

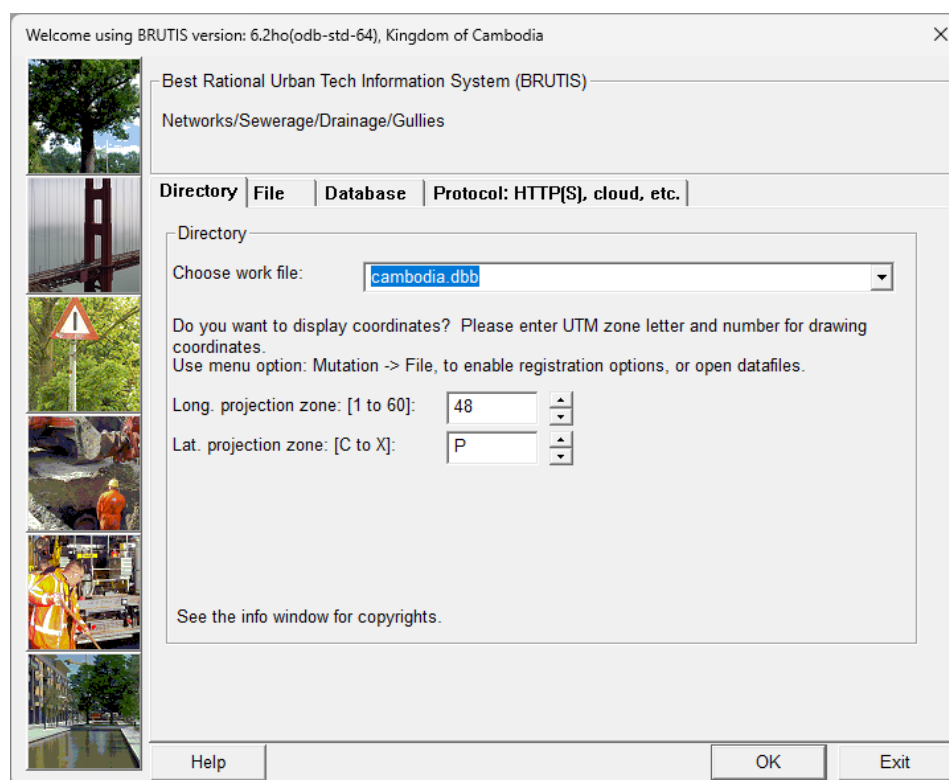
Riodesk

# BRUTIS

## Best Rational Urban Tech Information System

## Urban Drainage and Sewer Management

### *Users Manual*



## Foreword:

This manual is developed as part of the 'Pilot Urban Asset Management System in Kampot'.

This pilot project is part of the second Greater Mekong Sub-region (GMS) Corridor Towns Development Project implemented by the Ministry of Public Works and Transport under Loan agreement 3314-CAM with the Asian Development Bank.

The Project Management and Implementation Support, Detailed Design and Construction Supervision (Package 1) and Capacity Building (Package 2) are executed by **NJS Co., Ltd**, Japan in Joint Venture with **CEST Incorporated**, and **Key Consultants (Cambodia) Ltd**.

This manual is intended as guideline for participants of the training of the **BRUTIS** (Best Rational Urban Tech Information System) application tools for urban infrastructure management.

The manual has been prepared and made available to the 'Pilot Urban Asset Management System in Kampot' project by **Dr. Hendrik Kingma**, Engineer/ Software Developer and owner of the BRUTIS application tools for urban infrastructure management.

