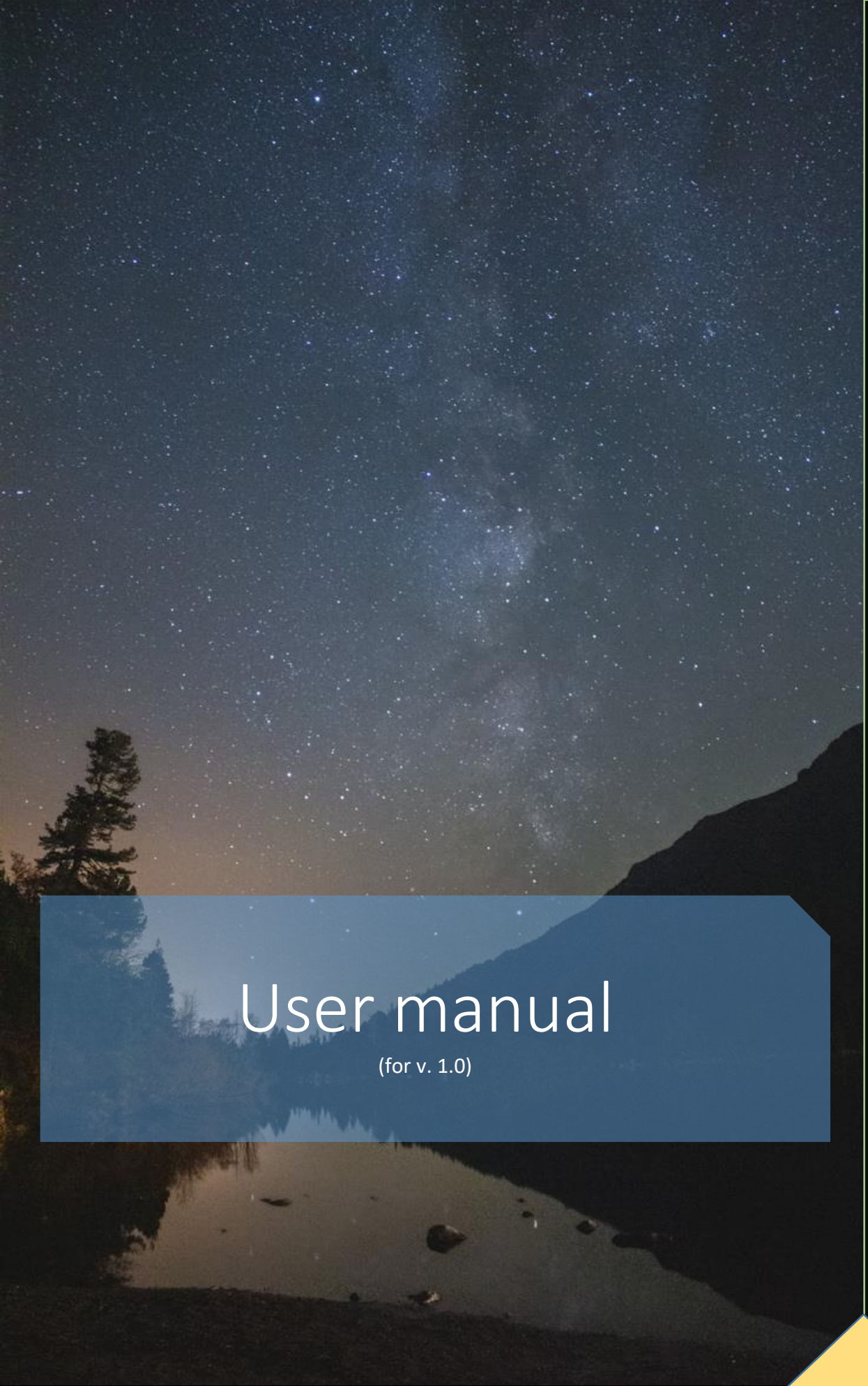

User manual

(for v. 1.0)

GeoMapper Data Collector

bojan.zolnaj@gmail.com

www.geomapper.rs

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Introduction

GeoMapper Data Collector works on devices running on Android OS (v. 6.0/Marshmallow and higher) and is using *Google Maps* as base map. Over them User can add custom offline maps, on which he can change transparency.

User can record track (as **KML**, **GPX** and **GeoJSON**) or point (***GeoPoint***), which are saved in **SQLite database**. Every point is saved in Main database and in Backup database, to prevent data loss. App is using Work/Session database, which stores only recent data (usually from last start) and enables App to perform faster. Saved points can be exported as SQLite database and/or as file in supported formats (**CSV**, **KML**, **GPX** and **GeoJSON**).

