“Introduction to QGIS”

Training Program
on
“Coastal Vulnerability Mapping and Analysis using QGIS”
Organized by
International Training Center for Operational Oceanography (ITCOO)
INCOIS, Hyderabad, India
November 25th - 29th 2024

United Nations Educational, Scientific and Cultural Organization
Intergovernmental Oceanographic Commission
OceanTeacher GLOBAL ACADEMY
INCOIS

Introduction to QGIS

QGIS is a free and open source cross-platform desktop Geographical Information System (GIS) software allowing users to analyze and edit spatial information, in addition to composing and exporting graphical maps.

Gary Sherman began the development of **Quantum GIS** in early 2002, and it became an incubator project of the Open Source Geospatial Foundation in 2007. Version 1.0 was released in January 2009.

Operating Systems: Linux, Unix, Mac OSX, Windows and Android

Development Platforms: C++ and Python **QGIS** makes extensive use of the Qt library.

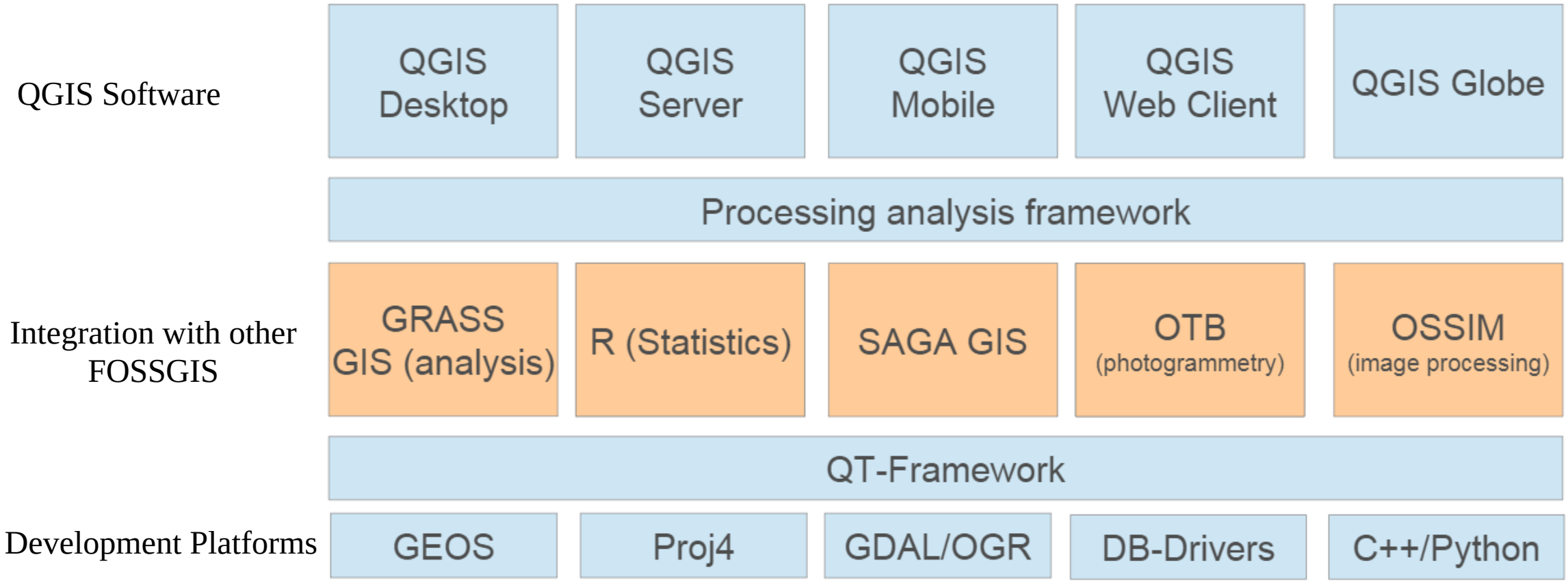
Developer(s): QGIS Development Team (worldwide, Volunteers)

First two developers of QGIS are Gary Sherman(Founder of QGIS) and Marco Hugentobler

About QGIS

- **Open Source:** QGIS is free and open-source software, which means that anyone can use, modify, and distribute it without cost. It is developed and maintained by a community of volunteers and organizations.
- **Cross-Platform Compatibility:** GIS is compatible with various operating systems, including Windows, macOS, and Linux, making it accessible to a wide range of users.
- **User Interface:** QGIS has an intuitive and user-friendly interface. It provides a map view, layer legend, and various toolbars for easy navigation and interaction.
- **Data Formats**: GIS supports a wide range of geospatial data formats, including vector and raster formats. This includes popular formats like Shapefiles, GeoJSON, GeoTIFF, and many others.
- **Data Creation and Editing:** Users can create and edit vector data layers. QGIS provides tools for digitizing, editing, and attributing geographic features.
- **Spatial Analysis:** GIS offers a variety of spatial analysis tools and algorithms for tasks such as overlay analysis, proximity analysis, terrain analysis, and more. Plugins can be added to extend functionality.
- **Cartography and Layout Design:** QGIS allows users to create high-quality maps and layouts for printing or export. It provides tools for designing map layouts and adding legends, scales, labels, and other cartographic elements.
- **Integration with Other Tools:** QGIS can be integrated with other open-source GIS tools and libraries. It also supports various database systems, allowing users to work with spatial data stored in databases.
- **Plugins and Extensions:** QGIS supports a plugin architecture that allows users to add additional features and tools. There is a wide range of plugins available for various tasks, further extending QGIS's capabilities.
- **Python Integration:** QGIS is scriptable using Python, allowing users to automate repetitive tasks, create custom tools, and extend the software's functionality.

Modular Framework of QGIS/ OSGeo



SAGA: System for Automated Geo-scientific Analysis
GRASS: Geographic Resources Analysis Support System
OTB: Orfeo Tool Box
OSSIM: Open Source Software Image Map
FOSS: Free and Open Source Software
GDAL: Geospatial Data Abstraction Library

QGIS Supported Formats

Raster Formats

- (Geo)TIFF
- JPEG
- GIF
- Erdas Imagine
- ECW (if SDK is installed)
- MisterSID (if SDK is installed)
- NetCDF (Klimadaten)
- ESRI ArcInfo Grid

Vector formats

- ESRI Shapefile
- DXF
- SpatiaLite
- Mapinfo
- GML
- KML
- Interlis (Switzerland)

Databases and Spreadsheets

- PostgreSQL / Postgis
- SQLite / SpatiaLite
- Microsoft SQL Server
- Oracle
- Sybase
- ESRI File Geodatabase (if SDK is installed)
- ESRI Personal Geodatabase (read only)
- Excel, OpenOffice, txt/csv

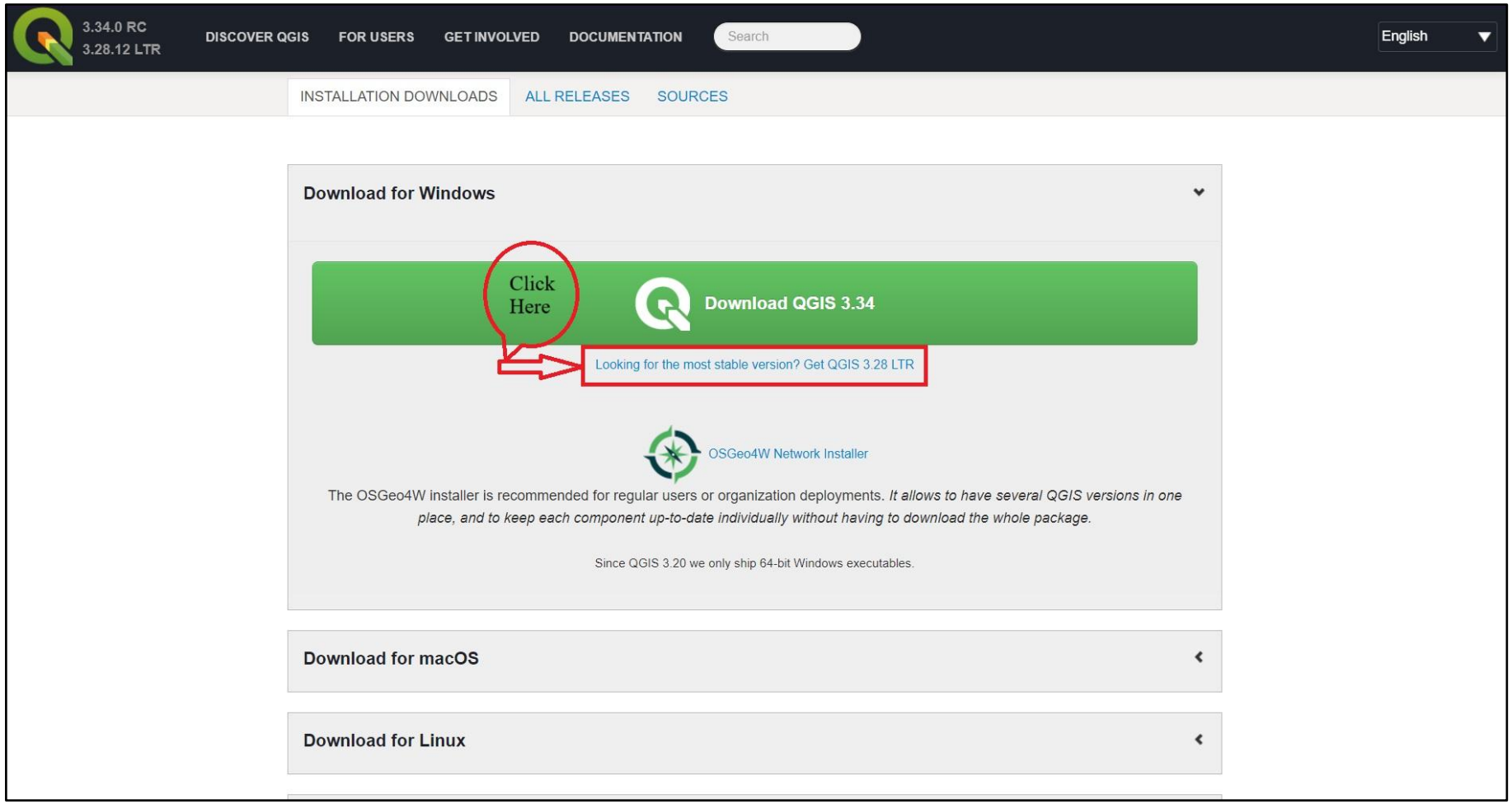
Web Services

- WMS (Web Map Service – symbolized maps)
- Web Map Tile Service (WMTS) – through the WMS-tab
- Web Feature Server (WFS) (raw vector data)
- Web Coverage Service (WCS) (raw raster data)
- Web Processing Service (WPS - Plugin)
- Catalogue Service for the Web (CSW - Plugin)
- OpenLayers Plugin (Google Maps, Bing Maps)