# Table of Contents

Chapter	Scope	Page
<b>1</b>	<b>Introduction</b>	<b>1</b>
1.1	General Philosophy	1
1.2	Scope	2
1.3	BRUTIS Documentation	2
1.4	Overview of This Manual	3
<b>2</b>	<b>Terms and definitions</b>	<b>4</b>
<b>3</b>	<b>Installing BRUTIS (detailed)</b>	<b>6</b>
3.1	Installation	6
3.2	Configure the menu and passports of the objects	6
3.3	How to use command line arguments (start options)	9
3.4	Database and ODBC	9
3.5	Connecting a GPS antenna	13
<b>4</b>	<b>Getting started</b>	<b>16</b>
4.1	Installing BRUTIS (global)	16
4.2	Starting BRUTIS	16
<b>5</b>	<b>Opening and importing files</b>	<b>19</b>
5.1	Open and read from files	19
5.2	Import data from files	19
5.3	Mutation (global)	26
5.4	Save to work file or database	27
5.5	Initial creating tables and data storage to database	30
<b>6</b>	<b>Mutation (detailed)</b>	<b>35</b>
6.1	Mutation Files	35
6.2	Conduit Inspection	36

6.3	Insert Nodes	40
6.4	Delete Conduit	41
6.5	Insert Conduit	42
6.6	Gully Cleaning	47
<b>7</b>	<b>Display Options</b>	<b>49</b>
7.1	Adjusting the GUI	49
7.2	Zoom Options	50
7.3	Find Options	51
7.4	Adjust Text formats	51
<b>8</b>	<b>Data Options</b>	<b>53</b>
8.1	Nodes	53
8.2	Conduits	53

<b>Appendix A</b>	<b>Command Line Arguments for changing behaviour BRUTIS</b>
<b>Appendix B</b>	<b>CSV and Revision file coding system</b>
<b>Appendix C</b>	<b>Coding system related to inventory and visual inspection</b>
<b>Appendix D</b>	<b>Example of how to convert data from geometry to the BRUTIS Model</b>
<b>Appendix E</b>	<b>BRUTIS Database</b>

# 1 Introduction

Welcome to the Urban Drainage Management System BRUTIS, developed by <https://www.riodesk.com>, based on the best management practice of sewage and drainage professionals in the Netherlands.

BRUTIS is an abbreviation for **B**est **R**ational **U**rban **T**ech **I**nformation **S**ystem. In BRUTIS is drain and sewer management an integral part of the management of all other objects in the urban space.

This software allows you to collect data, investigate conditions, perform assessments, plan, implement and improve drain and sewer systems. Based on the European Standard EN 13508-2

## Contents

- General philosophy of BRUTIS
- Scope
- Overview of this manual

## 1.1 General Philosophy

The general philosophy of BRUTIS is simplicity.

The system is easy to install because it consists of one executable: **BRUTIS64.exe**, and a **NCSEcw.dll** file for viewing ECW aerial photos. You only have to copy **BRUTIS64.exe** and **NCSEcw.dll** file to your MS Windows operating system.

The user interacts with BRUTIS through a graphical user interface (GUI). The main focus in the design of the interface was to offer an attractive geographical toolbox for rational management of urban drainage and sewer systems. The interface provides for the following functions:

- File management
- Read data from GIS, like Geo-Database, Shape-, CSV<sup>1</sup>- or Internet Files,
- Global Positioning (GPS)
- Data entry and editing
- Assessment tools
- Reporting facilities

The data is stored in a work-file or in a database. Possible databases are: Oracle, MS SQL-Server or MS Access.

After defining a username and password in Oracle or MS SQL-Server or creating a database file (.mdb) with MS Access the user connects with the database with the standard Open Data Base Connectivity (ODBC) functions supplied on all MS Windows computers.

The user is able to experiment, prototype or collect data in a mutation-file. The database administrator transfers the data from mutation-files or data read from GIS to the database with the BRUTIS buttons.

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<sup>1</sup> CSV is an abbreviation for comma separated values, The shapefile format is a geospatial vector data format for GIS.

After data transfer the database BRUTIS creates automatically a work-file with the database data after the transfer. BRUTIS displays the data in the work-file in the graphical user interface (GUI). With the work-file and mutation-file you can use BRUTIS outdoor for data collection and investigation without database connection.

## 1.2 Scope

BRUTIS is applicable for urban drain and sewer systems, which operate under gravity or pressure, from the point where the sewage leaves a building or roof drainage system, or enters a road gully, to the point where it is discharged into a treatment works or receiving water.

Urban drainage and sewer systems consist of several objects, for example:

- Conduits:
  - drainage canals;
  - pipes;
  - culverts in drainage canals;
  - etc.
- Nodes:
  - 
  - Manholes;
  - gates in outlets to rivers;
  - pumping stations;
  - reservoirs or retention basins;
  - etc.

