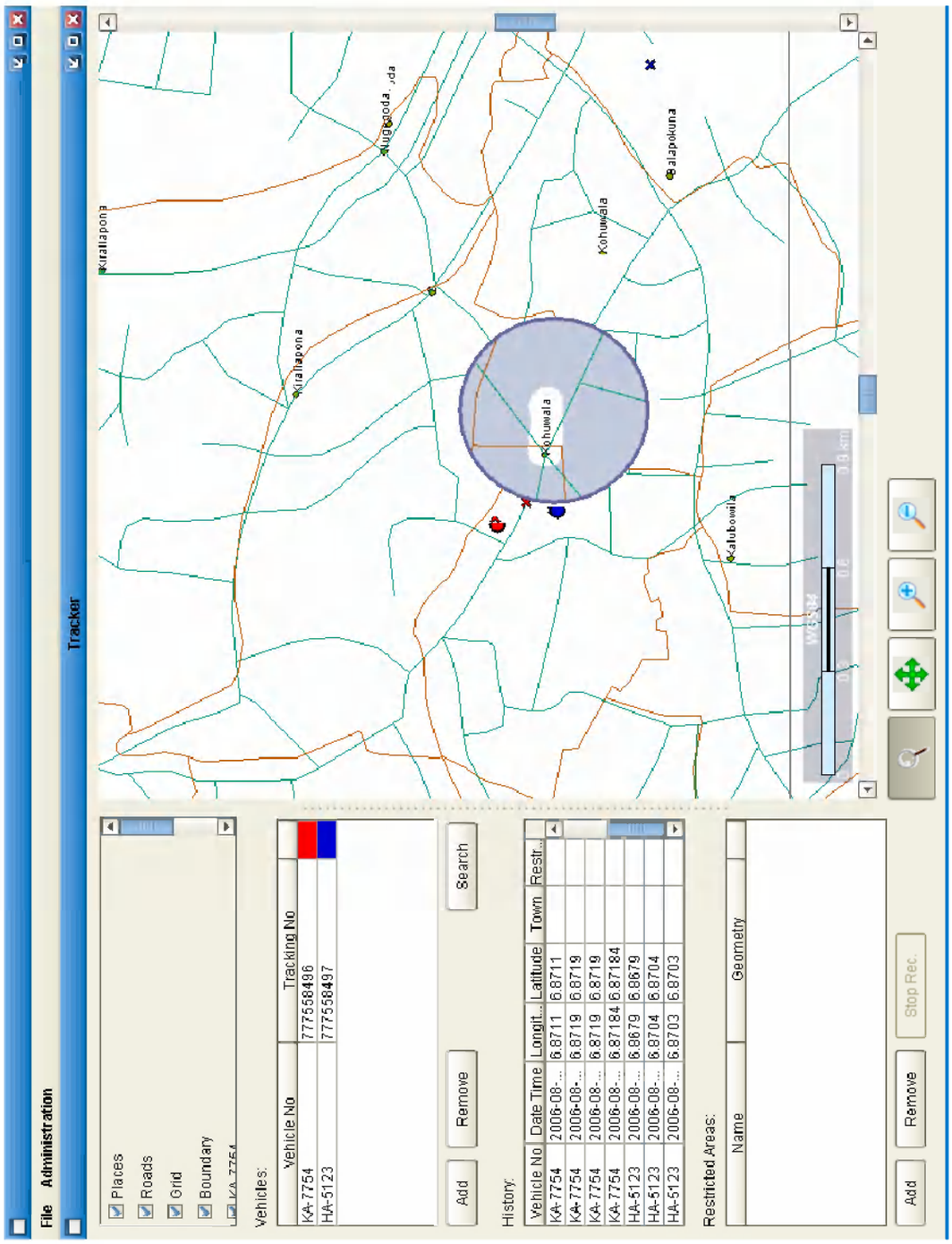
Screen-11 is to elaborate some useful features available with the system. There are series of features implemented with the right mouse click on the map. It shows that, the magnifying glass is in operation on the map.

