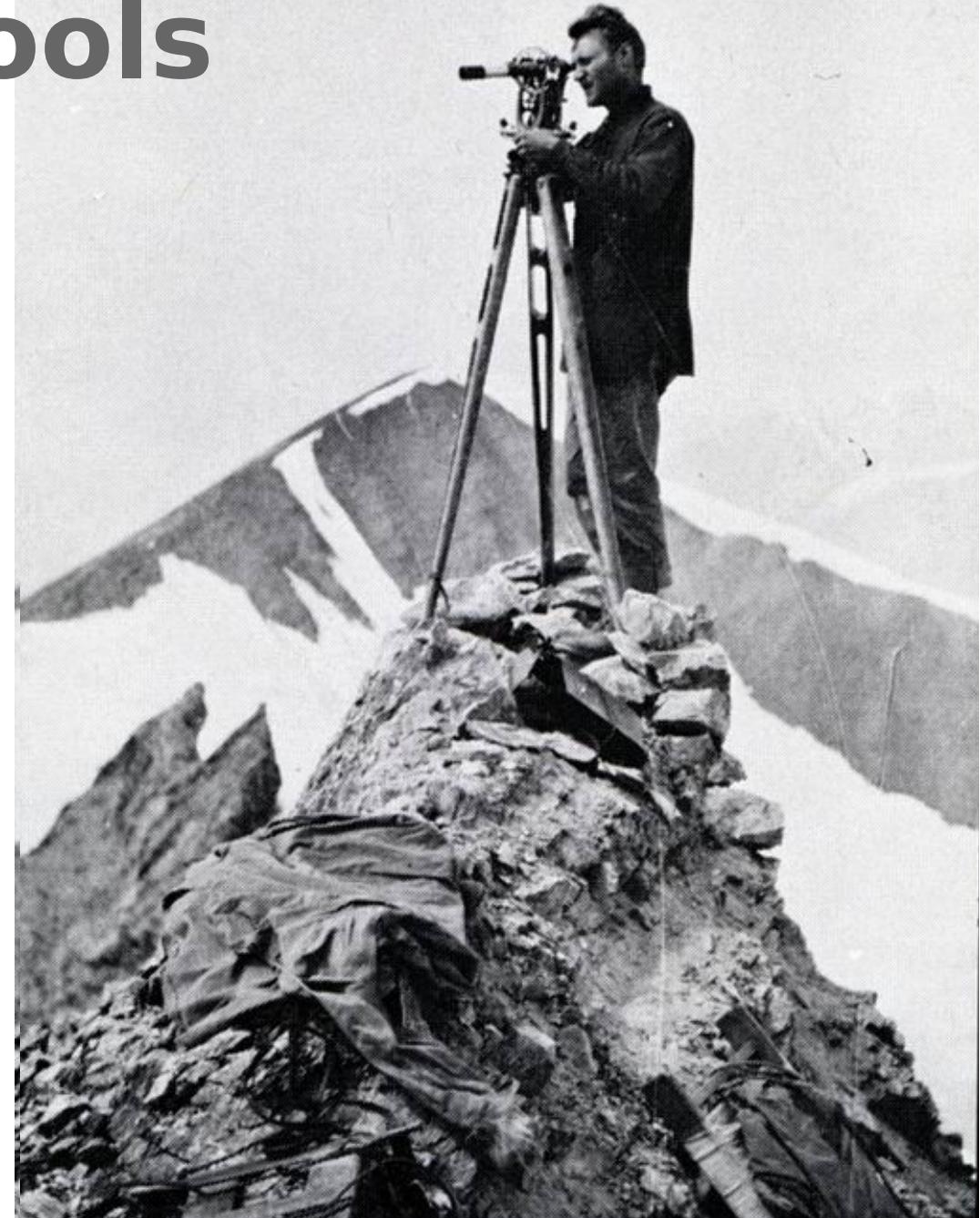
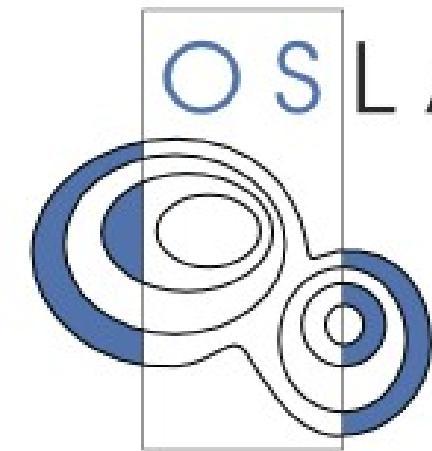


# OpenSource tools for Surveying



**Vincent Picavet**  
**Oslandia**



**OpenSource GIS  
Since 2009**

**Consulting, audit, development, training,  
assistance, support...**

**Environment, transportation, water, energy,  
smartcity, logistics, geomarketing...**

**PostGIS, QGIS, MapServer, Mapnik, Routing,  
data processing, simulation...**

**[www.oslandia.com](http://www.oslandia.com)**

# SUMMARY



**Context**

**The need**

**GIS**

**Data**

**Surveying**

- **Hardware**
- **Software**

**Versionning**

**Simulation**

**Future**



# CONTEXT



# Valcea County, Romania Pop. 300 000

## European project Water network development

### GIS setup needed

29 pumping stations  
19 wastewater stations  
1000km distribution  
350km wastewater



# THE NEED



**Desktop GIS**  
**Field data model**  
**Centralized data repository**  
**Surveying**  
**Offline and versions management**  
**Simulation coupling**  
**Map + web rendering**