The most important data input for the management system is:

- What do we have (urban drainage system)
- What is the performance (does it meet design standards)
- What is the level of physic condition (damages)
- What is the level of maintenance (sedimentation)

For a proper management of the entire system, it is of great importance to have access to a reliable database in which data of the entire system are included.

Even more important is to regularly update this database. The purpose of the database is having actual data for investigation of the hydraulic, structural and operational performance and to make yearly and a long-term planning for maintenance and investments.

BRUTIS is the interface between user and database.

## 1.3 BRUTIS Documentation

The BRUTIS documentation is arranged in the following two categories:

Documentation	Description
User's Manual	This manual provides installation instructions on how to get started and collect data with BRUTIS.
Reporting and Planning Guide	This manual is guide to using BRUTIS for reporting the performance, check the physic condition and the level

of maintenance, and perform costing and planning.

## 1.4 Overview of This Manual

This Users manual is the primary piece of documentation on how to use BRUTIS for:

- getting started
- the collection of available data;
- investigation and collection of missing data;
- implementation of the data in a management database.

In appendix A is documented how to change the behaviour of BRUTIS. The CSV and mutation-file coding system is defined in appendix B. The coding system for the registration of the drainage condition is defined in appendix C. Examples of how to import survey data is reported in appendix D. The BRUTIS database is defined in appendix E

## 2 Terms and definitions

For the purpose of this manual, the following definitions apply:

### Canal

Open water course designed to carry wastewater and/or surface water.

### Culvert/Orifice

Opening in a weir.

### Conduit

Drain, canal, culvert, rising main or pipeline designed to carry wastewater and/or surface water from node to node. Each conduit is defined by both node numbers and a conduit id.

### Ditch

Small open water course designed to carry wastewater and/or surface water.

### Drain

Pipeline or ditch, designed to carry wastewater and/or surface water from a source to a sewer.

### Drain system

Network of drains and ancillary works that conveys wastewater and/or surface water to a cesspool, sewer system or other place of disposal.

### Gate/Outfall

Final length of conduit from which sewage is discharged to a treatment works or receiving water.

### Gully

A deep ditch or channel cut in the earth by running water after a prolonged downpour.

### Installations

All extra hardware needed to drive pumps, adjust valves or measure data.

### Invert

Lowest point of the internal surface of the barrel of a pipe or channel at any cross section.

### Inspection chamber

Chamber with a removable cover constructed on a drain or sewer that provides access from surface level only, but does not permit entry of a person.

### Manhole

Chamber with a removable cover constructed on a drain or sewer to permit entry by personnel.

### Node

Manhole, inspection chamber, outfall or other significant intermediate point. Each node is defined by X- and Y Coordinates and a unique number.

### Pipeline

Assembly of pipes, fittings, masonry and insitu concrete units and joints between manholes and other structures.

**Pumping station**

Facilities including pumps and equipment for pumping fluids from one place to another. They are used for a variety of infrastructure systems that many people take for granted, such as the supply of water to canals, the drainage of low-lying land, and the removal of sewage to processing sites.

**Receiving water**

Any body of water such as a sea, river, stream or lake as well as an aquifer into which drain or sewer systems discharge

**Rehabilitation**

All measures for restoring and upgrading the performance of existing drain and sewer systems.

**Repair**

Rectification of local damage

**Rising main**

Pipe through which sewage is pumped

**Sewer**

Pipeline, ditch or canal designed to carry wastewater and/or surface water from more than one source.

**Sewer system**

Network of sewers and ancillary works which conveys wastewater and/or surface water from drains to a treatment work or other place of disposal.

**Spillway**

Final node from which sewage is discharged to a treatment works or receiving water.

**Weir**

A dam placed across a canal or in a node to raise or divert the water, or to regulate or measure the flow. A weir is defined by a from and to node number.