Coordinates are displayed in degrees (**DMS** and **DD** formats) and in meters (in **TM**, **UTM** and **MGRS**). For calculating coordinates in **Transverse Mercator** (sometimes called ***Gauss-Krüger***), 7-parameter Helmert transformation is used.

App is free and available for installation on Google Play Store.

GeoPoint

For saving point data in the field, App is using its own data type, called ***GeoPoint*** and it has following attributes:

- **ObsPoint** - number of (*observation*) point, User can set next value in ***Settings*** or change it when creating a new one
- **SubItem** - one ***ObsPoint*** can have multiple ***SubItems*** marked with number or character, User sets SubItem when creating new GeoPoint
- **Type** - type of GeoPoint, User sets type when creating new GeoPoint
- **Comment** - User sets comment when creating new GeoPoint
- **Latitude** - value is taken directly from device
- **Longitude** - value is taken directly from device
- **Elevation** - value is taken directly from device
- **Accuracy** - accuracy of current position, value is taken directly from device
- **Time** - value is taken directly from device
- **TimeZone** - value is taken directly from device
- **Date** - value is taken directly from device
- **User** - name of User, User can set value in ***Settings*** and it will be added into next GeoPoint
- **Project** - name Project, User can set value in ***Settings*** and it will be added into next GeoPoint
- **Zone** - zone for coordinates in meters, calculated directly based on values taken from device
- **Easting** - X coordinate in meters, calculated directly based on values taken from device
- **Northing** - Y coordinate in meters, calculated directly based on values taken from device

Currently, User can choose from 8 basic types of GeoPoint:

- **Start**, **End** and **other**
- **Crossroad**, **RestPlace**, **Spring**, **Viewpoint** and **Peak**

Besides them, there are 4 types for geology:

- **Observation (geology), Profile Start, Profile End** and **Column**

and 5 for hydrogeology:

- **Source, Spring (hydrogeology), Dug well, Drilled well** and **Piezometer**

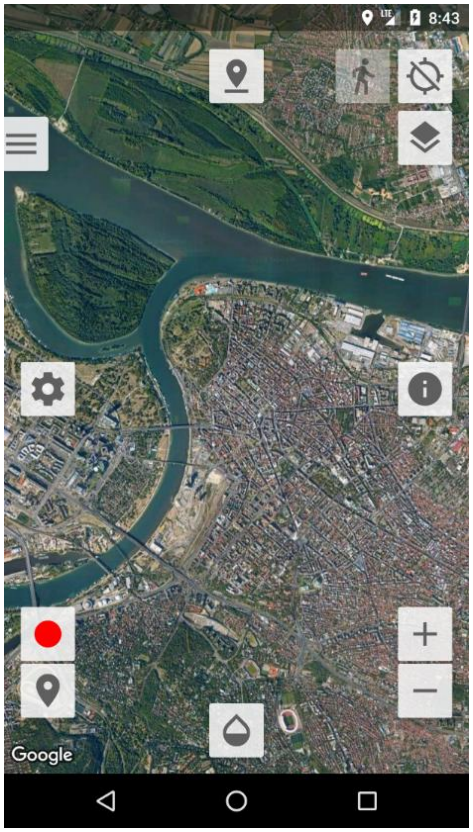
First run

On first run, App will ask for following permissions:

- **Location** is used for: locating device on the map, creating GeoPoints (at device location) and recording GPS tracks
- **Storage** is used for: exporting database, GeoPoints and GPS tracks, load GPX files from other sources and for storing custom offline maps

App will work without this permissions, but with limited functionality.

Internet connection is only needed for downloading Google Maps. If User plans to use **EGM96** file for correcting elevations from GPS, he can download it from ***Settings***. For correcting elevations from GPS, User can also (from ***Settings***) activate use of data from **NMEA** sentences.



1. App screen on first run

Before using external SD card, User needs to manually set path via ***Settings***->***Storage settings***->***Local path for SD card*** tab. Operating system should open directly SD card root and User needs to tap **SELECT** button.