**Hardware + Software + expertise**

# **GIS**



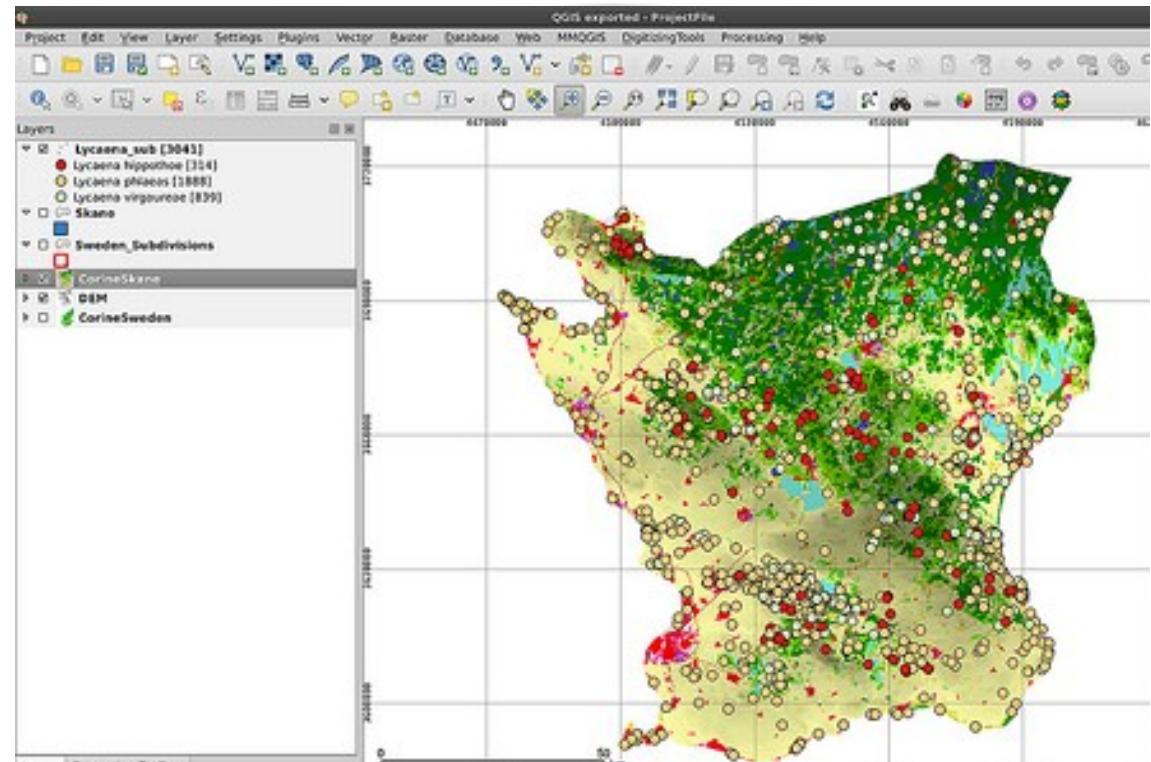


# Desktop GIS : QGIS

**Projects development :**

- Objects
- Symbology
- Composers
- Forms

**Plugin training**

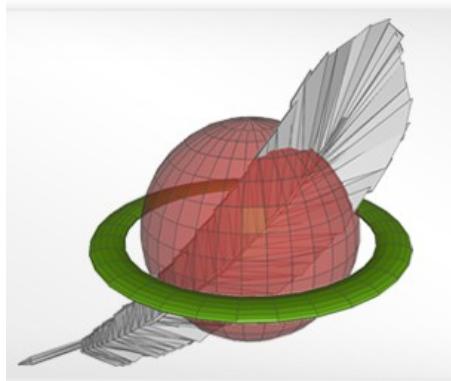




## Data repository : PostGIS

- Version 9.3
- Data model design
- Training

## Embedded : SpatiaLite



PC

## QGIS

Client

Data management  
Database management  
Quantum GIS  
PgAdmin



Data



Spatial database  
**PostgreSQL + PostGIS**

Raster data  
(Aerial, satellite...)



**Synchronization  
Versionning**

Server

## ROAM

Client



Data



Embedded spatial database  
**Spatialite  
Rasterlite**

Surveying

# DATA



# Data model

- Distribution
- Wastewater

**Distribution :**  
**SIGE model**  
**Projet qWat**  
**Nodes, pumps, valves**  
**leaks, pipes, stations,**  
**pressure zones,**  
**tanks...**

**Wastewater:**  
**Work in progress (Ch<sup>2</sup>standard)**

# **SURVEYING - HARDWARE**





# GPS



€525

[http://leica-geosystems.com/downloads123/zz/gpsgis/Zeno\\_GG03/brochures-datasheet/Leica\\_Zeno\\_GG03\\_DAT\\_en.pdf](http://leica-geosystems.com/downloads123/zz/gpsgis/Zeno_GG03/brochures-datasheet/Leica_Zeno_GG03_DAT_en.pdf)

[http://leica-geosystems.com/en/Leica-Zeno-GG03\\_99885.htm](http://leica-geosystems.com/en/Leica-Zeno-GG03_99885.htm)

# Tablet



# PANASONIC FZ-G1

**Windows 8  
(or 7, happily)  
64b, 4GB RAM  
128GB SSD  
WIFI, Bluetooth  
3G/4G  
10" HD  
touch + stylus  
Rugged**



# **SURVEYING - SOFTWARE**





**NMEA GPS Support**  
**Domain-specific objects**  
**Digitizing**  
**Notes**  
**Camera**  
**GUI ergonomy (touch / stylus)**  
**OpenSource**  
**Configurable**  
**Translatable**  
**« QGIS compatibility »**

**« ROAM »**

**Specific application**

**QGIS-powered**

**Same projects**

**Same rendering**

**Vector / Raster**

**Online / offline**

**SpatiaLite data (or other)**

**Project management GUI**

# IntraMaps Roam: Mobile Data Collection

The map displays a street network with buildings labeled with numbers such as Nr. 1, Nr. 2, Nr. 4, Nr. 5, Nr. 6, Nr. 8, Nr. 10, Nr. 10A-Nr. 12, Nr. 11, Nr. 11A, Nr. 12A, Nr. 14, Nr. 16, Nr. 55, and Nr. 57. Several yellow lines represent sewer pipe segments, each marked with a circular icon containing 'CM'. One segment is labeled '250 PVC STR. VEGA' and another is labeled 'STR. STRAUBING'. Other segments are labeled '300 PVC' and '315 PVC'. A green circle with a plus sign and the word 'Cam' is located in the top right corner of the map area.