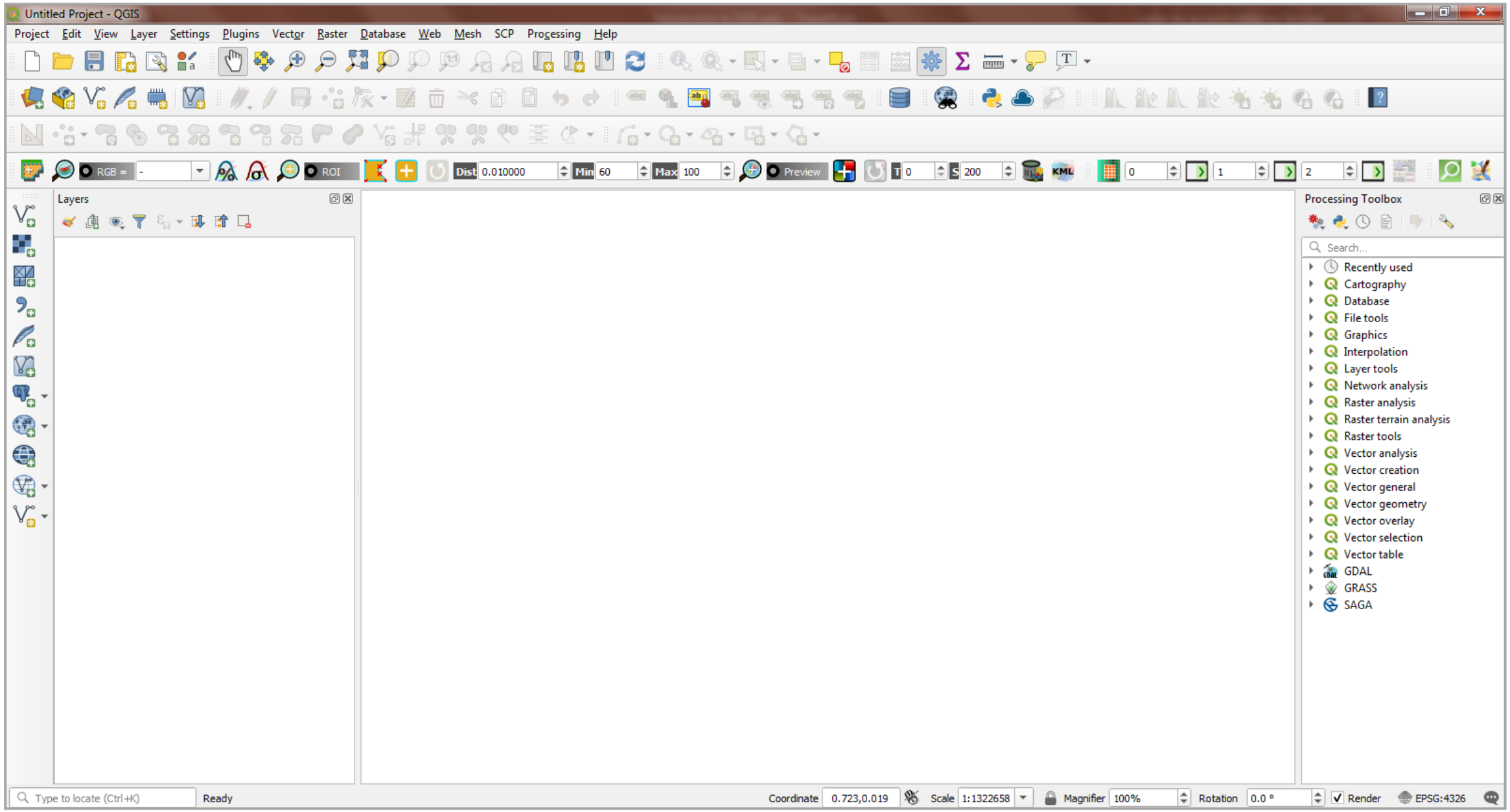
QGIS Software Installation

Download QGIS software from the below link (Download stable version QGIS 3.28 LTR).

https://www.qgis.org/en/site/forusers/download.html



Explanation of QGIS Software Tools



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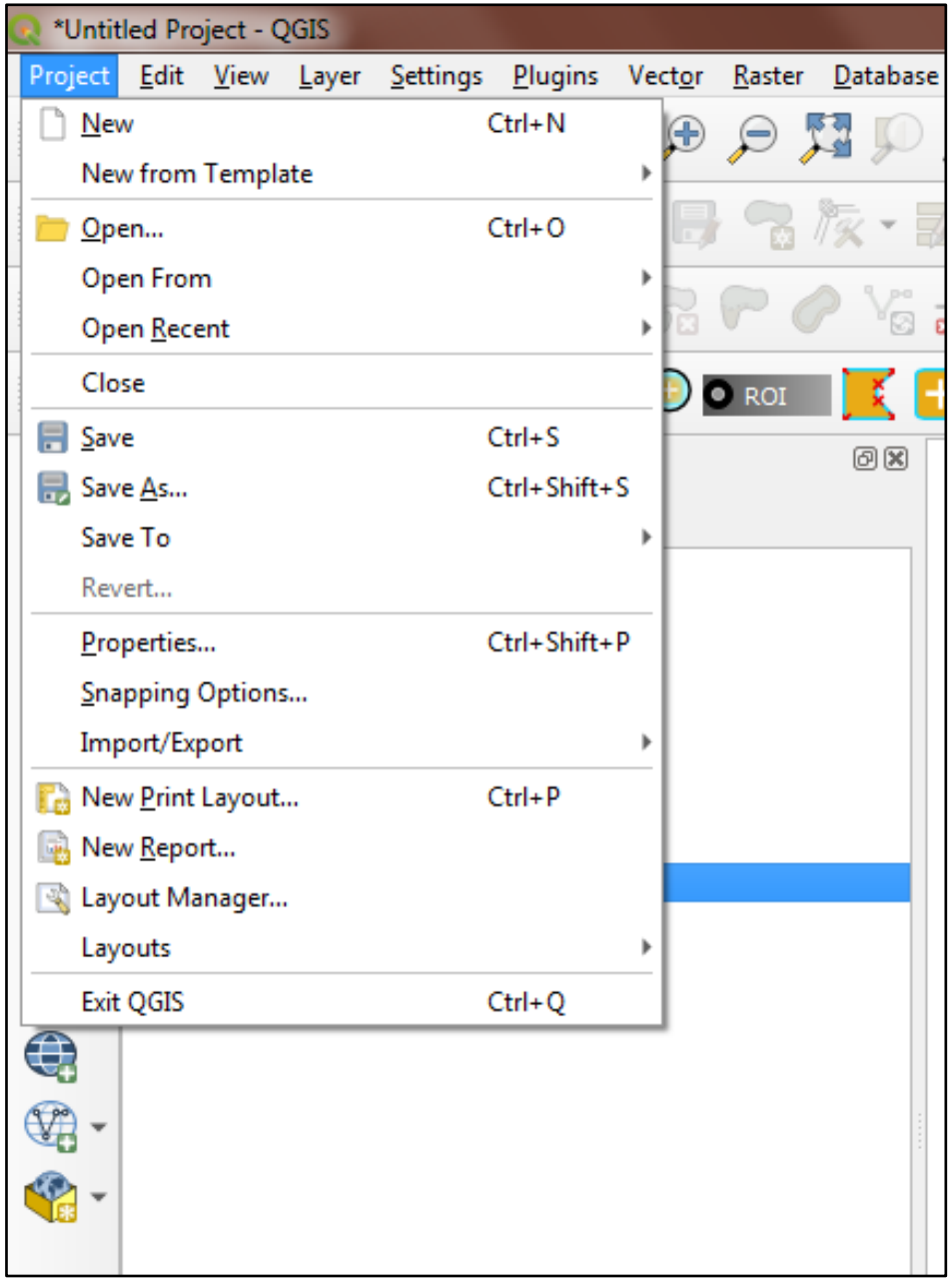
*Untitled Project - QGIS
Project
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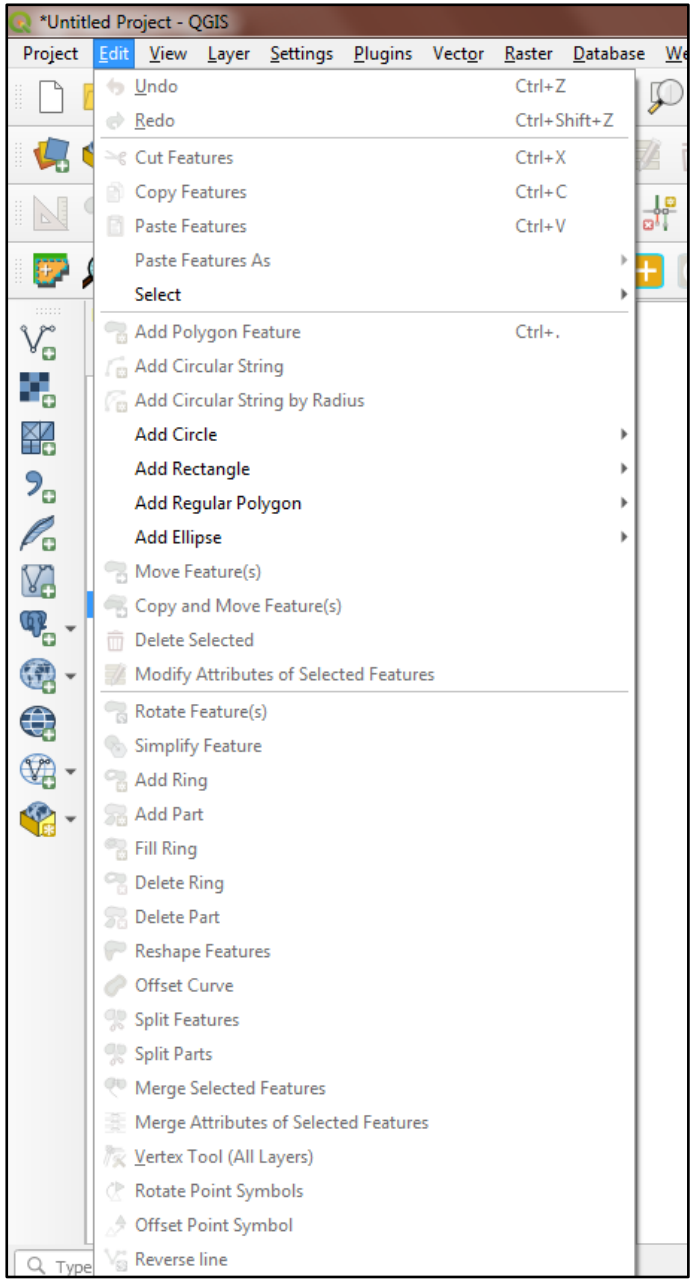
Vector
Raster
Database
New Ctrl+N
New from Template
Open... Ctrl+O
Open From
Open Recent
Close
Save Ctrl+S
Save As... Ctrl+Shift+S
Save To
Revert...
Properties... Ctrl+Shift+P
Snapping Options...
Import/Export
New Print Layout... Ctrl+P
New Report...
Layout Manager...
Layouts
Exit QGIS Ctrl+Q
ROI