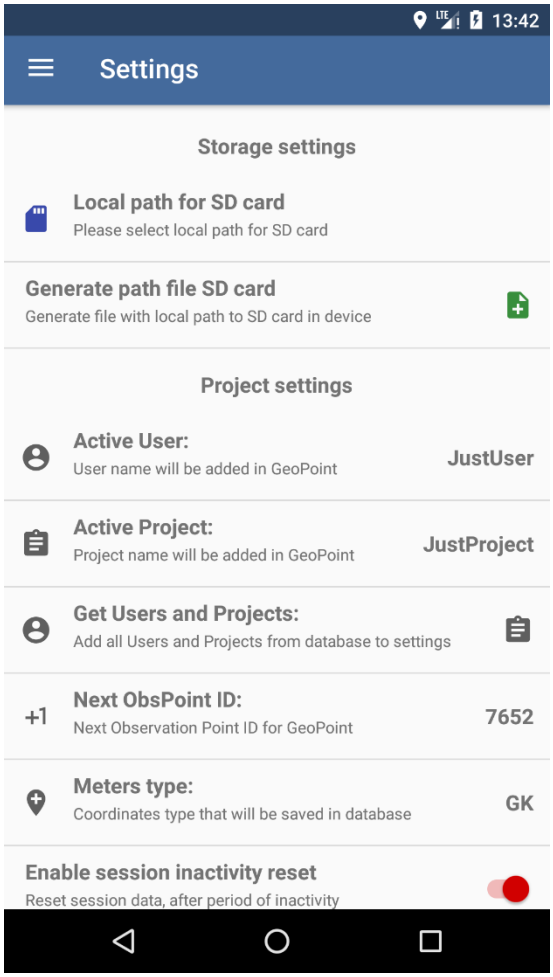
Please note that on some devices this option is blocked in Operating system by manufacturer or mobile network operator. In this case, you can use ***Settings***->***Storage settings***->***Generate path file for SD card*** *tab to generate path file in* ***GeoMapperDC/Config*** *directory. Rename it (sample_sd_path.json->sd_path.json) and change path value from 171E-2604 to your SD card root path.*

You can find your full SD card root path using some file explorer app and it has form /storage/171E-2604/.

On SD card create ***GeoMapperDC*** directory and following directories in it:

a. ***Maps***, for ***Google Maps Tiles*** maps
b. ***MapsDB***, for ***MapBox MBTiles Tileset*** and ***RMaps SQLite Database*** maps
c. ***GPSTracks***, for .gpx files

Basic Settings



- **Active User** - name of User (will be written in database with GeoPoint)
- **Active Project** - name of Project (will be written in database with GeoPoint)
- **Next ObsPoint ID** - number of next point that will be recorded

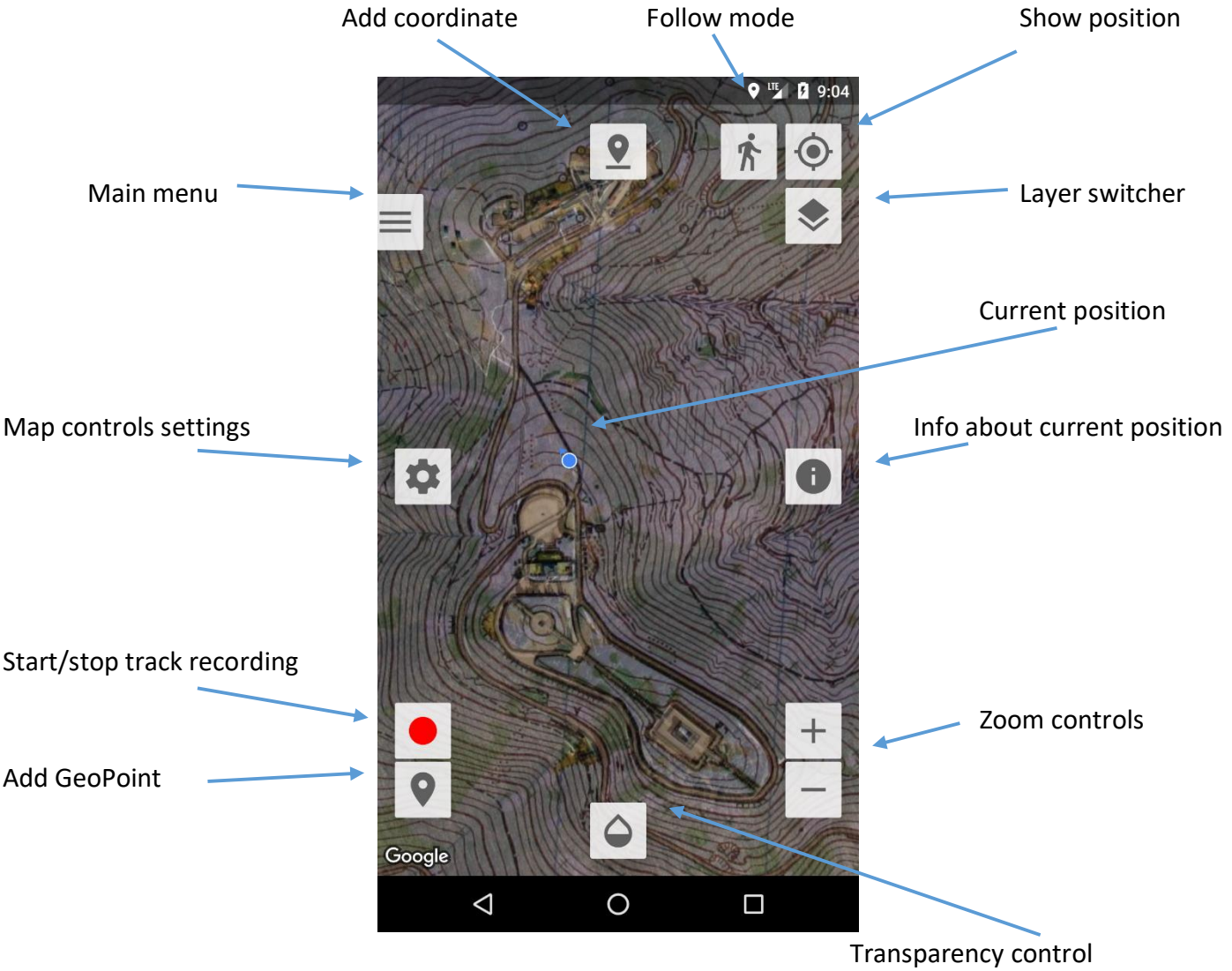
- **Maximum accuracy** - maximum value for accuracy* of location (in **meters**) in horizontal plane. All locations with bigger value than this will be discarded (both for GeoPoint and for track recording). Default value is **25 m**
- **Minimal duration** - minimal elapsed time (in **milliseconds**) between two locations in track. All locations received before this period ends, will be discarded. Default value is **1000 ms** (1 second)
- **Minimal distance** - minimal distance (in **meters**) between two locations in track. All received locations within this distance, will be discarded. Default value is **1 m**