Map

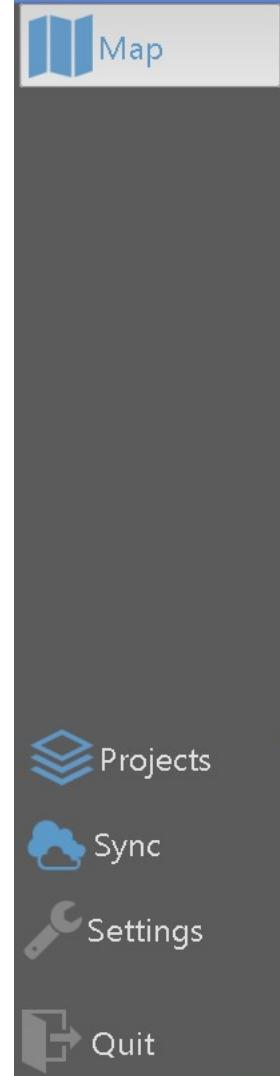
Home View Aerial Photo Pan Zoom In Zoom Out Select Capture Capture at GPS

Projects Sync Settings Quit

Project: Canalizare Valcea User: Tableta.04

Map Center: 451919.853868, 400844.518249

# IntraMaps Roam: Mobile Data Collection



Home View Aerial Photo Pan Zoom In Zoom Out Select Cam Capture Capture at GPS

1 of 1

conducte\_canal (Conducte Canal)

Id	1092
Tip Conducta	Menajera
Material	PVC
Diametru	300
Stare Functională	Functional
Strada	STR. STRAUBING
Forma Conductă	Circular
An Execuție	2010
Descriere	NULL
Ult Editor	postgres
Ult Data	2014-03-11 09:44:00
Ar lesire	266
Ar Intrare	285

Project: Canalizare Valcea User: Tableta.04

Map Center: 451909.701333, 400848.282672

Nr. 5

250 PVC C160

STR. VEGA

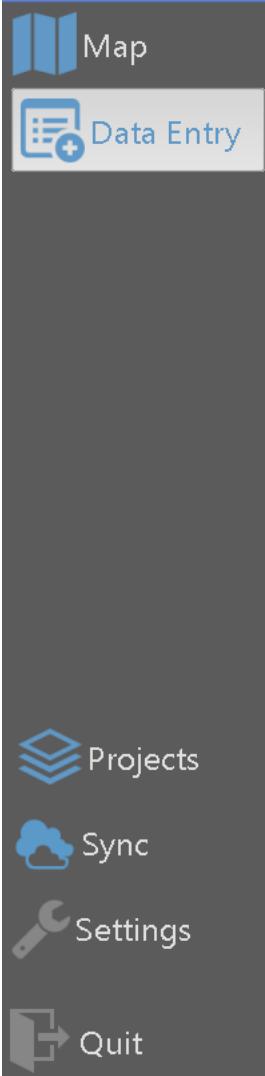
300 PVC

STR. STRAUBING

Nr. 6

Nr. 8

Nr. 12A



Delete



Cancel



Save

Diametru	<input type="text" value="300"/>
Material	<input type="text" value="PVC"/>
Stare Funcțională	<input type="text" value="Functional"/>
Forma Conductă	<input type="text" value="Circular"/>
AR intrare	<input type="text" value="285"/>
AR ieșire	<input type="text" value="266"/>
Descriere	<input type="text"/>



Cancel

Save

ID Conducta Stare Functie Precizie Precizie alti Tip Observatii 

Precizie alti

Imprecisa

Mai buna de 100 cm

Mai buna de 50 cm

Mai buna de 10 cm

Mai buna de 5 cm

Necunoscuta

- Map
- Data Entry
- Projects
- Sync
- Settings
- Quit

# IntraMaps Roam: Mobile Data Collection

Map

Data Entry

Cancel

Save

Functie: Conducta de distributie

Metoda de instalare: Ingropare

Material/Dimensiuni: Polietilena 80

Distribuitor: APAVIL

Precizie: Precisa

Stare: Functional

Tip apa: Potabila

Remark:

Projects

Sync

Settings

Quit

Project:

OSLANDIA

2:26 PM  
4/8/2014

# IntraMaps Roam: Mobile Data Collection

Map      Home View      Aerial Photo      Pan      Zoom In      Zoom Out      Select      Cam▼      Capture      Capture at GPS

camine\_canal (Camin Canal)

conduite\_canal (Conduite Canal)

Id	1091
Tip Conducta	Menajera
Material	PVC
Diametru	300
Stare Functională	Functional
Strada	STR. STRAUBING
Forma Conductă	Circular
An Execuție	2010
Descriere	NULL
Ult Editor	postgres
Ult Data	2014-03-11 09:44:00
Ar lesire	285
Ar Intrare	281

1 of 3

Projects      Sync      Settings      Quit

Project: Canalizare Valcea User: Tableta.04

Map Center: 451909.701333, 400848.282672

IntraMaps Roam: Mobile Data Collection

The application interface for IntraMaps Roam shows an aerial photograph of a residential area. On the left, a vertical sidebar lists project management options: Map, Data Entry (selected), Projects, Sync, Settings, and Quit. The main window title is "IntraMaps Roam: Mobile Data Collection". The toolbar includes icons for Home View, Aerial Photo, Pan, Zoom In, Zoom Out, Select, Capture, and Capture at GPS. An annotation on the map indicates a vertical distance of 250 PVC CM 60 between two points labeled STR. VEGA and STR. STRAUBING. Other annotations include horizontal distances of 300 PVC CM and 150 CM, and house numbers like Nr. 5, Nr. 6, Nr. 8, Nr. 12A, Nr. 14, and Nr. 16.