*Untitled Project - QGIS
Project
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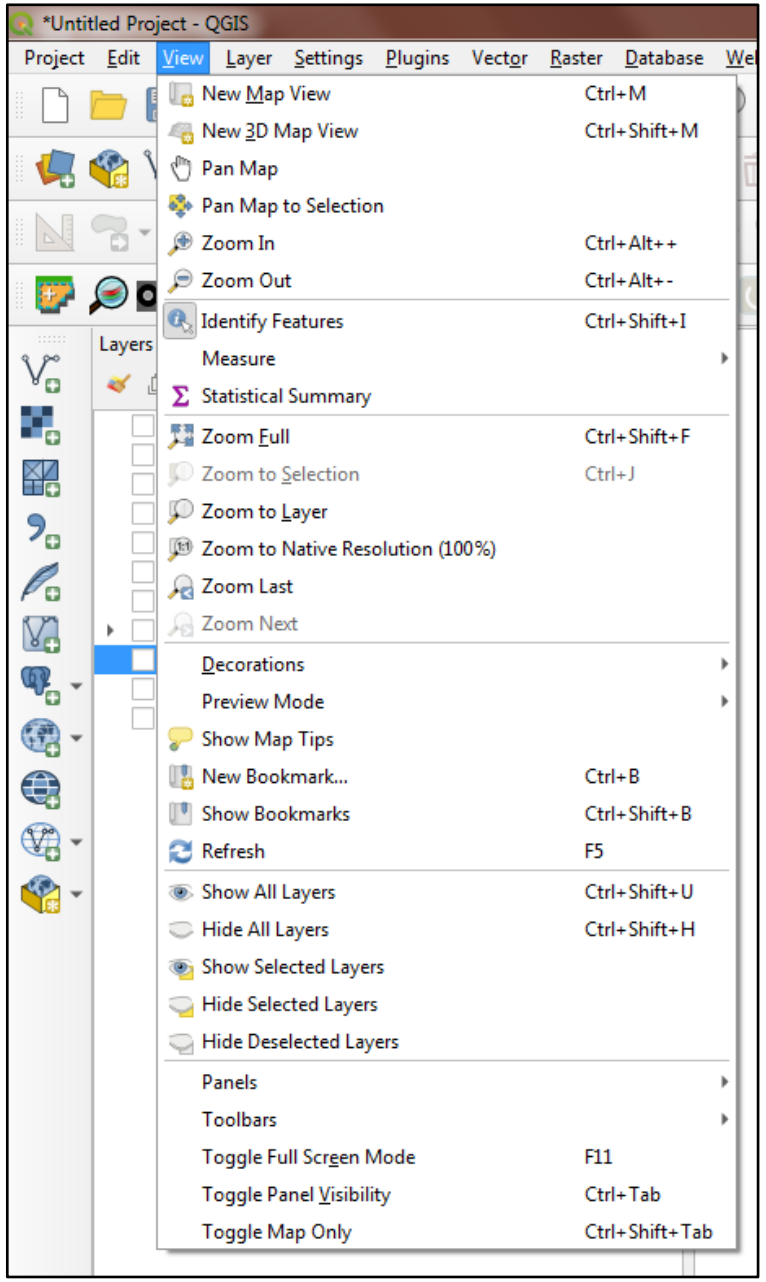
Raster
Database
Undo Ctrl+Z
Redo Ctrl+Shift+Z
Cut Features Ctrl+X
Copy Features Ctrl+C
Paste Features Ctrl+V
Paste Features As
Select
Add Polygon Feature Ctrl+.
Add Circular String
Add Circular String by Radius
Add Circle
Add Rectangle
Add Regular Polygon
Add Ellipse
Move Feature(s)
Copy and Move Feature(s)
Delete Selected
Modify Attributes of Selected Features
Rotate Feature(s)
Simplify Feature
Add Ring
Add Part
Fill Ring
Delete Ring
Delete Part
Reshape Features
Offset Curve
Split Features
Split Parts
Merge Selected Features
Merge Attributes of Selected Features
Vertex Tool (All Layers)
Rotate Point Symbols
Offset Point Symbol
Reverse line


*Untitled Project - QGIS
Project
Edit
View
Layer
Settings
Plugins
Vector
Raster
Database
Layers
New Map View Ctrl+M
New 3D Map View Ctrl+Shift+M
Pan Map
Pan Map to Selection
Zoom In Ctrl+Alt++
Zoom Out Ctrl+Alt+-
Identify Features Ctrl+Shift+I
Measure
Statistical Summary
Zoom Full Ctrl+Shift+F
Zoom to Selection Ctrl+J
Zoom to Layer
Zoom to Native Resolution (100%)
Zoom Last
Zoom Next
Decorations
Preview Mode
Show Map Tips
New Bookmark... Ctrl+B
Show Bookmarks Ctrl+Shift+B
Refresh F5
Show All Layers Ctrl+Shift+U
Hide All Layers Ctrl+Shift+H
Show Selected Layers
Hide Selected Layers
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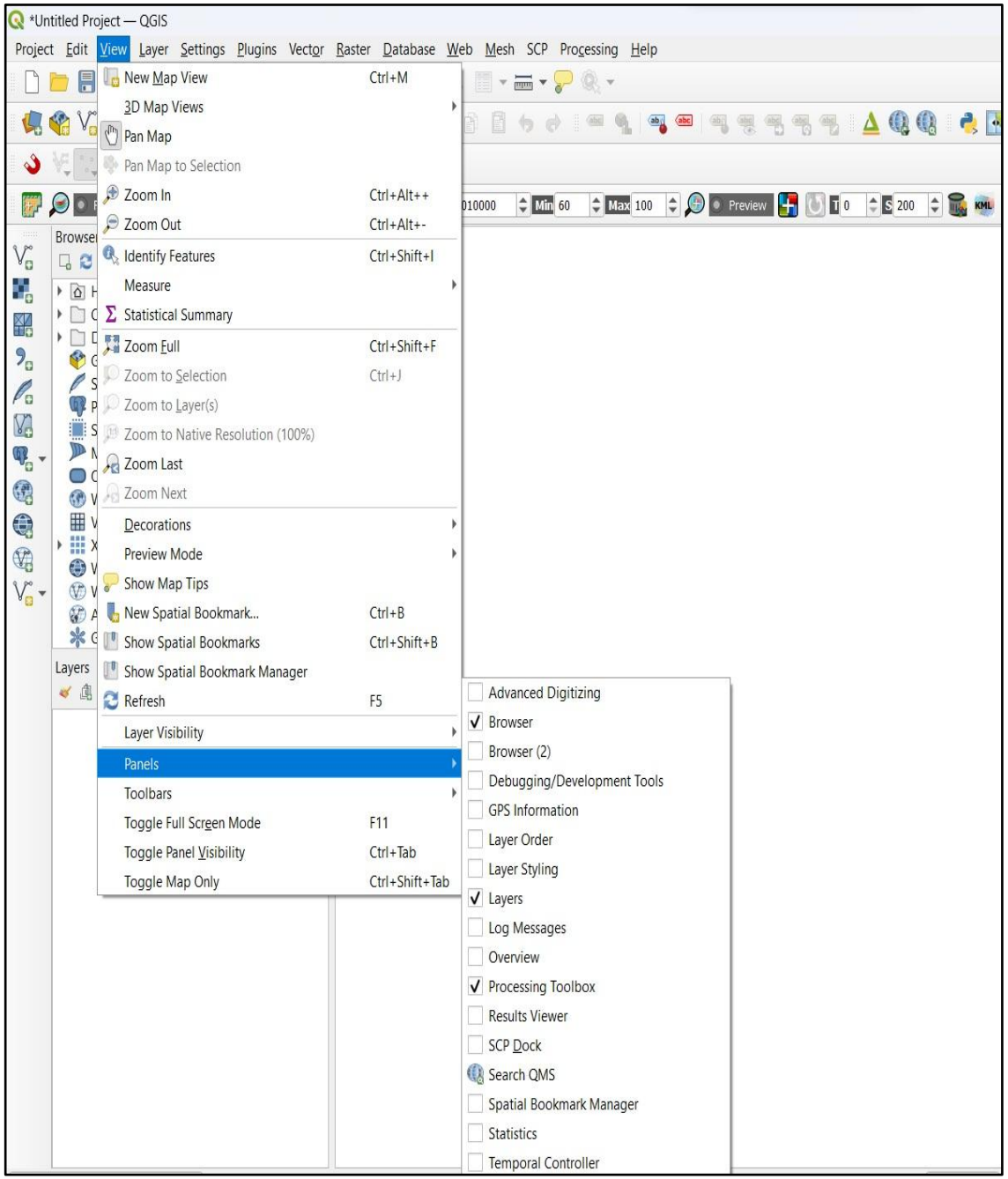
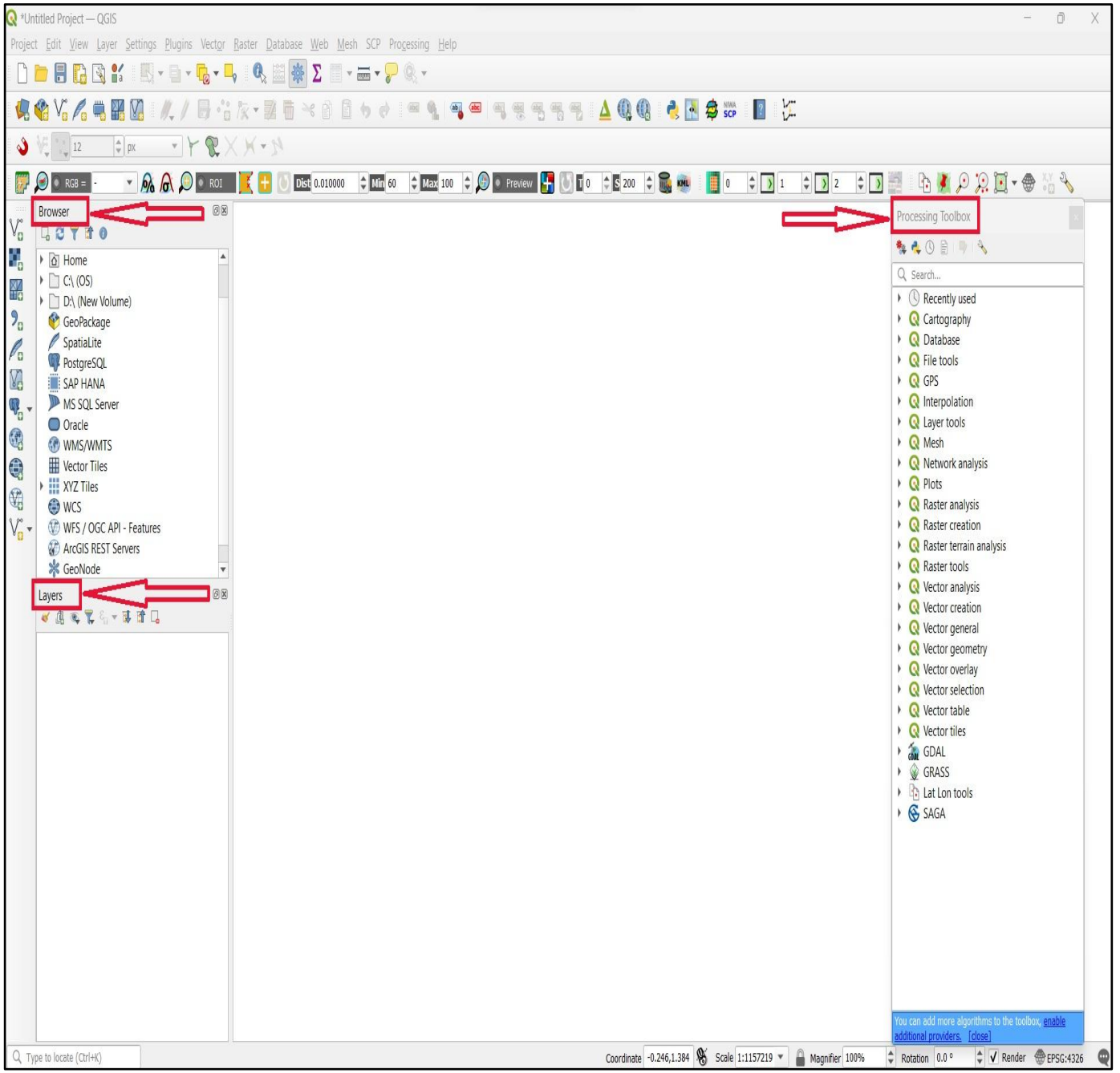
Panels
Toolbars
Toggle Full Screen Mode F11
Toggle Panel Visibility Ctrl+Tab
Toggle Map Only Ctrl+Shift+Tab

Continue…..