**We define horizontal accuracy as the radius of 68% confidence. In other words, if you draw a circle centered at this location's latitude and longitude, and with a radius equal to the accuracy, then there is a 68% probability that the true location is inside the circle.*

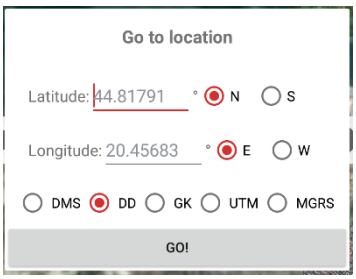
(From Android documentation)

Map window

Map window is main window in App (back button from other windows will return User on it), showing map and controls:

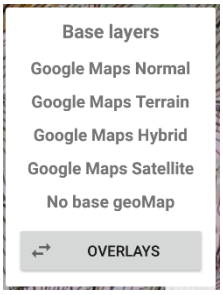


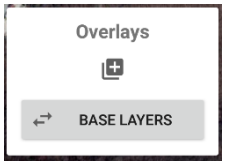
- **Add coordinate** - opens dialog for adding coordinates. It will create marker on that coordinate and center map on it

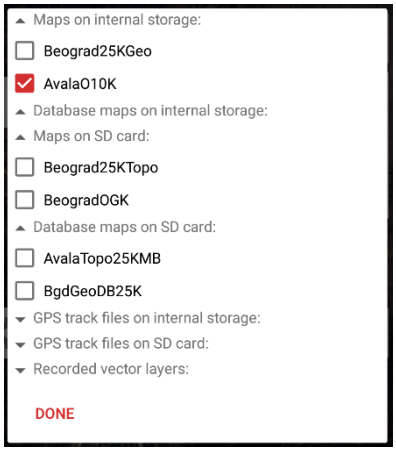


- **Follow mode** - when active, will move map, keeping current position in center
- **Current position** - blue circle on map represent current position. If location is disabled in device, tap on this control will open system setting for User to enable location use

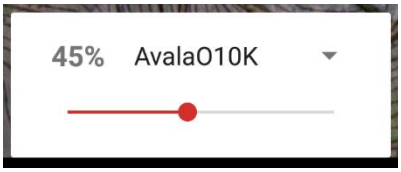
- **Layer switcher** - control for changing base map (**BASE LAYERS**) which are Google Maps and adding custom offline maps from device memory (**OVERLAYS**) over them. Besides custom maps, User can add recorded tracks, exported markers and tracks recorded by some other device or app