Map

Data Entry

Projects

Sync

Settings

Quit

Home View

Aerial Photo

Pan

Zoom In

Zoom Out

Select

Cam

Capture

Capture at GPS

Nr. 5

250 PVC CM 60

STR. VEGA

300 PVC CM

STR. STRAUBING

Nr. 6

Nr. 8

Nr. 12A

Nr. 14

Nr. 16

Project: Canalizare Valcea User: Tableta.04

Map Center: 451909.701333, 400848.282672

IntraMaps Roam: Mobile Data Collection

Map

Home View Aerial Photo Pan Zoom In Zoom Out Select Conduct Capture End Capture

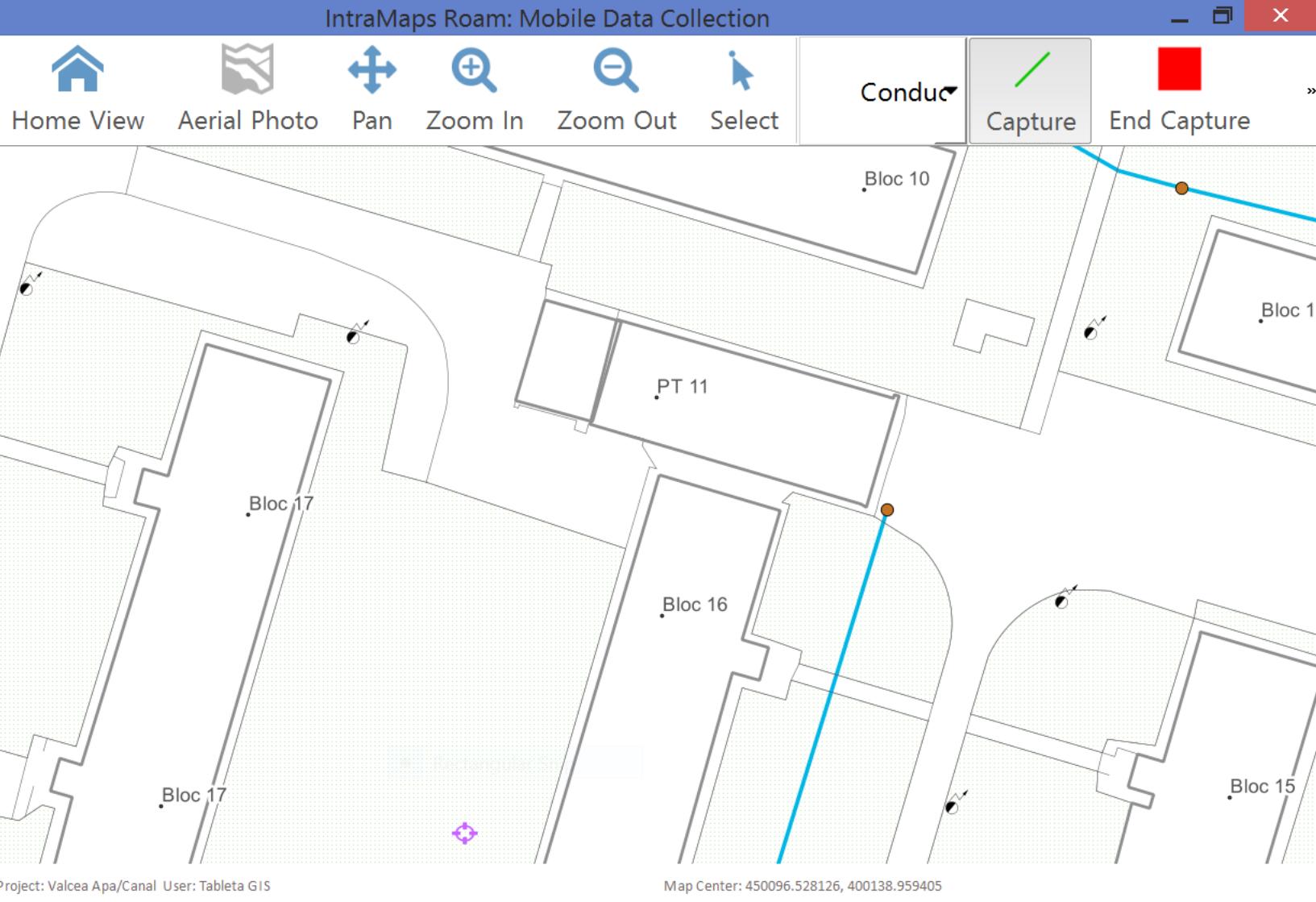
Bloc 11 AL. OLANESTI Bloc 11 Bloc 11 Bloc 12

Projects Sync Settings Quit

Project: Valcea Apa/Canal User: Tableta GIS

Map Center: 450188.578369, 400151.935477

## IntraMaps Roam: Mobile Data Collection



# Project management GUI



IntraMaps Config Manager

Tree Inspection (Sample)

Open Project Folder Open In QGIS Save Project

Project Title: Tree Inspection (Sample)

Description: Sample tree inspection module

Enable any layers that should be enabled for selection. Point selection layers can also be used for data capture.

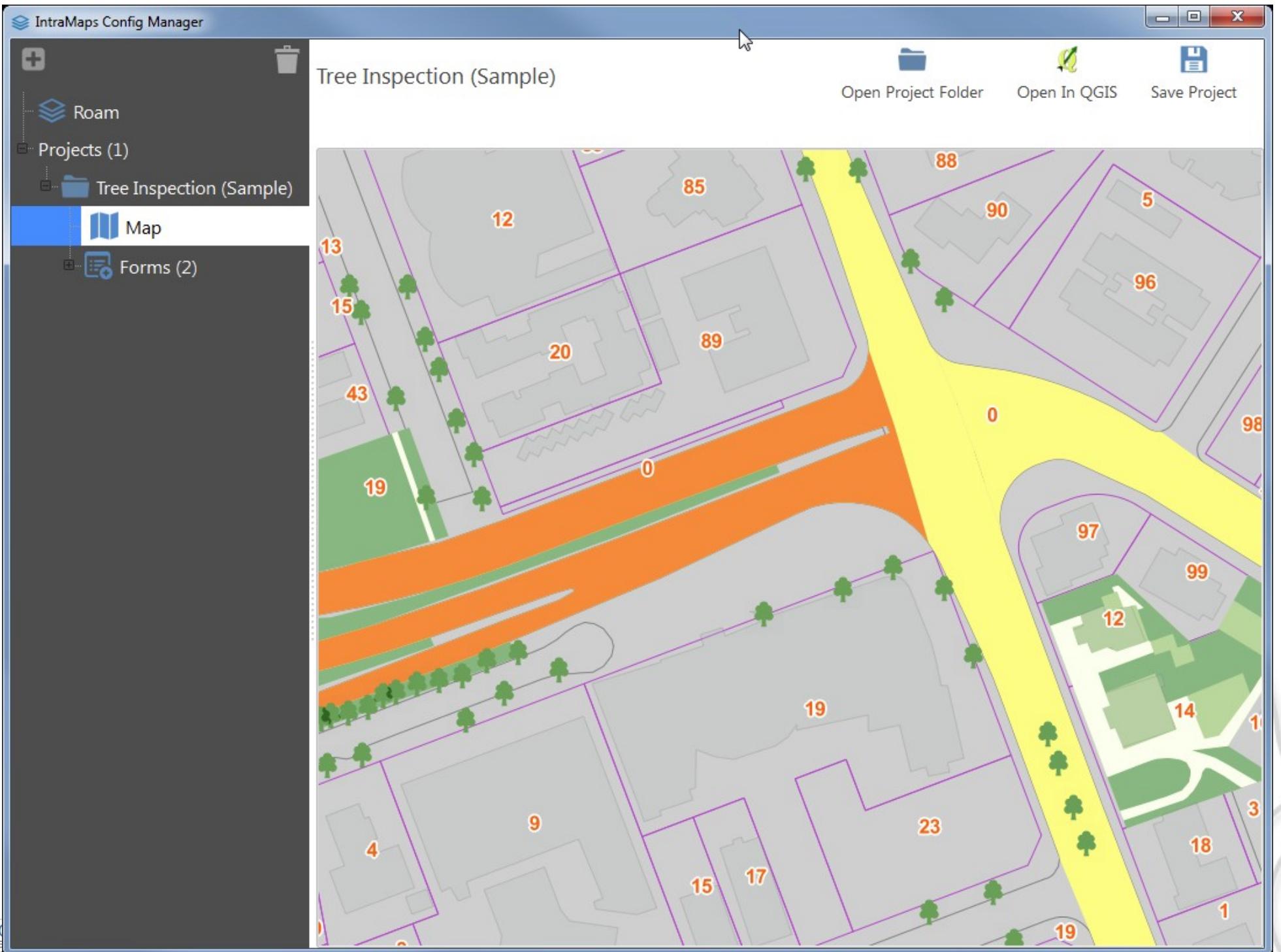
Main Roads  
 Adjacent Councils  
 Trees  
 River  
 House Number