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
New Map View Ctrl+M
3D Map Views
Pan Map
Pan Map to Selection
Zoom In Ctrl+Alt++
Zoom Out Ctrl+Alt+-
Identify Features Ctrl+Shift+I
Measure
Statistical Summary
Zoom Full Ctrl+Shift+F
Zoom to Selection Ctrl+J
Zoom to Layer(s)
Zoom to Native Resolution (100%)
Zoom Last
Zoom Next
Decorations
Preview Mode
Show Map Tips
New Spatial Bookmark... Ctrl+B
Show Spatial Bookmarks Ctrl+Shift+B
Show Spatial Bookmark Manager
Refresh F5
Layer Visibility
Panels
Toolbars
Toggle Full Screen Mode F11
Toggle Panel Visibility Ctrl+Tab
Toggle Map Only Ctrl+Shift+Tab
Advanced Digitizing
Browser
Browser (2)
Debugging/Development Tools
GPS Information
Layer Order
Layer Styling
Layers
Log Messages
Overview
Processing Toolbox
Results Viewer
SCP Dock
Search QMS
Spatial Bookmark Manager
Statistics
Temporal Controller
Browser
Layers


*Untitled Project — QGIS
Browser
Home
C:\ (OS)
D:\ (New Volume)
GeoPackage
SpatiaLite
PostgreSQL
SAP HANA
MS SQL Server
Oracle
WMS/WMTS
Vector Tiles
XYZ Tiles
WCS
WFS / OGC API - Features
ArcGIS REST Servers
GeoNode
Layers
Processing Toolbox
Search...
Recently used
Cartography
Database
File tools
GPS
Interpolation
Layer tools
Mesh
Network analysis
Plots
Raster analysis
Raster creation
Raster terrain analysis
Raster tools
Vector analysis
Vector creation
Vector general
Vector geometry
Vector overlay
Vector selection
Vector table
Vector tiles
GDAL
GRASS
Lat Lon tools
SAGA
You can add more algorithms to the toolbox, enable additional providers. [close]
Type to locate (Ctrl+K)
Coordinate -0.246,1.384
Scale 1:1157219
Magnifier 100%
Rotation 0.0 °
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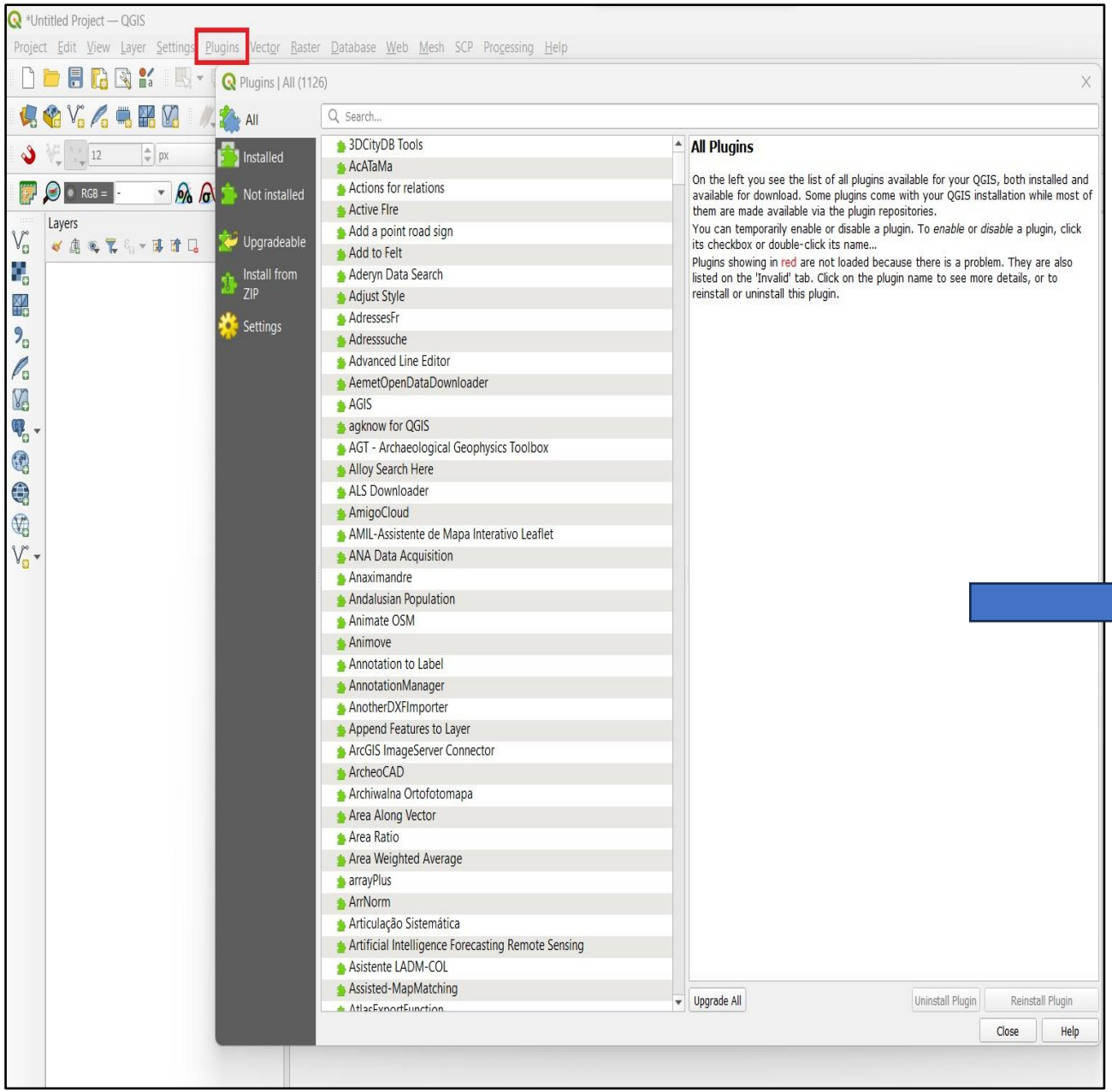
Continue…..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Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
Plugins | All (1126)
All
Installed
Not installed
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Install from ZIP
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AcATaMa
Actions for relations
Active FIre
Add a point road sign
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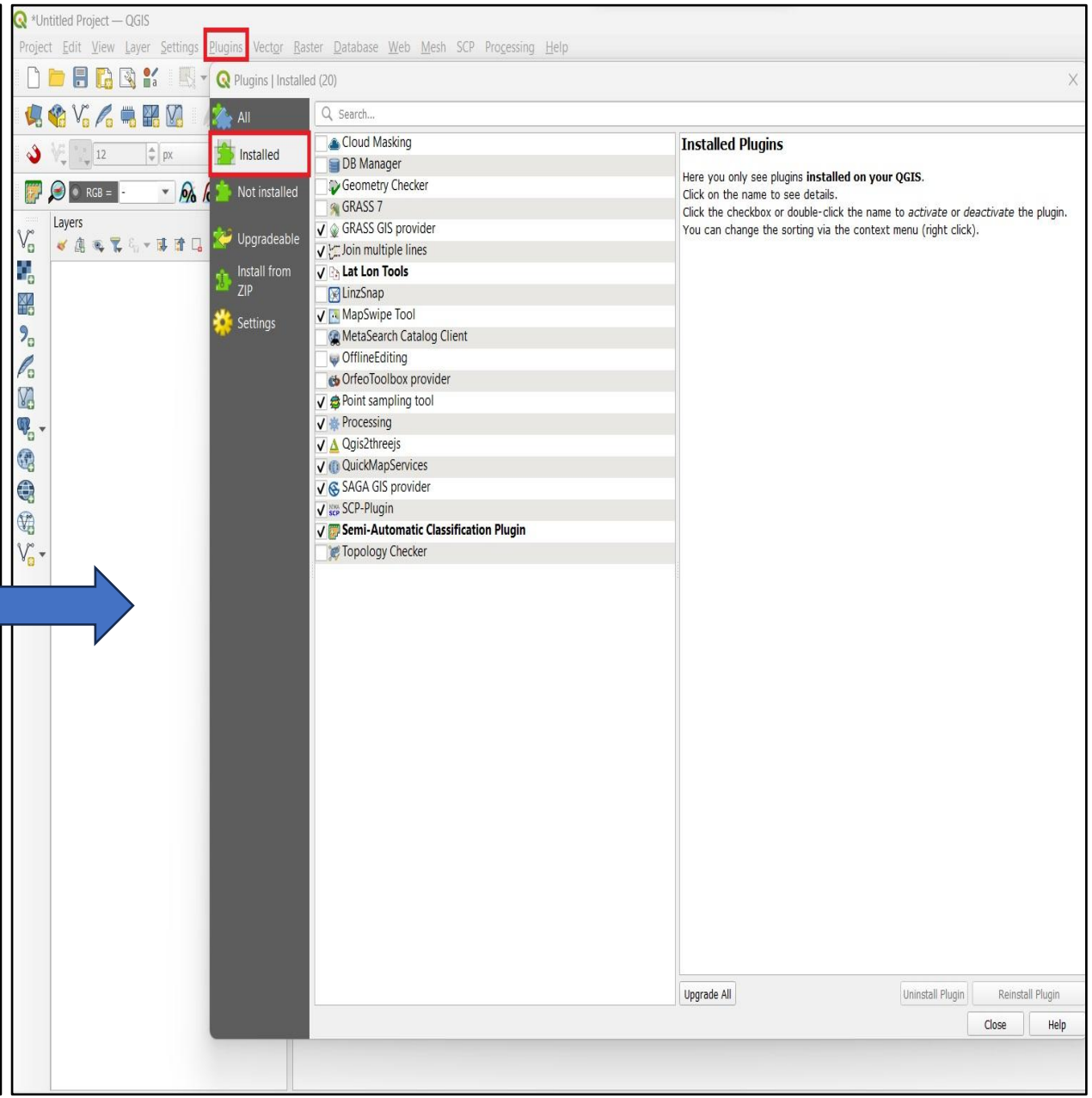
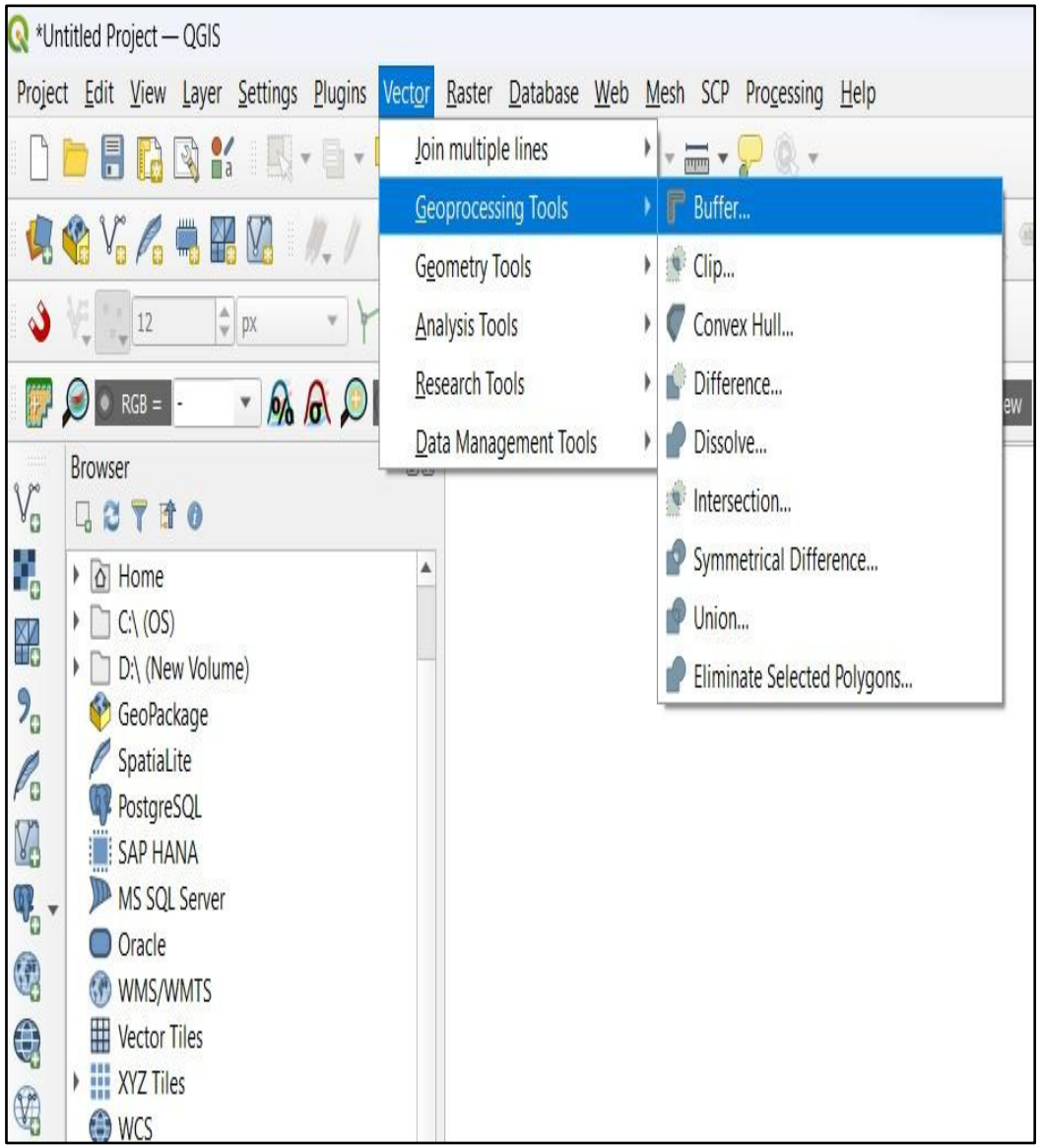
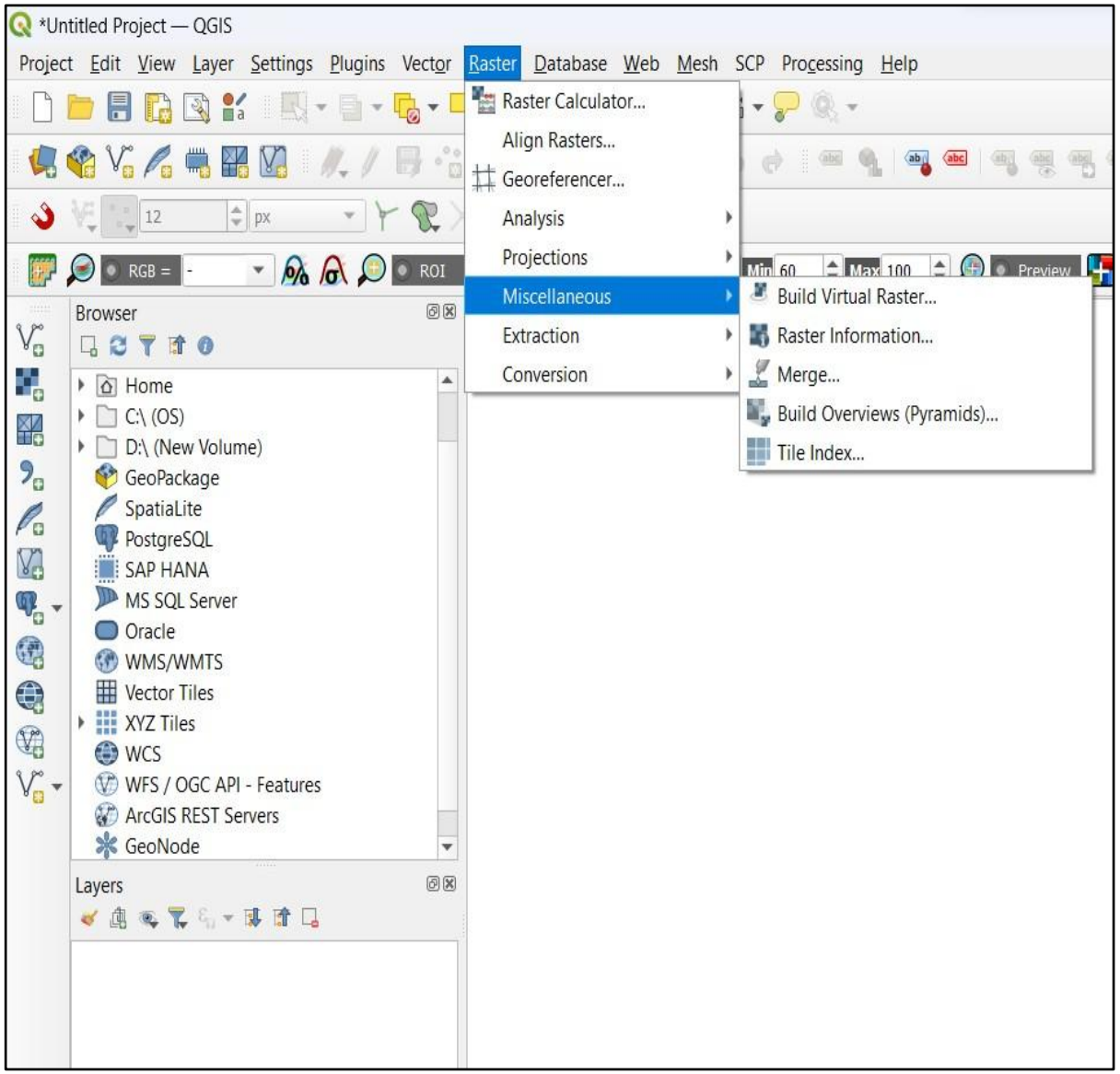
Adresssuche
Advanced Line Editor
AemetOpenDataDownloader
AGIS
agknow for QGIS
AGT - Archaeological Geophysics Toolbox
Alloy Search Here
ALS Downloader
AmigoCloud
AMIL-Assistente de Mapa Interativo Leaflet
ANA Data Acquisition
Anaximandre
Andalusian Population
Animate OSM
Animove
Annotation to Label
AnnotationManager
AnotherDXFImporter
Append Features to Layer
ArcGIS ImageServer Connector
ArcheoCAD
Archiwalna Ortofotomapa
Area Along Vector
Area Ratio
Area Weighted Average
arrayPlus
ArrNorm
Articulação Sistemática
Artificial Intelligence Forecasting Remote Sensing
Asistente LADM-COL
Assisted-MapMatching
All Plugins
On the left you see the list of all plugins available for your QGIS, both installed and available for download. Some plugins come with your QGIS installation while most of them are made available via the plugin repositories.
You can temporarily enable or disable a plugin. To enable or disable a plugin, click its checkbox or double-click its name...
Plugins showing in red are not loaded because there is a problem. They are also listed on the 'Invalid' tab. Click on the plugin name to see more details, or to reinstall or uninstall this plugin.
Upgrade All
Uninstall Plugin
Reinstall Plugin
Close
Help
Layers