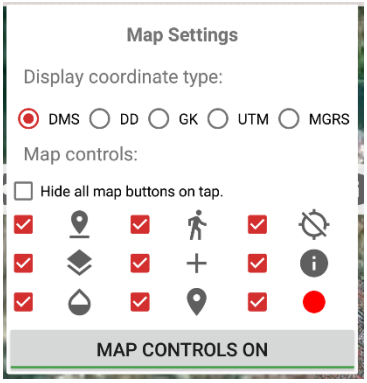


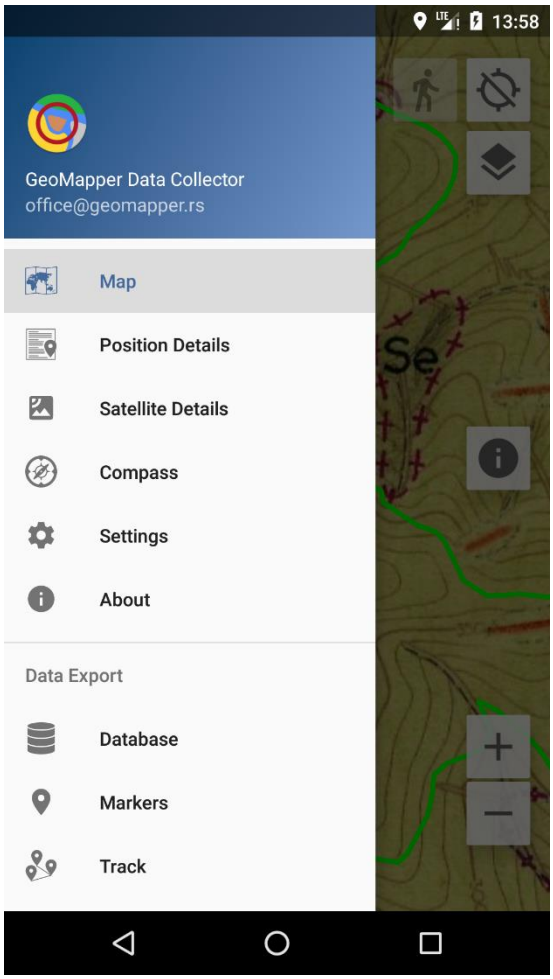


- **Info about current position** - expands small window with coordinate, elevation, speed and accuracy of current position, with time from last position update. When app is recording track, start time, duration and distance will be displayed
- **Zoom controls** - map zoom in/out controls
- **Transparency control** - expands small window in which User can control transparency of currently added custom offline maps



- **Add GeoPoint** - opens new window for creating GeoPoint at current position
- **Start/stop track recording** - start (red circle) or stop (black square) track recording
- **Map controls settings** - opens dialog (***Map Settings***) in which User can choose type of coordinates and customise which controls will be visible. With ***Hide all map buttons on tap*** checked, all controls can be hidden (and shown) with a single tap





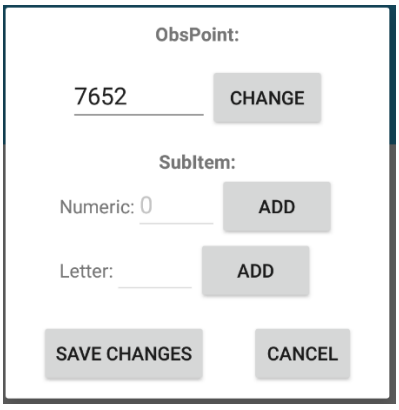
- **Main menu** - open other windows with **Position** and **Satellites** details, **Compass**, App **Settings** and **About** section or windows for exporting **Database**, **Markers** or **Track**

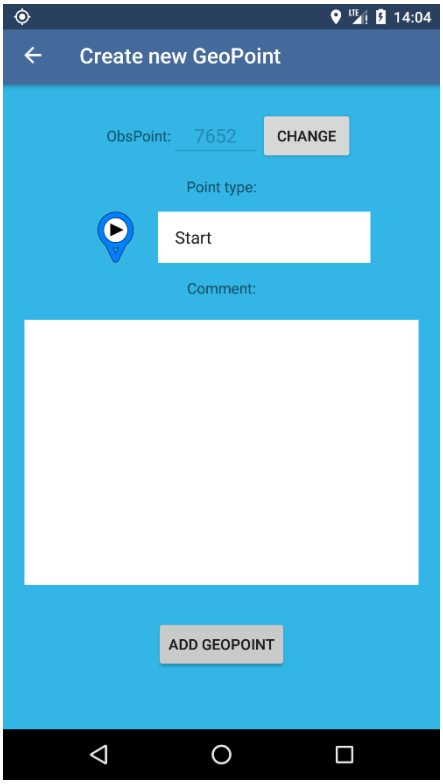
Recording GeoPoint

Process of recording GeoPoint in database starts with selecting her position/coordinates. It can be done in 3 different ways:

1. **Current position** - from ***Map*** window with ***Add GeoPoint*** control and from ***Position Details*** window or **notification**, with ***ADD GEOPOINT*** button. This will work only when location is enabled in device and accuracy of current position is not higher then set value (by default, less then **25 m**, it can be changed from ***Settings*** window)
2. **Manually entered coordinate** - from ***Map*** window with ***Add coordinate*** control User can enter coordinates. Marker will be created at that position and map will center on it.
3. **Long tap on map** - from ***Map*** window with long tap anywhere on it, marker will be created at that position.
   In 2. and 3. tap on marker will open popup with his coordinates and tap on that popup will open window for creating GeoPoint. In these cases, there is no additional limitations so they can be used with location disabled in device.

After selecting position/coordinates, ***Create new GeoPoint*** window opens up and in it User can chose type of GeoPoint (***Point type***) and enter comment about it. ***CHANGE*** button will open dialog in which ***ObsPoint*** value can be changed and/or add ***SubItem*** value, which can be number (*1, 2, 3...*) or letter (*a, b, c...*).

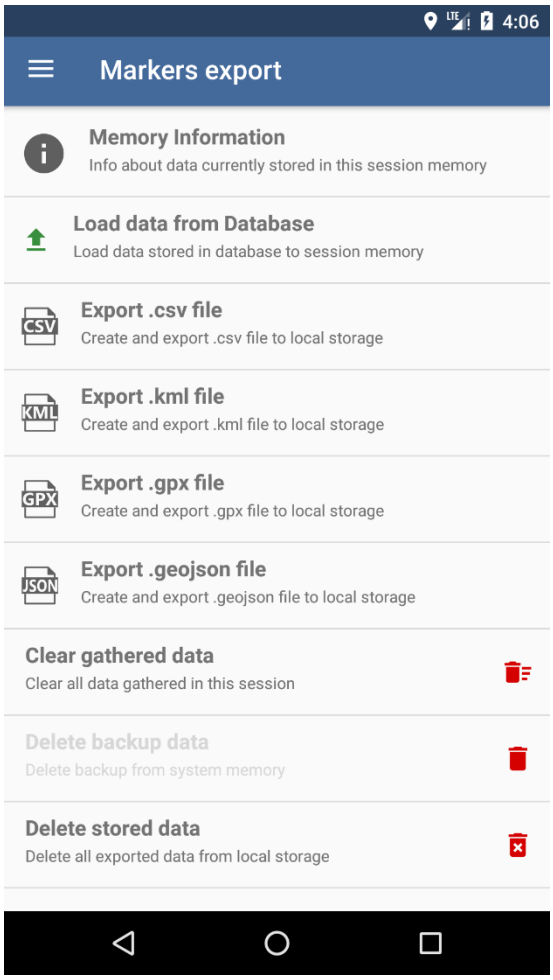




ADD GEOPOINT button will add new GeoPoint to database and create marker with symbol, representing selected type on map.

Exporting recorded GeoPoints

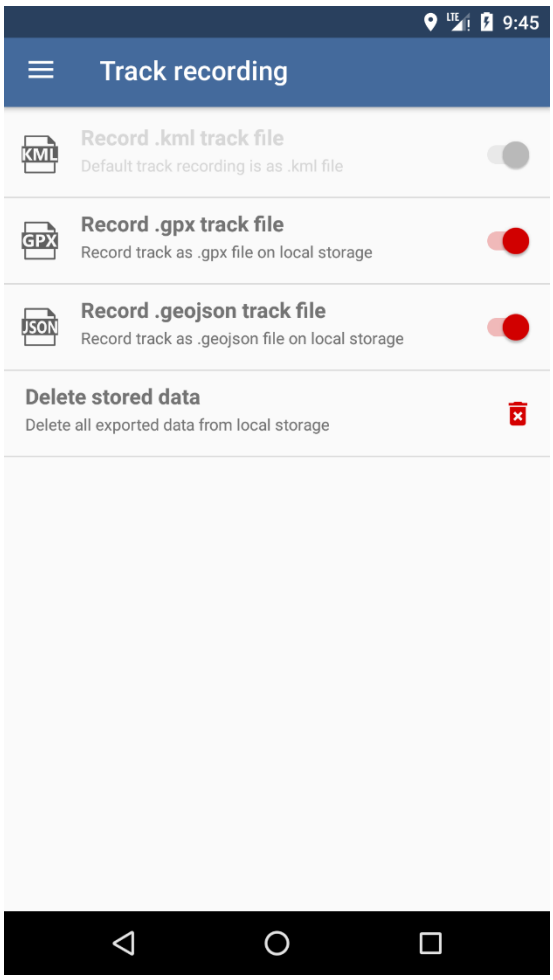
Recorded GeoPoints can be exported from ***Markers export*** window.