Compatible Roam Version: 2.0.0 You are running IntraMaps Roam version 2.0.0

Splash



The City of South Perth logo features the text "City of South Perth" in a stylized font. The word "City of" is in gold, and "South Perth" is in blue. Below the text are three wavy lines in blue and gold, representing water or waves.





Roam

Projects (1)

Tree Inspection (Sample)



Forms (2)

Second Inspection

Tree Inspection



## Tree Inspection (Sample)



Open Project Folder



Open In QGIS



Save Project

Form folder [trees2](#)

Label Second Inspection

Capture Layer Trees

Type auto

Form

Preview



Add Attribute



Remove Attribute

ID (Text)

Ward (List)

Photo (Image)

Inspection Date (Date)

Powerlines over head? (List)

Suburb (List)

Tree height (m) (Text)

Condition (List)

Botanical Name (List)

## Attribute

Field ward (TEXT)

Name Ward

Control List

Required?

Hidden?

Read Only Never

Default Value

 Allow Null Value From layer From pre-defined list

Single item per line. Descriptions can be added after the item using a semicolon e.g Test ; My Testing

Sub Type;Como Beach

Sub Type2;Mill Point

Sub Type3;Moresby

Sub Type4;Manning

# VERSIONNING



# **Strong project requirements :**

- data history**
- offline work**
- scenario management**

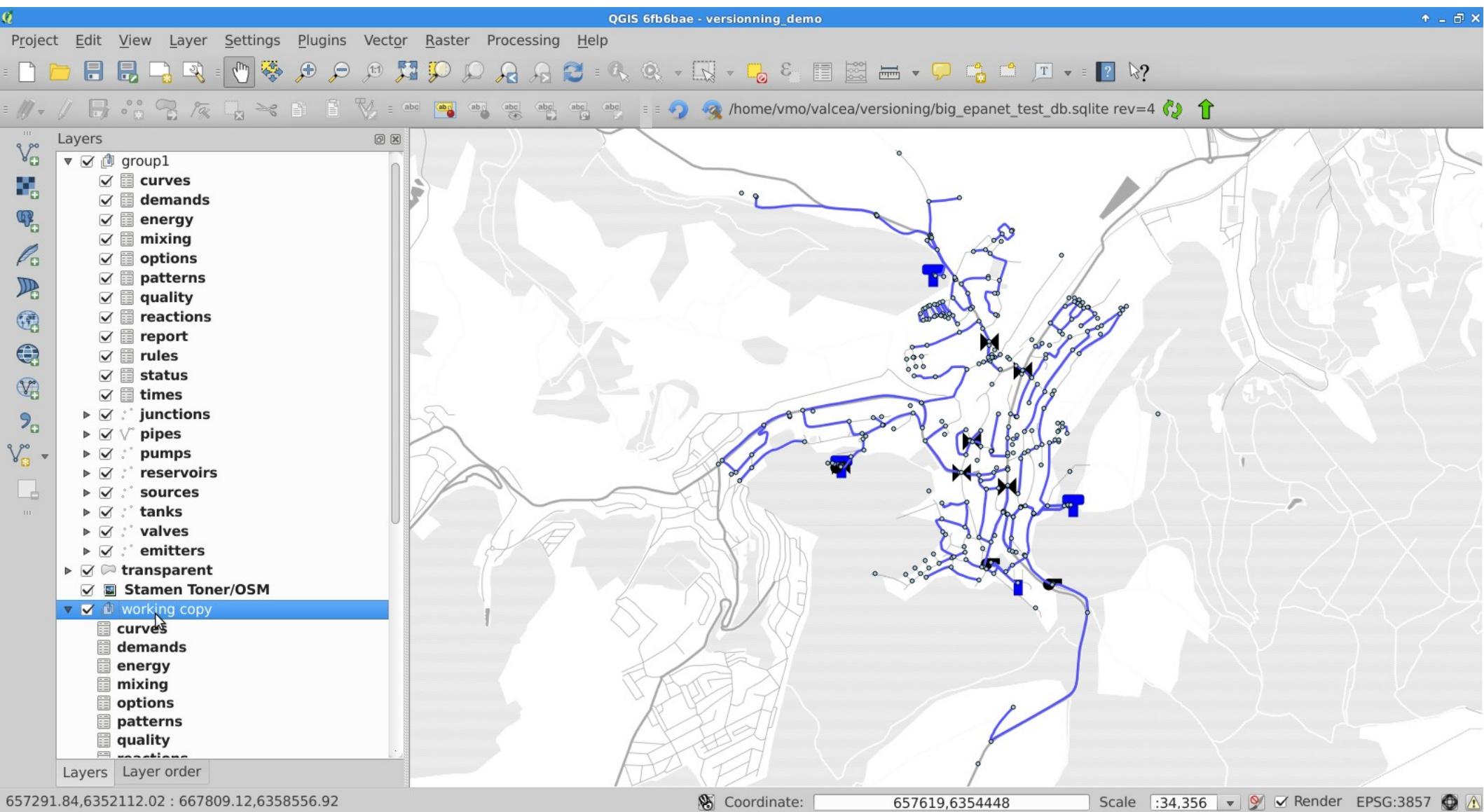
**=> data versionning**

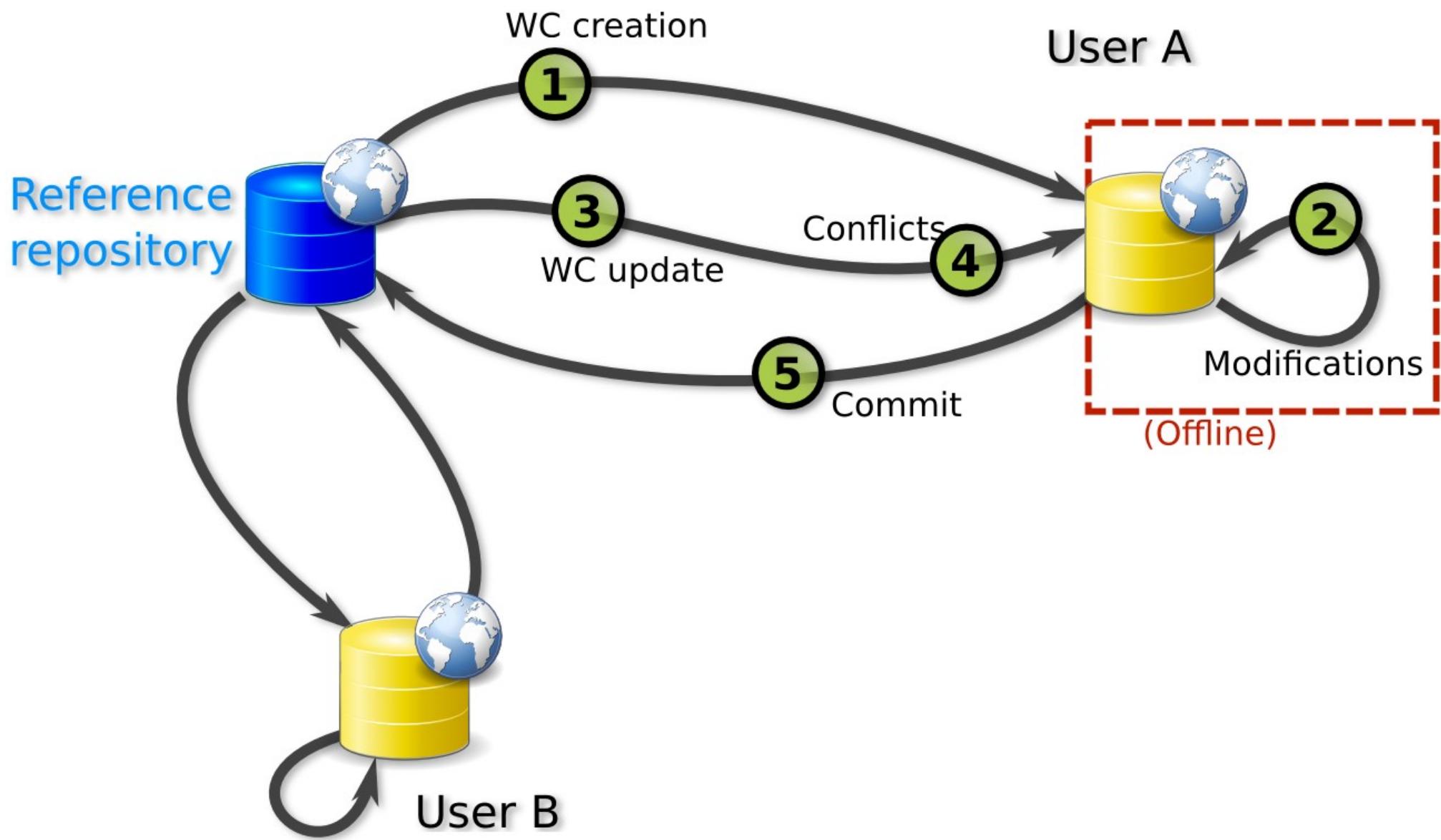
- PostGIS / SpatiaLite**
- commits**
- branches**
- conflict management**