## 3 Installing BRUTIS (detailed)

### Contents

- Installation.
- Configure the menu and passports of the objects;
- How to change the behaviour of BRUTIS by using command line arguments;
- Create a database and connect with Open Database Connectivity (ODBC);
- Connecting a GPS Antenna.

In this tutorial it is assumed that you install BRUTIS in the directory: C:\BrutisData

### 3.1 Installation

Simply copy the BRUTIS64.exe file to a project directory on your MS Windows operating system. The BRUTIS64.exe has an icon as depicted in figure 3.1



Figure 3.1

### 3.2 Configure the menu and passports of the objects

BRUTIS has many menu options and an extensive data model. To make it easier to use, it is possible to disable menu options and hide object data.

Menu option: “**Display / Configure menu and toolbar...**”, start the window shown in figure 3.2.1

This window lists all menu options, represented by a code, menu text and an: 1 or 0.

By changing menu texts, you can, for example, clarify them or put them in a different language. With a 1 you ensure that the option is present. With a 0 it is not present.

With the [OK] button you save the changes in the file: **brutis\_init.csv**, and close the window. With the [Cancel] button you close the window without saving the changes.

Restarting the program takes effect the changes to the menu.

**brutis\_init.csv** also stores the data field texts of, among other things, the node and pipeline passports.

You can also open **brutis\_init.csv** with an editor or with MS Excel, and directly make changes to the menu and passports.

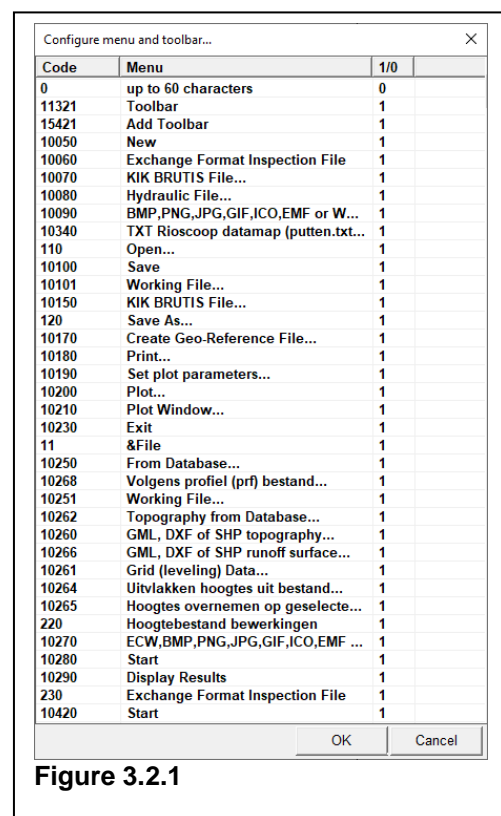


Figure 3.2.1

Figure 3.2.2. shows an example with a notepad view of brutis\_init.csv and the conduit passport, with all conduit data fields enabled, by code 1.

<p>CONDUIT,AAD,"From node no.:",1                  CONDUIT,AAF,"To node no.:",1                  CONDUIT,AAZ,"Pipe No.:",1                  CONDUIT,ABF,"Date of change:",1                  CONDUIT,ABG,"Time mutation:",1                  CONDUIT,ACJ,"Pipe type:",1                  CONDUIT,ACK,"System type:",1                  CONDUIT,AC3,"Function:",1                  CONDUIT,AC2,"System GWSW:",1                  CONDUIT,AC4,"Operating voltage [v]:",1                  CONDUIT,AC5,"Nominal voltage [v]:",1                  CONDUIT,ACN,"Year of construction:",1                  CONDUIT,ACM,"Year of renovation:",1                  CONDUIT,ACA,"Profile:",1                  CONDUIT,ACG,"Length [m]:",1                  CONDUIT,ACC,"Width [mm]:",1                  CONDUIT,ACB,"Height [mm]:",1                  CONDUIT,AC6,"Bottom width [mm]:",1                  CONDUIT,ACD,"Material:",1                  CONDUIT,AC7,"Material Casing:",1                  CONDUIT,AC8,"Material Lining:",1                  CONDUIT,XAC,"Pressure class:",1                  CONDUIT,XAD,"SDR value:",1                  CONDUIT,ACO,"Joint connection:",1                  CONDUIT,AXP,"joint material:",1                  CONDUIT,ACS,"Foundation:",1                  CONDUIT,ACX,"Basis:",1                  CONDUIT,ACP,"Wall thickness [mm]:",1                  CONDUIT,ACH,"NAP BOB From pit no [m]:",1                  CONDUIT,ACI,"NAP BOB To pit no [m]:",1                  CONDUIT,AKB,"Collection BOB From:",1                  CONDUIT,AKL,"Collection BOB To:",1                  CONDUIT,XXH,"NAP Setting level [m]:",1                  CONDUIT,ACQ,"Hardening type:",1                  CONDUIT,ACR,"Use topsoil:",1</p>	<table border="1"> <tr> <td>Sewerage</td> <td>Common</td> <td>Hydraulic</td> <td>Planning</td> </tr> <tr> <td colspan="2">Description</td> <td colspan="2">Input</td> </tr> <tr> <td colspan="2">From node no.:</td> <td colspan="2">P39</td> </tr> <tr> <td colspan="2">To node no.:</td> <td 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Figure 3.2.2