- **Memory Information** gives info about GeoPoints (total number of GeoPoints, ObsPoint values of first and last) in Work/Session database.
- **Load data from Database** will clear all data from Work/Session database and load in it, all recorded data from Main database.
- **Export .csv/kml/gpx/geojson file** generates file with all GeoPoints from Work/Session database. File will be saved in ***GeoMapperDC/Tracks*** directory, in internal memory.
- **Clear gathered data** will clear all data from Work/Session database (all recorder data remains in Main database)
- **Delete stored data** will delete all contents of ***GeoMapperDC/Tracks*** directory.

Recording tracks

Before GPS track recording is started, User can set file formats for track saving in ***Track recording*** window. Base format is **KML** and App will always save track file in that format. Other available formats are **GPX** and **GeoJSON** and App will, by default, save track file in all three formats.

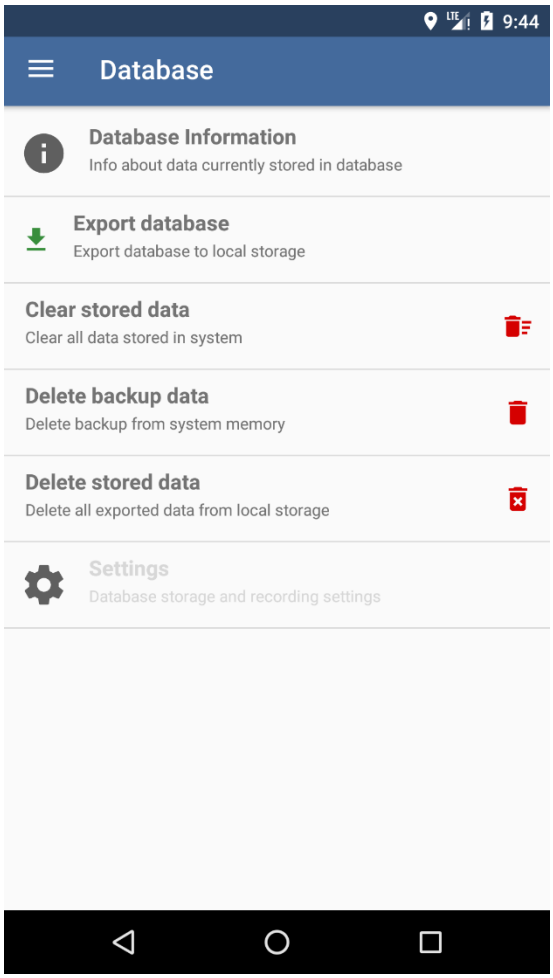


Track recording can be started from ***Map*** window with ***Start/stop track recording*** control and from ***Position Details*** window or from ***notification***, with ***START RECORDING*** button. App will start recording track, only if Location is enabled in device.

When track recording is started, path line will be drawn over map and when recording is stopped, new track file(s) will be created in ***GeoMapperDC/Tracks*** directory, in internal memory of device. Recorded track will also include all GeoPoints created during recording and two additional points (Start and End) with basic info about track (start time, end time, duration and track length).

During recording, App will discard all positions that don`t match conditions set for **maximum accuracy**, **minimal duration** and **minimal distance** (default values are **25 m**, **1000ms/1s** and **1m**, respectively).