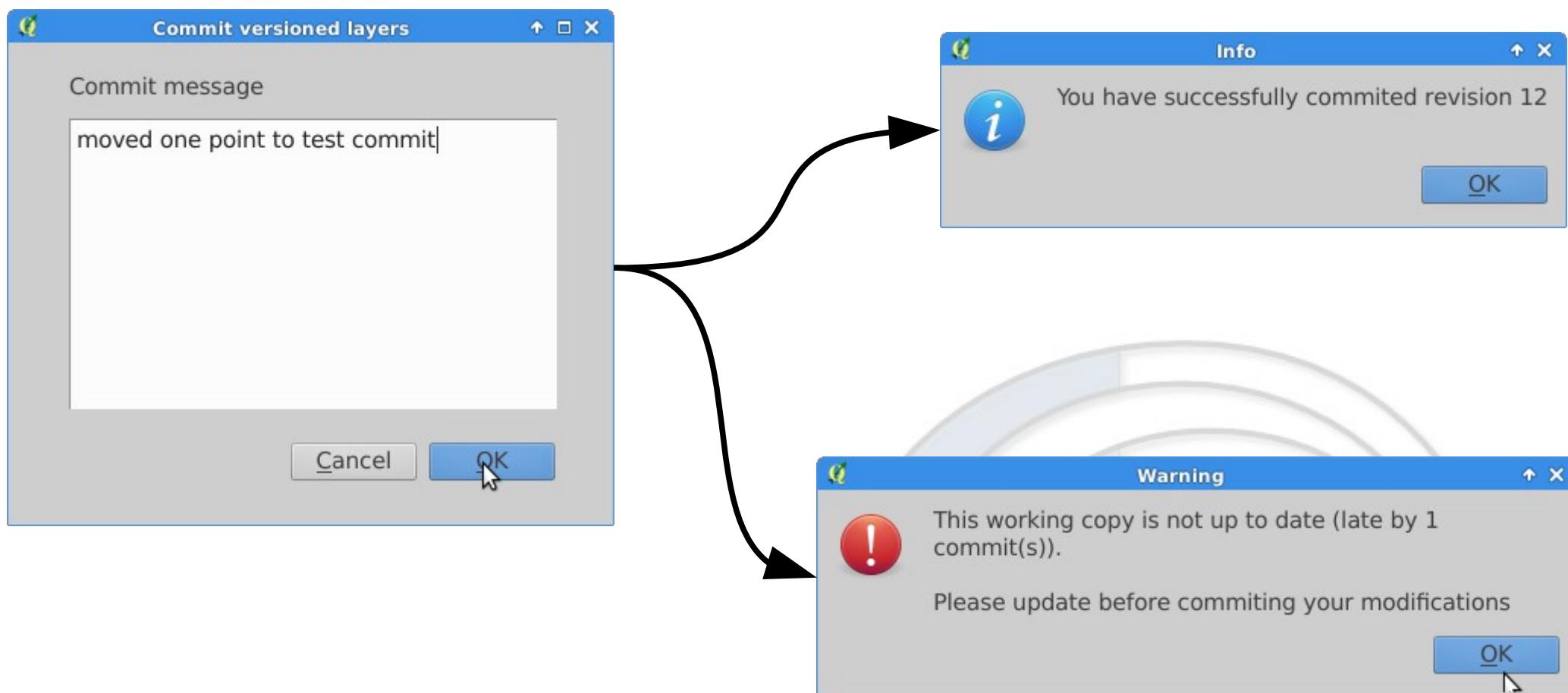
# Working copy (WC)

- Offline (SpatiaLite) → Tablet
- In database





# Commit



# Conflict management

A screenshot of QGIS showing conflict management for a network layer. A warning dialog box is displayed at the top left:

**Warning**

Unresolved conflicts for layer(s) junctions.

Please resolve conflicts by opening the conflict layer attribute table and deleting either 'mine' or 'theirs' before continuing.

Please note that the attribute table is not refreshed on save (known bug), once you have deleted the unwanted change in the conflict layer, close and reopen the attribute table to check it's empty.

**OK**

The main QGIS interface shows the following:

- Project Bar:** Project, Edit, View, Layer, Settings, Plugins, Vector, Raster, Processing, Help.
- Toolbar:** Includes tools for selection, zoom, measurement, and various editing functions.
- Layers Panel:** Shows a tree view of layers:
  - junctions conflicts** (selected)
  - group1
  - working copy
    - curves**
    - demands**
    - energy**
    - mixing**
    - options**
    - patterns**
    - quality**
    - reactions**
    - report**
    - rules**
    - status**
    - times**
  - junctions**
  - pipes**
  - pumps**
  - reservoirs**
- Map View:** Displays a map of a network with nodes (blue dots) and pipes (green lines). A yellow dot is also present on the map.
- Attribute Table:** Shows the attribute table for the selected "junctions conflicts" layer:

conflict_id	origin	action	OGC_FID	id noeud	altitude	emande bas	irbe modulat	unk_rev_beg	runk_rev_end	trunk_parent	trunk_child	branch_rev_b	branch_rev_e	/branch_pare	iybranch_c
0	329	mine	modified	331	N18b2	315.67	0.081346...	DOM_AUD...	12	NULL	329	NULL	NULL	NULL	NULL
1	329	theirs	modified	330	N18b2	315.67	0.081346...	DOM_AUD...	11	NULL	329	NULL	NULL	NULL	NULL
- Bottom Bar:** Includes icons for selection, zoom, and other QGIS functions.