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
Plugins | Installed (20)
All
Installed
Not installed
Upgradeable
Install from ZIP
Settings
Search...
Cloud Masking
DB Manager
Geometry Checker
GRASS 7
GRASS GIS provider
Join multiple lines
Lat Lon Tools
LinzSnap
MapSwipe Tool
MetaSearch Catalog Client
OfflineEditing
OrfeoToolbox provider
Point sampling tool
Processing
Qgis2threejs
QuickMapServices
SAGA GIS provider
SCP-Plugin
Semi-Automatic Classification Plugin
Topology Checker
Installed Plugins
Here you only see plugins installed on your QGIS.
Click on the name to see details.
Click the checkbox or double-click the name to activate or deactivate the plugin.
You can change the sorting via the context menu (right click).
Upgrade All
Uninstall Plugin
Reinstall Plugin
Close
Help
Layers

Continue…..


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
Join multiple lines
Geoprocessing Tools
Geometry Tools
Analysis Tools
Research Tools
Data Management Tools
Buffer...
Clip...
Convex Hull...
Difference...
Dissolve...
Intersection...
Symmetrical Difference...
Union...
Eliminate Selected Polygons...
Browser
Home
C:\ (OS)
D:\ (New Volume)
GeoPackage
SpatiaLite
PostgreSQL
SAP HANA
MS SQL Server
Oracle
WMS/WMTS
Vector Tiles
XYZ Tiles
WCS

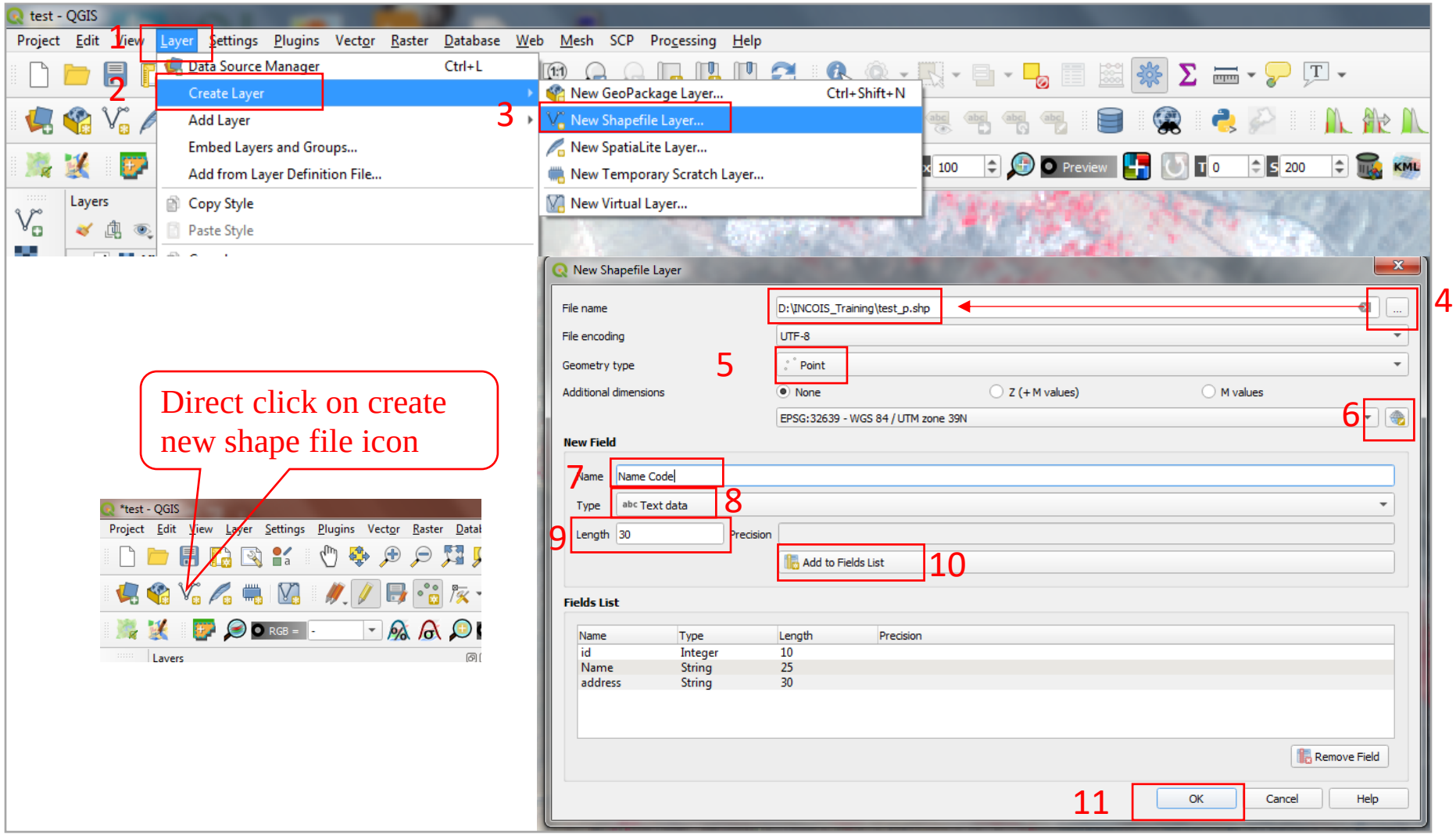

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
Raster Calculator...
Align Rasters...
Georeferencer...
Analysis
Projections
Miscellaneous
Extraction
Conversion
Build Virtual Raster...
Raster Information...
Merge...
Build Overviews (Pyramids)...
Tile Index...
Browser
Home
C:\ (OS)
D:\ (New Volume)
GeoPackage
SpatiaLite
PostgreSQL
SAP HANA
MS SQL Server
Oracle
WMS/WMTS
Vector Tiles
XYZ Tiles
WCS
WFS / OGC API - Features
ArcGIS REST Servers
GeoNode
Layers