Figure 3.2.3 shows an Example with a notepad representation of brutis\_init.csv and the conduit passport, in which conduit data fields are disabled, by code 0.

<pre> CONDUIT,AAD,"From node no.:",1 CONDUIT,AAF,"To node no.:",1 CONDUIT,AAZ,"Pipe No.:",1 CONDUIT,ABF,"Date of change:",1 CONDUIT,ABG,"Time mutation:",1 CONDUIT,ACJ,"Pipe type:",1 CONDUIT,ACK,"System type:",1 CONDUIT,AC3,"Function:",0 CONDUIT,AC2,"System GWSW:",0 CONDUIT,AC4,"Operating voltage [v]:",0 CONDUIT,AC5,"Nominal voltage [v]:",0 CONDUIT,ACN,"Year of construction:",1 CONDUIT,ACM,"Year of renovation:",0 CONDUIT,ACA,"Profile:",1 CONDUIT,ACG,"Length [m]:",1 CONDUIT,ACC,"Width [mm]:",1 CONDUIT,ACB,"Height [mm]:",1 CONDUIT,AC6,"Bottom width [mm]:",1 CONDUIT,ACD,"Material:",1 CONDUIT,AC7,"Material Casing:",0 CONDUIT,AC8,"Material Lining:",0 CONDUIT,XAC,"Pressure class:",0 CONDUIT,XAD,"SDR value:",0 CONDUIT,ACO,"Joint connection:",1 CONDUIT,AXP,"joint material:",0 CONDUIT,ACS,"Foundation:",0 CONDUIT,ACX,"Basis:",0 CONDUIT,ACP,"Wall thickness [mm]:",0 CONDUIT,ACH,"NAP BOB From pit no [m]:",1 CONDUIT,ACI,"NAP BOB To pit no [m]:",1 CONDUIT,AKB,"Collection BOB From:",0 CONDUIT,AKL,"Collection BOB To:",0 CONDUIT,XXH,"NAP Setting level [m]:",0 CONDUIT,ACQ,"Hardening type:",0 CONDUIT,ACR,"Use topsoil:",1                 </pre>	<table border="1"> <tr> <td>Sewerage</td> <td>Common</td> <td>Hydraulic</td> <td>Planning</td> </tr> <tr> <th colspan="2">Description</th> <th colspan="2">Input</th> </tr> <tr> <td>From node no.:</td> <td></td> <td>P39</td> <td></td> </tr> <tr> <td>To node no.:</td> <td></td> <td>P40</td> <td></td> </tr> <tr> <td>Pipe No:</td> <td></td> <td>1</td> <td></td> </tr> <tr> <td>Date of change:</td> <td></td> <td>20230310</td> <td></td> </tr> <tr> <td>Time mutation:</td> <td></td> <td>230603</td> <td></td> </tr> <tr> <td>Pipe type:</td> <td></td> <td>jica</td> <td></td> </tr> <tr> <td>System type:</td> <td></td> <td>pipe</td> <td></td> </tr> <tr> <td>Year of construction:</td> <td></td> <td>0</td> <td></td> </tr> <tr> <td>Profile:</td> <td></td> <td>unknown</td> <td></td> </tr> <tr> <td>Length [m]:</td> <td></td> <td>41.959</td> <td></td> </tr> <tr> <td>Width [mm]:</td> <td></td> <td>300</td> <td></td> </tr> <tr> <td>Height [mm]:</td> <td></td> <td>300</td> <td></td> </tr> <tr> <td>Bottom width [mm]:</td> <td></td> <td>300</td> <td></td> </tr> <tr> <td>Material:</td> <td></td> <td>unknown</td> <td></td> </tr> <tr> <td>Joint connection:</td> <td></td> <td>unknown</td> <td></td> </tr> <tr> <td>NAP BOB From pit no [m]:</td> <td></td> <td></td> <td></td> </tr> <tr> <td>NAP BOB To pit no [m]:</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Use topsoil:</td> <td></td> <td>unknown</td> <td></td> </tr> </table> <p style="text-align: center;"> <input type="button" value="LOGBOEK"/> <input type="button" value="OK"/> <input type="button" value="CANCEL"/> </p>	Sewerage	Common	Hydraulic	Planning	Description		Input		From node no.:		P39		To node no.:		P40		Pipe No:		1		Date of change:		20230310		Time mutation:		230603		Pipe type:		jica		System type:		pipe		Year of construction:		0		Profile:		unknown		Length [m]:		41.959		Width [mm]:		300		Height [mm]:		300		Bottom width [mm]:		300		Material:		unknown		Joint connection:		unknown		NAP BOB From pit no [m]:				NAP BOB To pit no [m]:				Use topsoil:		unknown	
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Figure 3.2.3