Screen-12



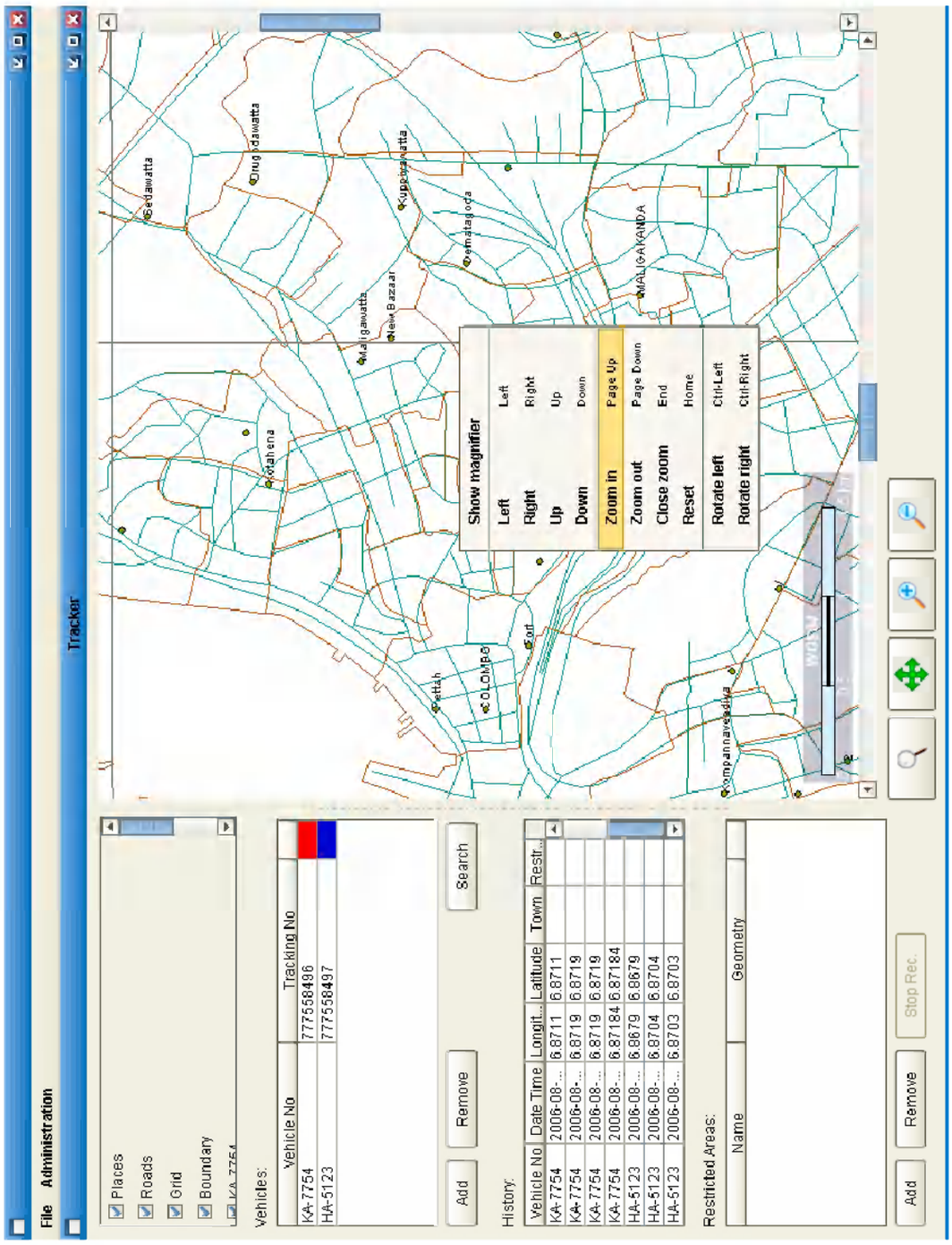
Features such as rotate map on to the left and the right side are also available with the system. Screen-12 shows that the base map has been rotated on to the left side.

Screen-13



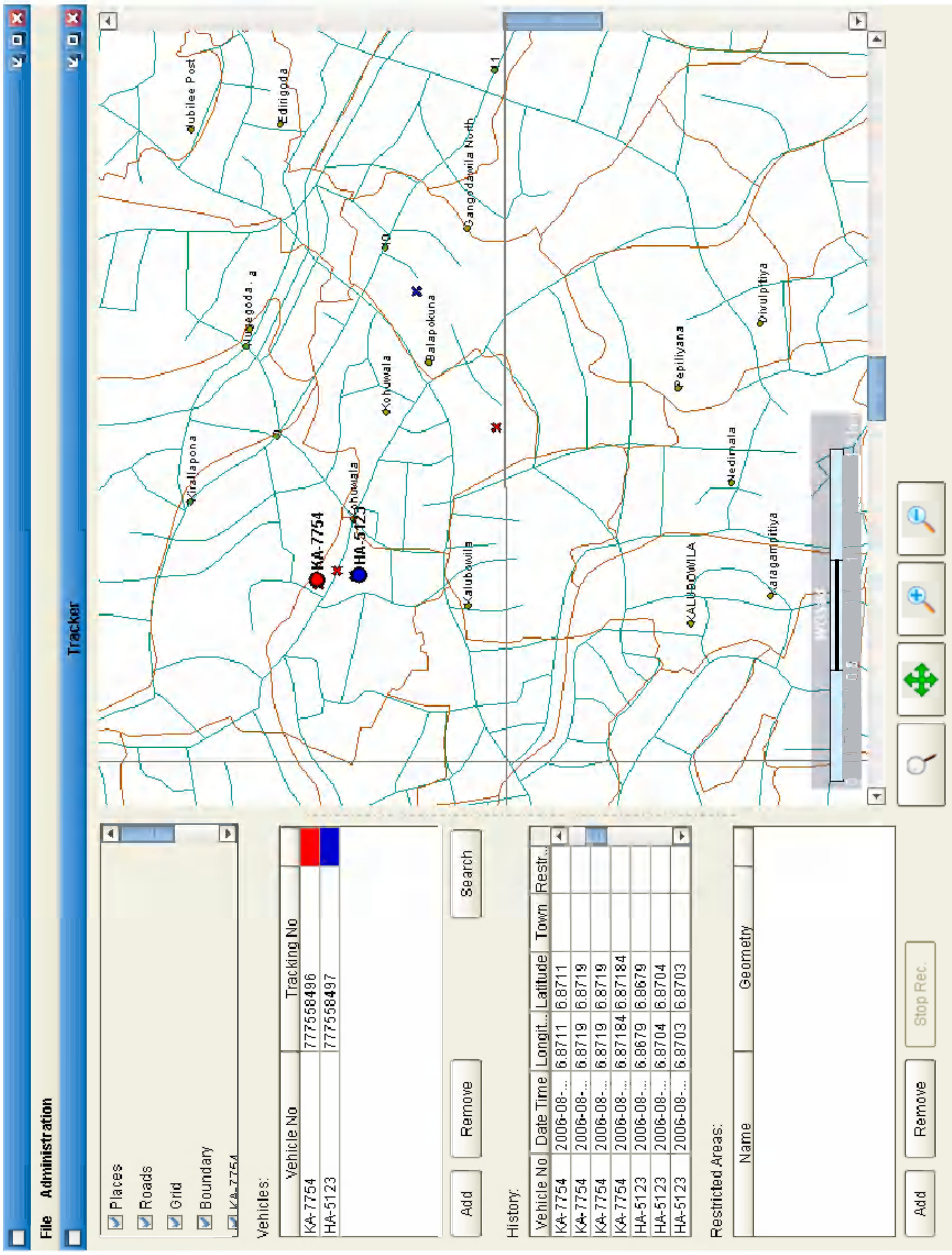
Screen-13 shows that, the magnifying glass is in function on the base map.