Shape file creation:

Shape files are three types :

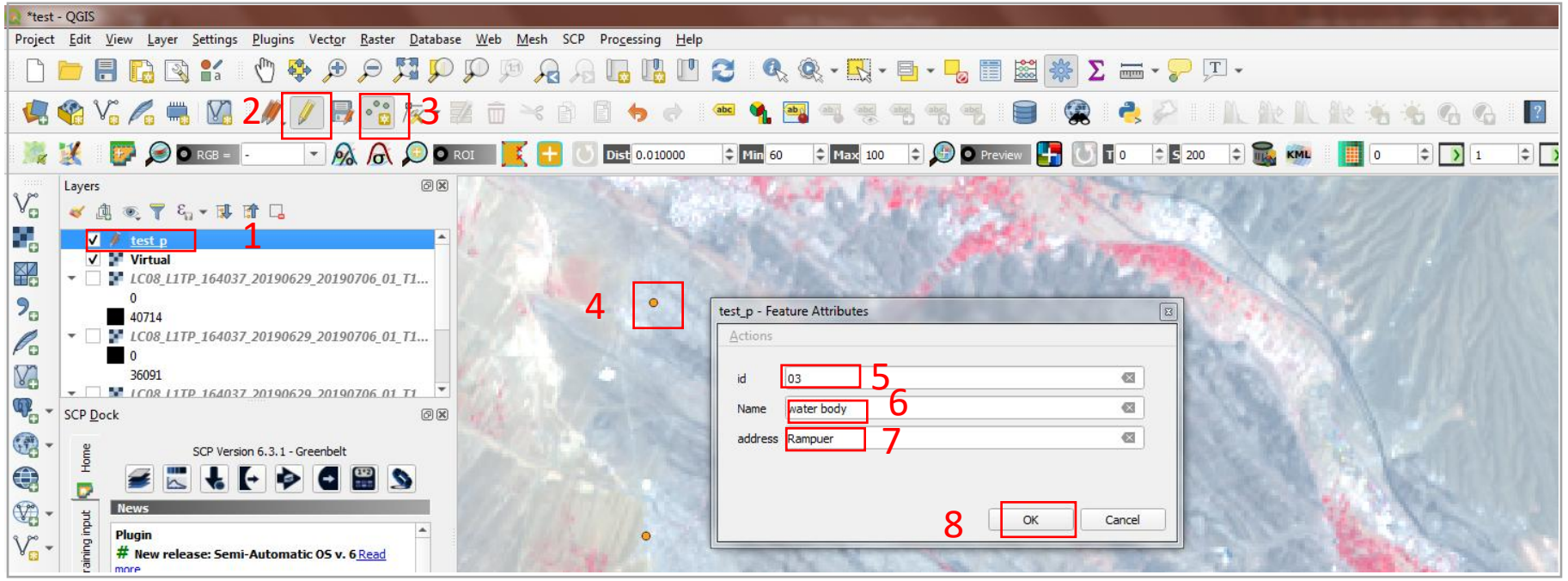
1. Point shape file
2. Line shape file
3. Polygon shape file

Point Shape file creation :

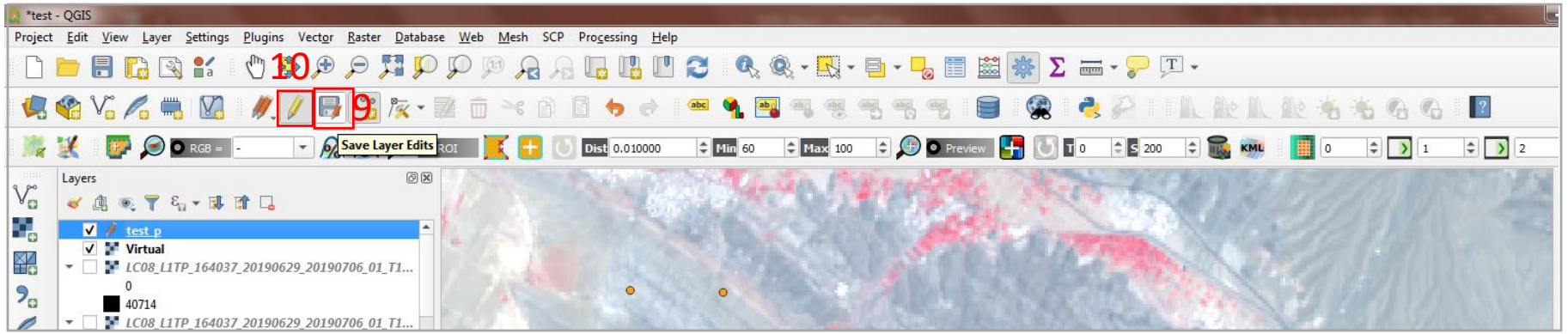


Point Shape file Editing :

- Select point shape file
- Click on Toggle editing ⟶ add point feature ⟶ put points on image

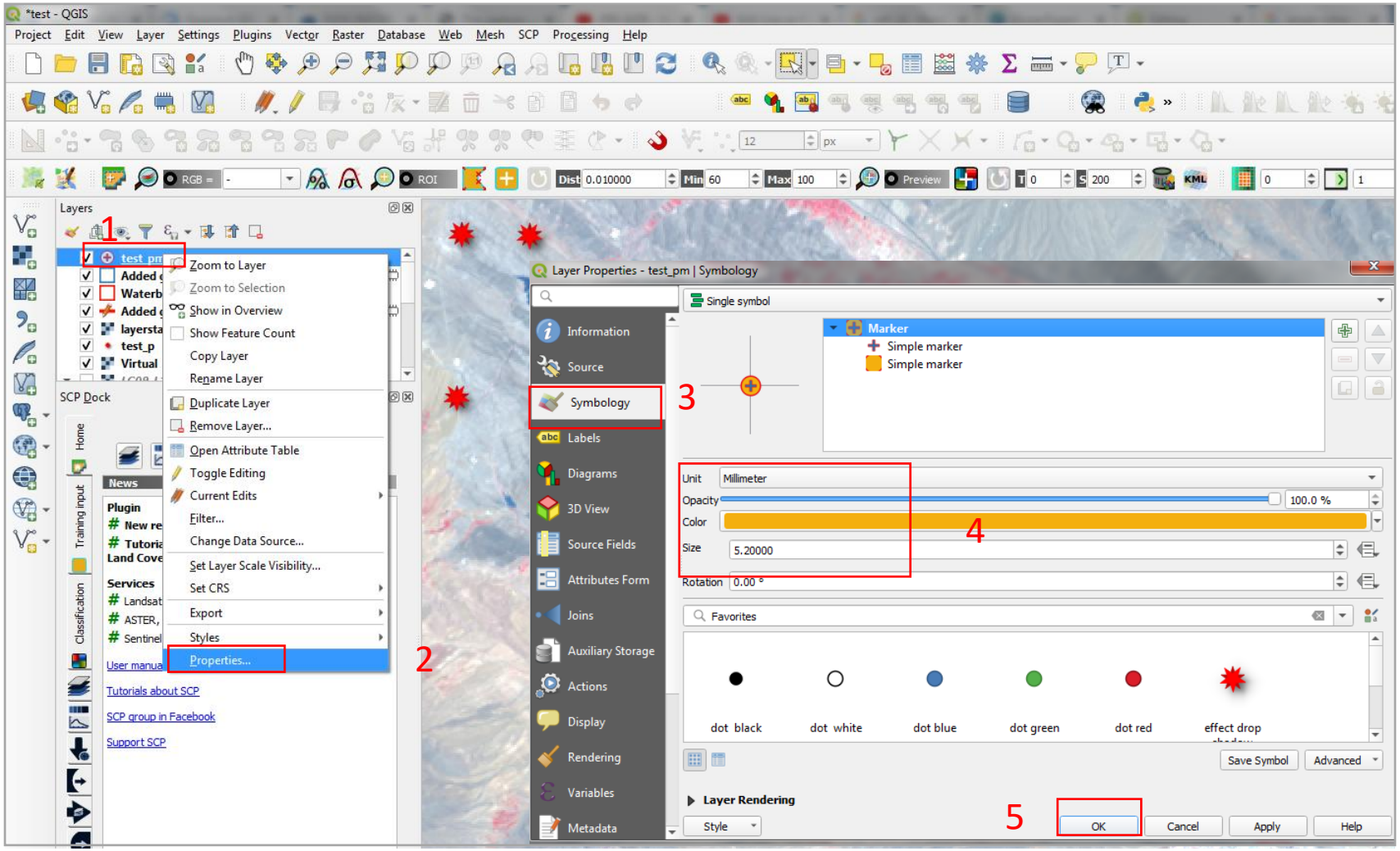


- To save edited data click on save layer edits.
- To stop editing click on Toggle editing



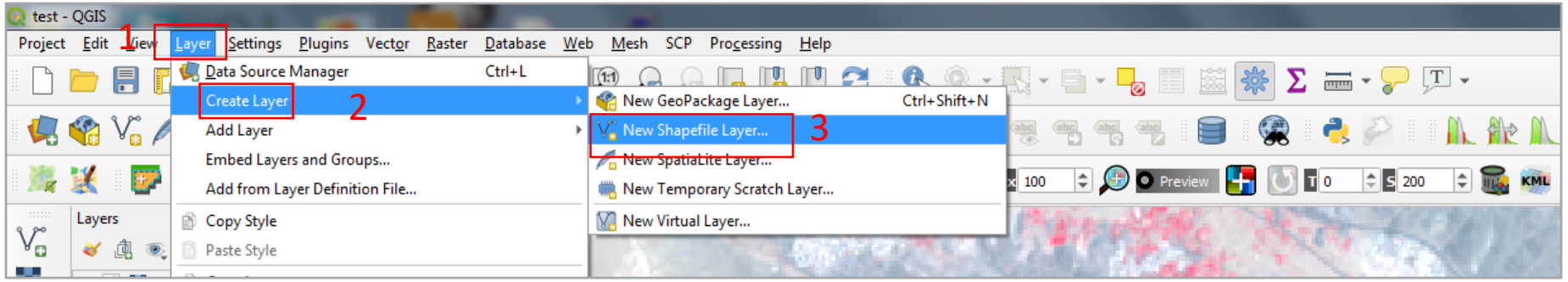
Symbology :

- To change symbol Select layer(Point or Line or Polygon) right click ⟶ Properties
- In layer properties window ➞ Click on Symbology Now change the symbol style, colour, size ➞ ok