Brutis\_init.csv contains lines for:

MENU	Menu texts, on/off
OBJECT	Object data field texts, on/off
NODE	Node data field texts, on/off
GULLY	Gully data field texts, on/off
CONDUIT	Conduit data field texts, on/off
PUMP	Pump data field texts, on/off
VALVE	Valve data field texts, on/off
SENSOR	Sensor data field texts, on/off
INST	Installation data field texts, on/off
WEIR	Weir data field texts, on/off
ORIF	Orifice data field texts, on/off

### 3.3 How to use command line arguments (start options)

You can use command line arguments or define all arguments in start options in a **brutis\_init.xml** configuration file, to start your BRUTIS application with special behaviour.

In appendix A you will find a listing of all possible start options.

Go to Windows menu: "**Start -> Run**" and enter the file path and file name of the application, followed by the command line arguments. For example:

```
"C:\BrutisData\BrutIS64.exe" utm=BR,init=kc_init.xml
```

(Including the quotation marks). In this example the file path to the installation directory is C:\BrutisData, the application file name is BRUTIS64.exe, and the command line arguments we are using are:

- utm=BR
- init=kc\_init.xml

Between arguments you should place a comma (,) directly between each command line argument that you wish to use.

Option: utm, defines latitude/longitude to UTM coordinate translation type. The default is: 0.

Option: init, defines the name of the configuration file where all start options are defined. The default is: **brutis\_init.xml**. Use menu option: "**Tools / Start Options...**", to change the options in the configuration file.

If you regularly wish to start your application using command line arguments then you can also create a shortcut on your Desktop which includes them. To do this, right-click on an open space of the desktop and choose "New -> Shortcut". Follow the wizard to create the new shortcut. When it prompts you for location (not name), type the file path and file name followed by the command line arguments, exactly as in the example above.

### 3.4 Database and ODBC

BRUTIS interacts with a user-defined database. It uses ODBC, "Open Database Connectivity", to:

- allow user access to database table and field names;
- transmit data to the database;
- execute generated SQL (Structured Query Language) statements.

The user must:

- create the database;
- configure:
  - an ODBC "Data Source Name" for the database or
  - define an ODBC driver name as start option or command-line argument.