Screen-14



Some features which on the control panel are also available with the right mouse click. eg : Zoom in / Zoom out, Reset, Magnifying glass etc.

<u>Screen-15</u>



Screen-15 depicts a very closer view of both tracking vehicles on the map. It also shows the history of tracking details for both vehicles on the left hand side on the control panel. That includes tracking Date and Time, Longitude and Latitude.

Appendix E

Field Evaluation form - Vehicle Tracking System

Field Evaluation Form

Evaluator: _____
Testers: _____

This form is to be used by each evaluator. One form will be filled out for each case tested by the evaluator. Please attach additional pages for comments if needed.

Test Case: _____
Test Case Identifier: _____
Test Case Name: _____
Testing Date: _____

Test	Type Rating	Rating	Comments
Integration	Pass = 5 Fail = 0		
Usability	0 = worst to 5 = best		
System	Pass = 5 Fail = 0		
Interoperability	Pass = 5 Fail = 0		
Integrity	Pass = 5 Fail = 0		
Performance	0 = worst to 5 = best		
Reliability Availability	0 = worst to 5 = best		

Summary of comments and overview of testing:

Appendix F

Test Cases #1

Test Case #1	Test Consistency and Integration with LBS and correctness of GPS positioning information.
Test Identifier	A
Test Case Name	LBS integration
Objective	To determine Vehicle tracking system can collect positioning information from the location based service (LBS) consistently and accurate enough to be used in vehicle tracking in the field under various conditions.
Test Scenario (conditions/setup)	Field test the positioning information collection capabilities under the following conditions: 1) Steep hillside slope 2) Near buildings and structures 3) Heavy drizzling conditions.
Input data requirement	Use default tracking layer shape files to record tracking data collection.
Process steps	For each of the various test conditions: 1) Start the program and load project file 2) Check the setup 3) Acquire GPS information 4) Drive a minimum of 1000 meters making periodic stops while the data is being collected. 5) Record observations on evaluation form. 6) Test whether data has been captured successfully
Expected results	The average tracking data should be accurate within 5km radius. There should be no huge data gaps or dropouts in re-capturing of data.

Test Cases #2

Test Case #2	Test usability and user friendliness of Vehicle tracking system.
Test Identifier	B
Test Case Name	Vehicle tracking system - Function testing
Objective	To determine that, Vehicle tracking system is stable and it is very overfriendly. 1) Test menu stability 2) data collection 3) user friendliness and usability 4) process flow.
Test Scenario (conditions/setup)	System testing for usability and system stability. Main GUI is tested carefully against with its available features one by one.
Input data requirement	Use manual data entry and go through each and every feature.
Process steps	1) Start the program 2) Select and unselect all layers of .shp files a. select and unselect grid layer b. select and unselect places layer c. select and unselect administration layer 3) Add a new polygon a. record a new restricted polygon b. remove selected restricted polygon 4) Add new tracking vehicle into the main plain 5) Remove tracing vehicle from the control panel 6) Add and remove of tracking users from the system 7) Record observations on evaluation form
Expected results	1) Operations should be smooth and accurate 2) There should be a very minimum of noise or irregular tracking data 3) Extremely minimal guidance for using the system