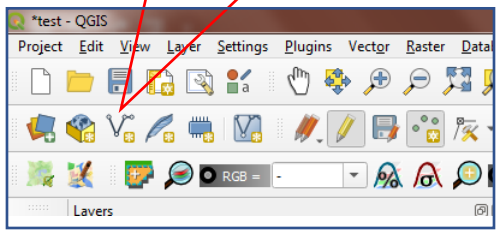


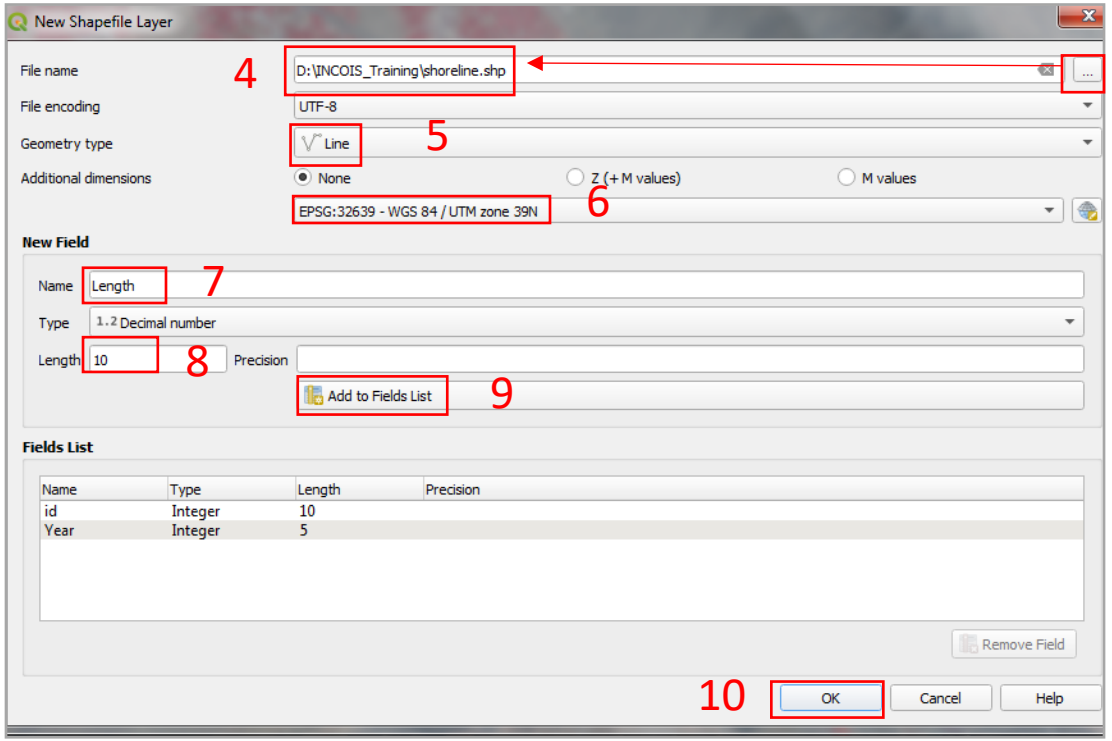
Line Shape file creation:

➢ Go to layer ⟶ Create Layer ⟶ New shapefile Layer



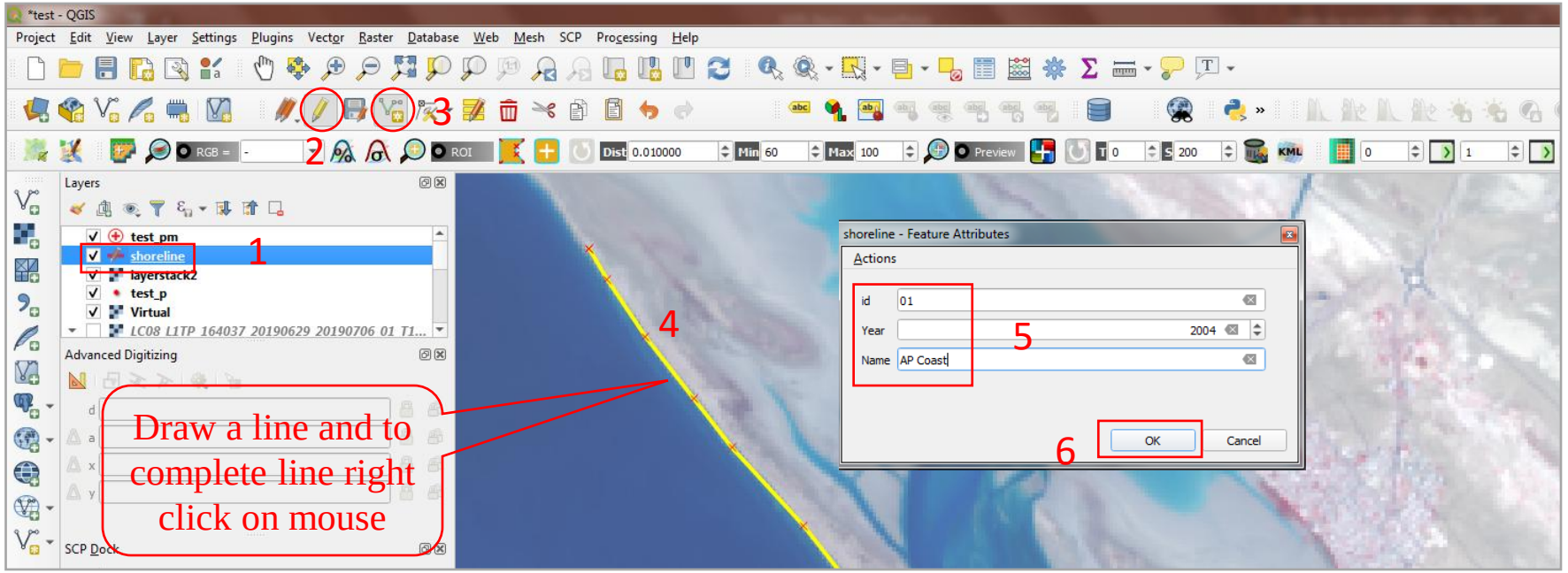
Direct click on create new shape file icon



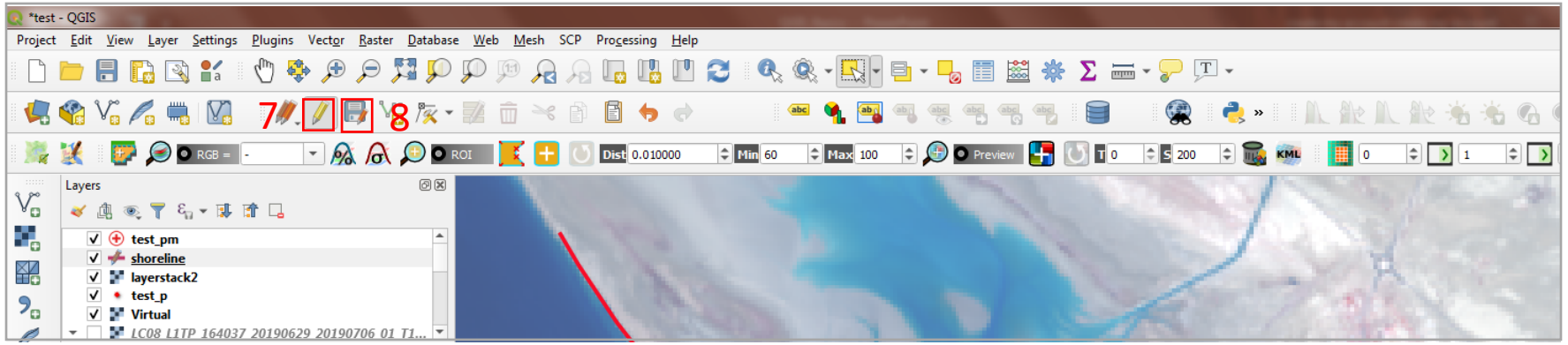


Line Shape file Editing :

- Select line shape file
- Click on Toggle editing ⟶ add line feature ⟶ draw a line on image

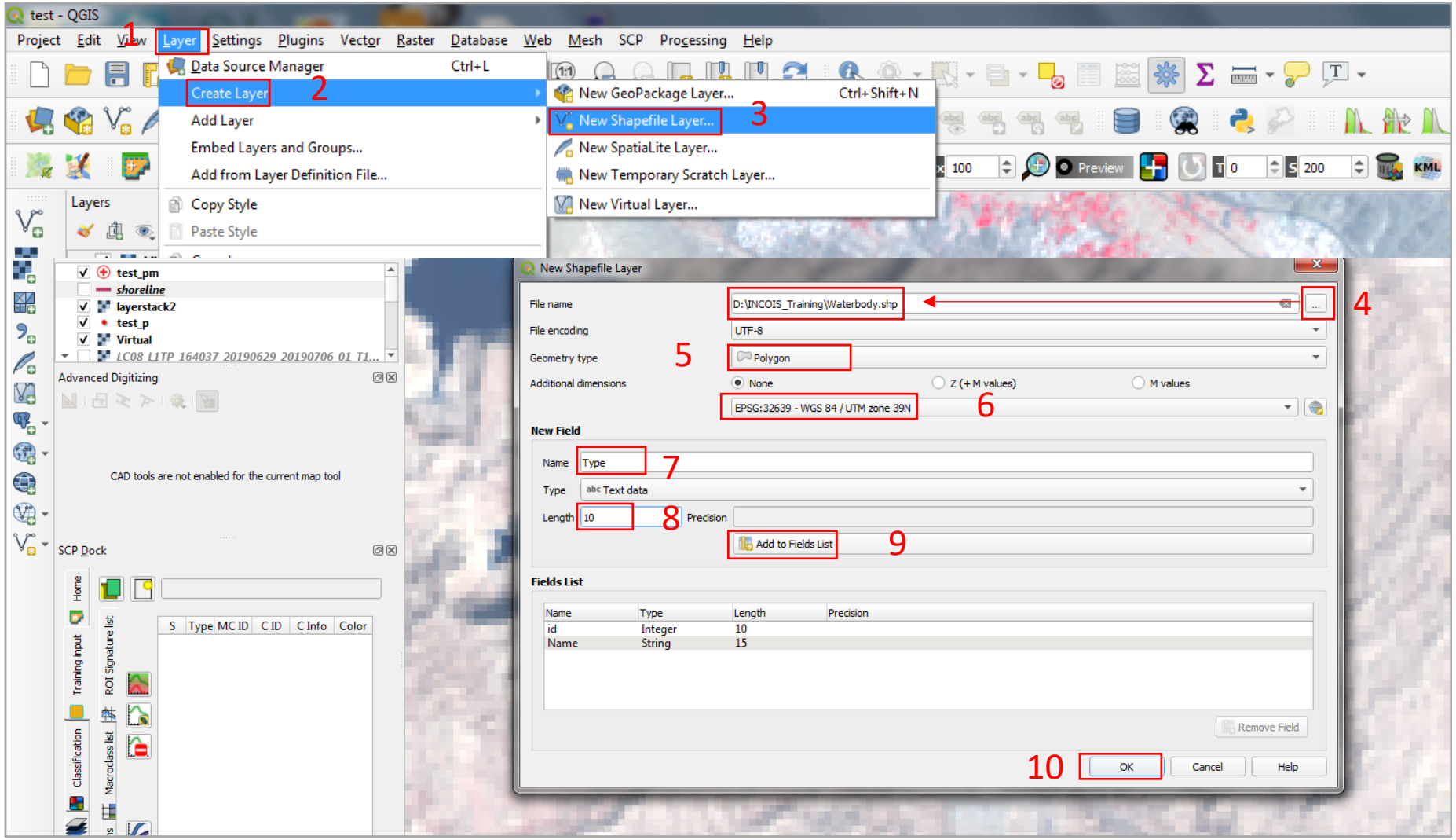


- To save edited data click on save layer edits.
- To stop editing click on Toggle editing