Database



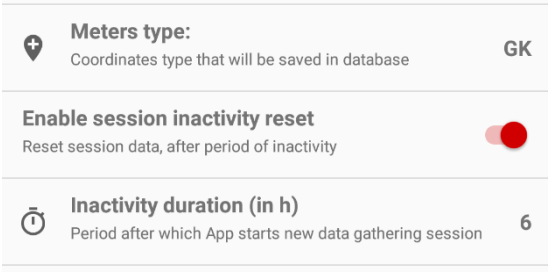
- **Database Information** gives info about GeoPoints (total number of GeoPoints, ObsPoint values of first and last) in Main database.
- **Export database** creates SQLite file with ***geo_points*** table in which are all recorded GeoPoints from Main database. It will be placed in ***GeoMapperDC/Database*** directory, in internal memory.
- **Clear stored data** will delete all recorded data from Main database.
- **Delete backup data** will delete Backup database, from internal memory.
- **Delete stored data** will delete all contents of ***GeoMapperDC/Database*** directory

For working with SQLite databases, User can use:

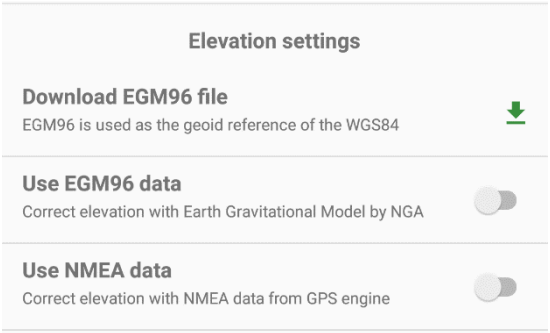
- **aSQLiteManager**, for Android OS
- **DB Browser for SQLite**, for Windows OS

Additional settings and options

Besides basic settings, from ***Settings*** window User can set additional settings and activate other options.



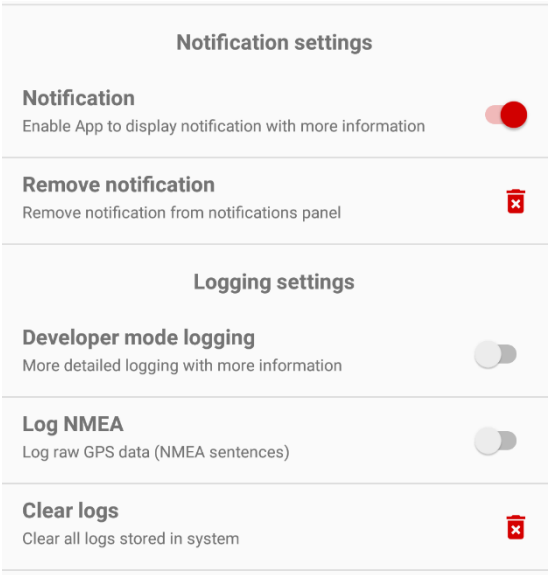
- **Meters type** - coordinates type in meters (**GK**, **UTM** or **MGRS**) that will be added in database.
- **Enable session inactivity reset** - enables removing all data from Work/Session database, if App is not active for specified time.
- **Inactivity duration** - elapsed time (in **hours**) of inactivity, after which App will remove all data from Work/Session database.



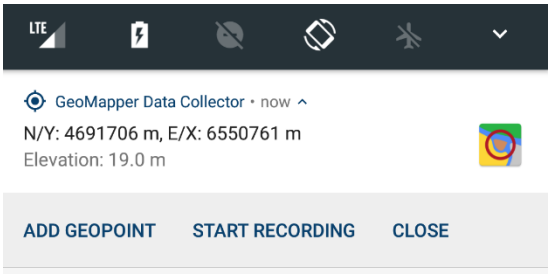
- **Download EGM96 file** - from ***earth-info.nga.mil*** .
- **Use EGM96 data** - enables use of **EGM96** file for elevation correction.
- **Use NMEA data** - enables elevation corrections based on data from **NMEA** sentences.

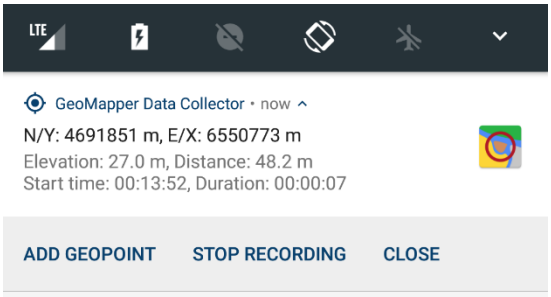
Enabling elevation correction will give elevation of device above **geoid** (which is represented on **topographic maps**) instead of elevation above **ellipsoid**, which is given by **GPS**.

Detailed explanation of difference can be found in this article ***Mean Sea Level, GPS, and the Geoid*** (*www.esri.com*).



- **Notification** - enables notifications, with current position, info about recording and shortcuts for creating new GeoPoint and starting/stopping track recording.





- **Log NMEA** - enables logging **NMEA** sentences in file, which will be saved in ***GeoMapperDC/Logs*** directory, in internal memory. When this option is started, App will log all data in active log file, until User disables this option. Then, new log file will be created with logged data and active log will be cleared.