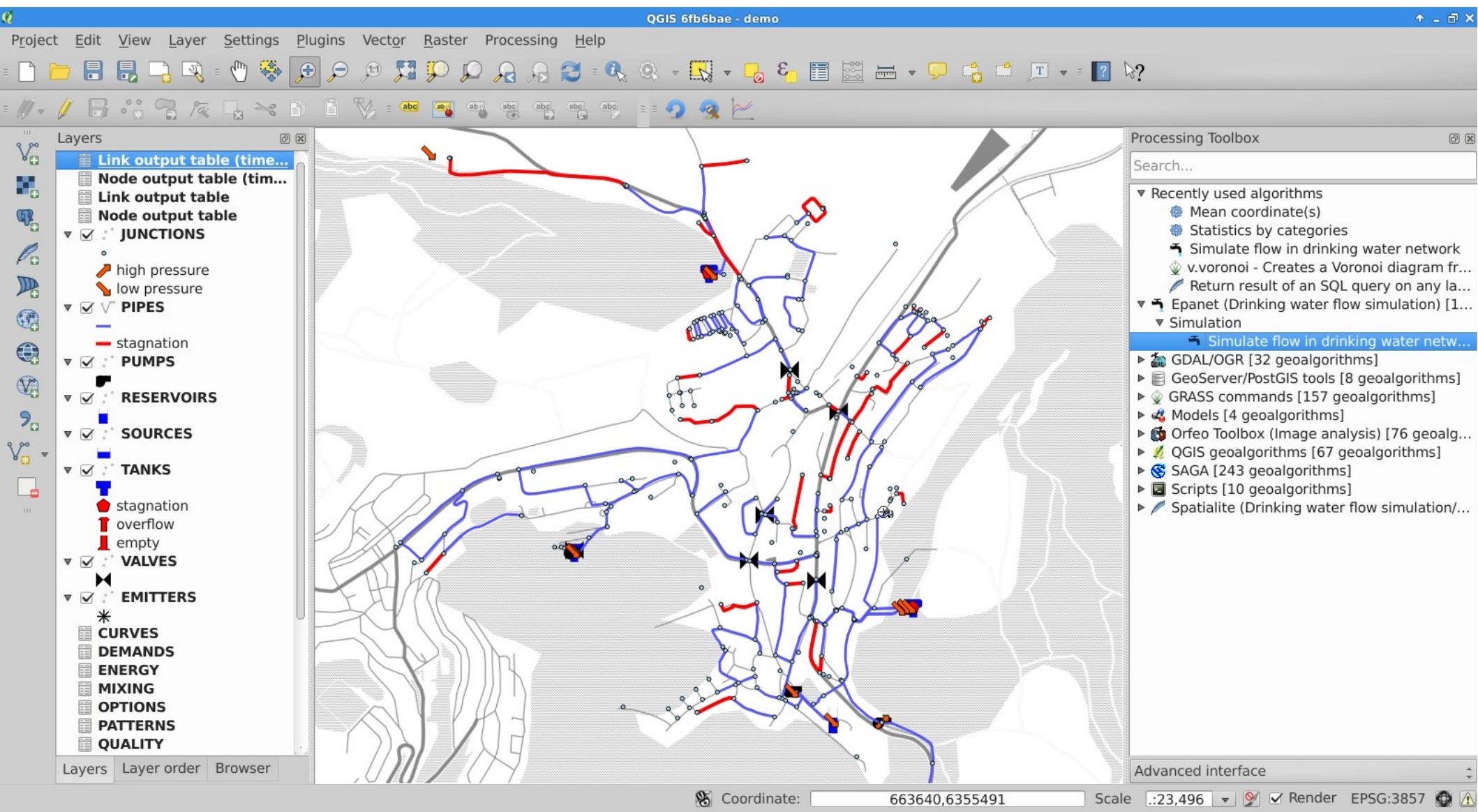
# SIMULATION



# EPANET integration

## Hydraulics simulation

### Processing = geo-data algorithms

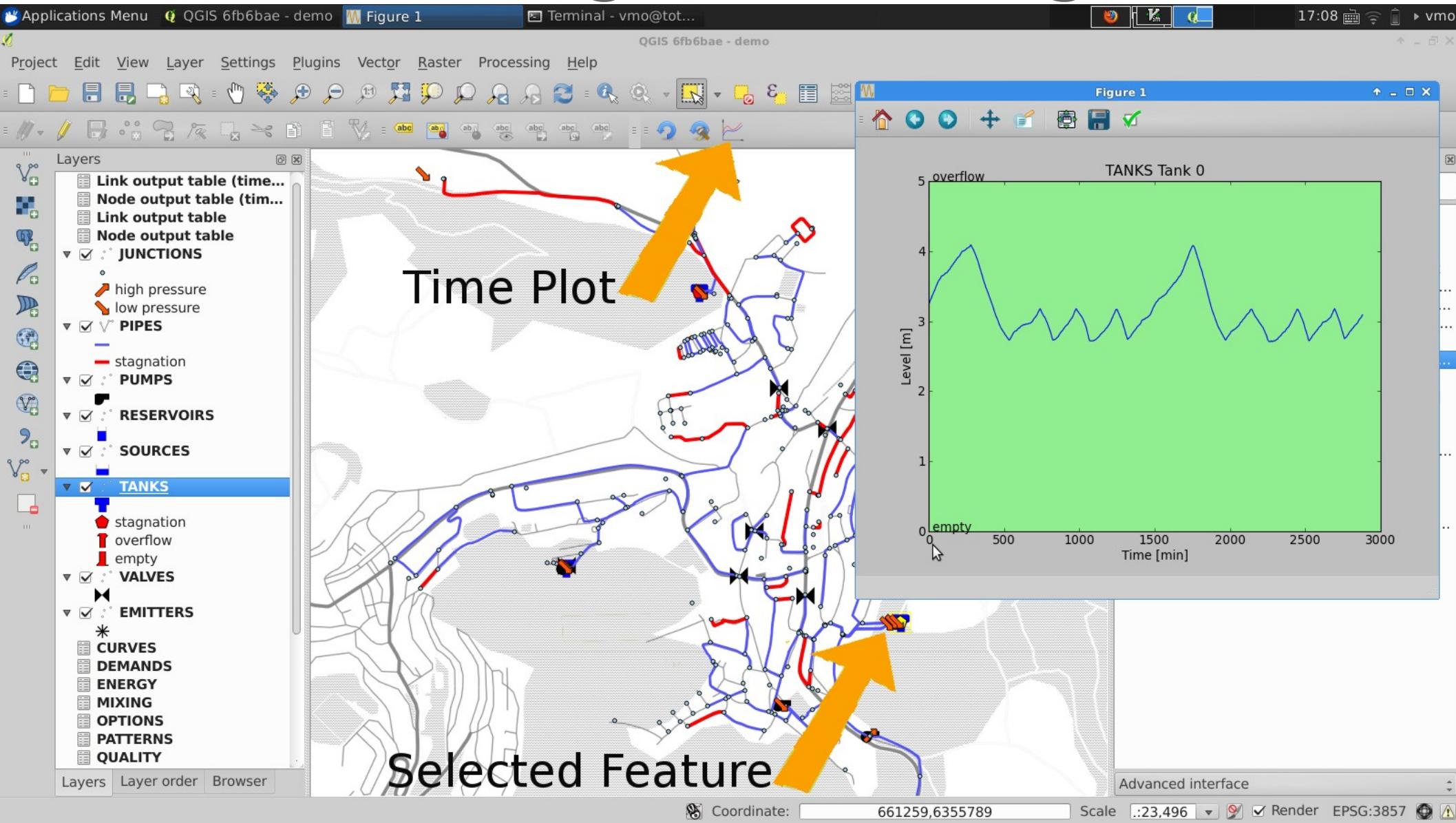


# Map of results

## Temporal data visualization

## Database integration

## SWMM integration coming soon



# FUTURE



**Better domain specific objects**  
Database design (+wastewater), QGIS GUI

**Surveying software improvements**  
GPS tracking and infos, capture data on canvas...

**SCADA connections**

**Geo-Webservices, SOS**

**Integrated software stack**

**Community**  
Users, contributors, funders

# Questions ?

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Thanks to

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Hugo Mercier

Tudor Barascu

Denis Rouzaud

GIS Office of Apavil

Nathan Woodrow (DMS)