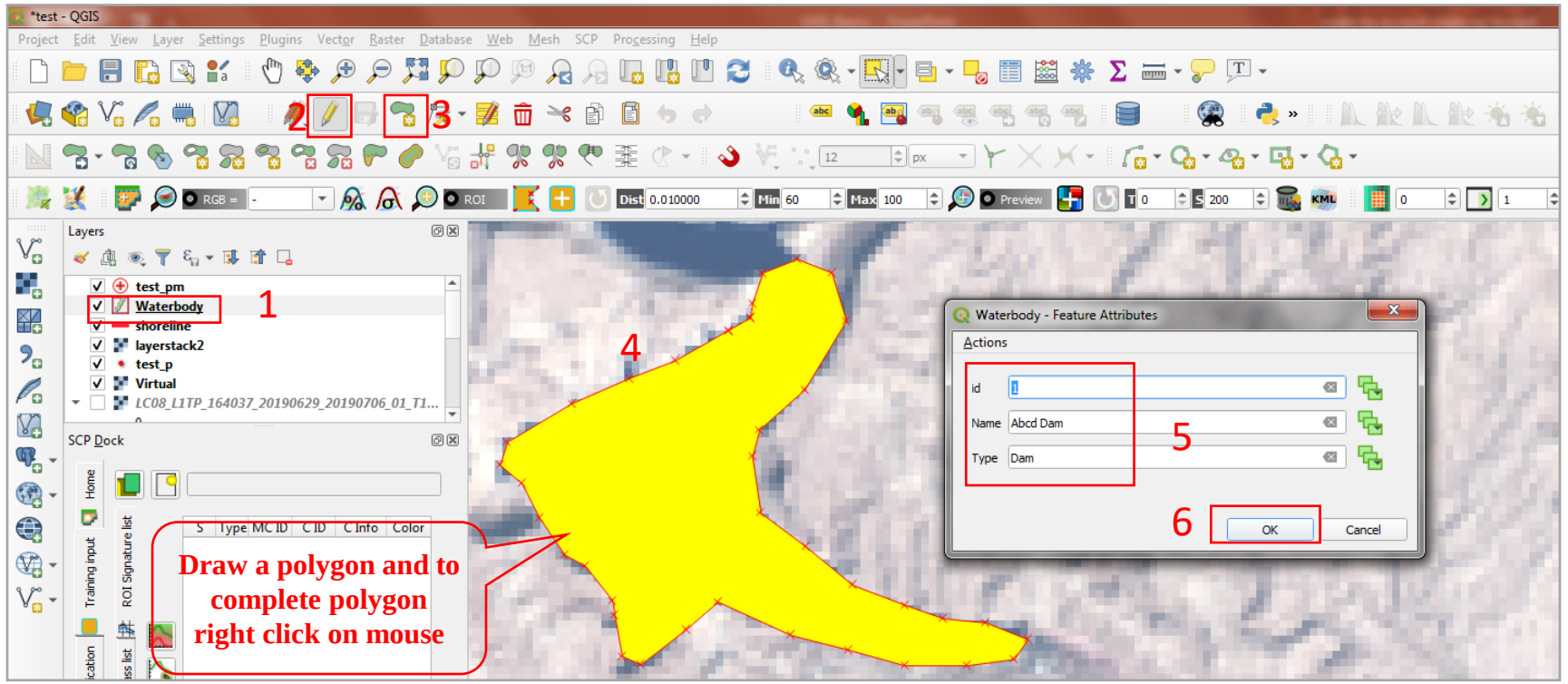
Polygon Shape file creation:

➢ Go to layer ⟶ Create Layer ⟶ New shapefile Layer



Polygon Shape file Editing:

- Select polygon shape file
- Click on Toggle editing ⟶ add polygon feature ⟶ draw a polygon on image

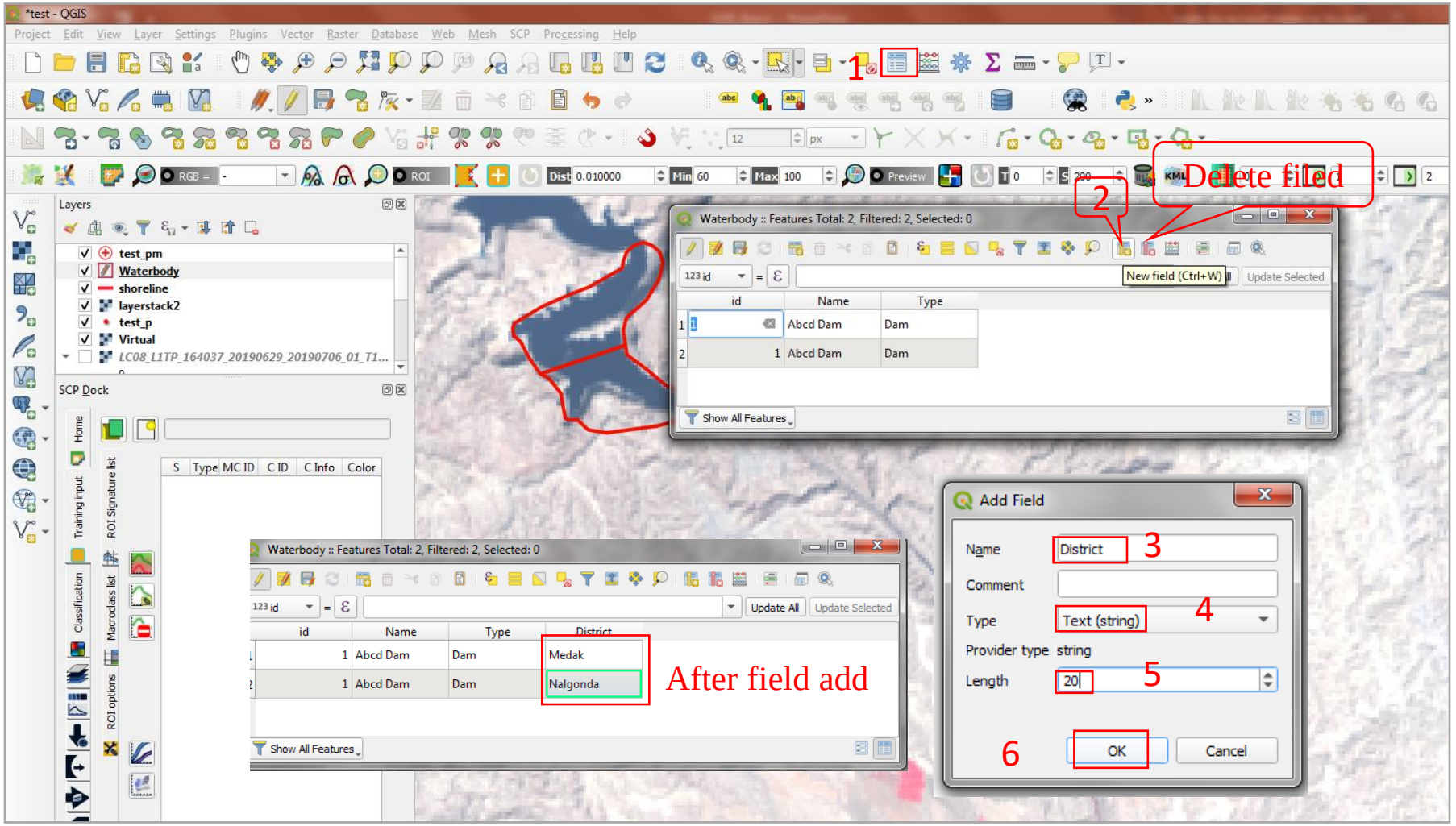


- To save edited data click on save layer edits.
- To stop editing click on Toggle editing

Adding fields to Attribute table

Adding fields to attribute table:

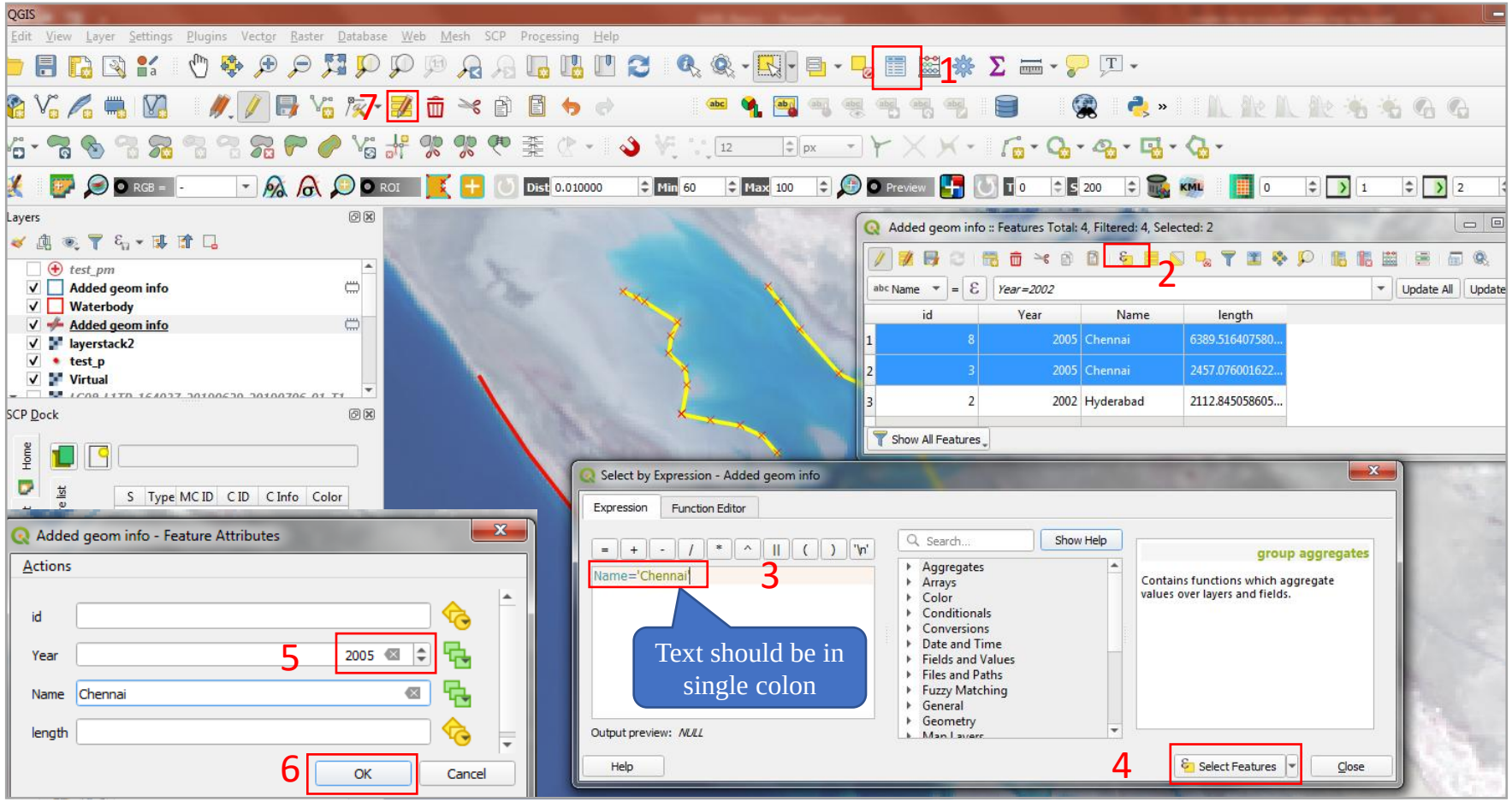
- Click on open attribute table → Attribute table window opens → Click on New field
- Add field window opens → Give the field name, type, length → Ok
- To Delete filed → click on Delete field → Select filed from delete field window → OK



Attribute data editing

If we want give the name to all same class fields at a time:

- Click on open attribute table
- Click on select by expression ⟶ type the expression ⟶ Click on Select feature
- Click on modify attributes of all selected features simultaneously ⟶ enter the name ok



Reference:
https://en.wikipedia.org/wiki/QGIS

Thank you