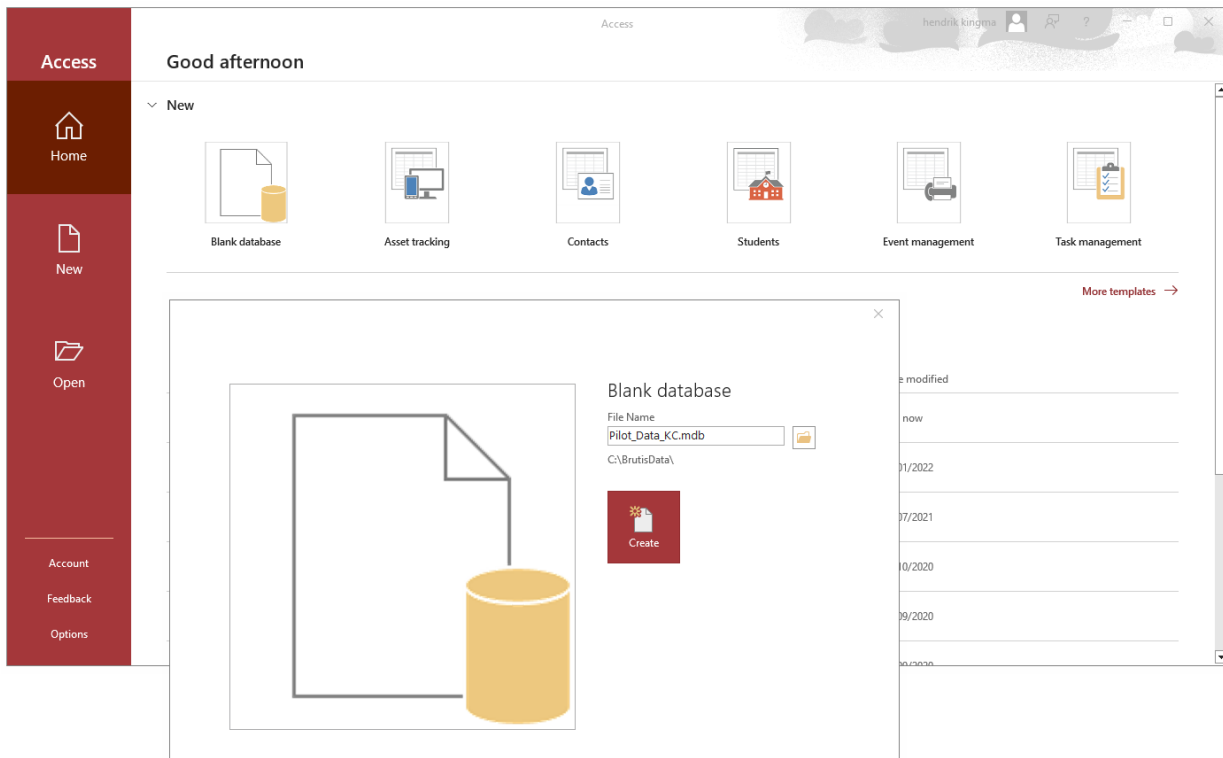
ODBC allows software products like BRUTIS to interact with a wide variety of Database Management Systems (DBMSs). DBMSs like Oracle, SQL-Server and MS Access. The DBMS must provide a software

component known as an ODBC "driver". Most DBMSs available on Windows platforms provide ODBC drivers.

A simple database with ODBC configuration can be created in a matter of minutes, once you know how.

### Creating a database


The user must provide an empty "target" database.



**Figure 3.4.1**

Here's how to create a database using Microsoft Access:

It is assumed that MS Access is installed on the desktop.

1. Start MS Access
2. Create a blank mdb file.
  - a. Click on the "**New**" button and choose the "Blank Database" icon. A "Blank Database" dialog will appear as depicted in figure 3.4.1;
  - b. Click on the "**Browse for a location to put your database**",  button;
  - c. Select a location, Save as type: "Microsoft Access Databases (2002 – 2003 format) (\*.mdb). And type a name for your new database. The new database will have a default name, Database1.mdb and it is recommended that you change this name to reflect your data. In this example we give the name: Pilot\_Data\_KC.mdb. Create the database in the assumed directory: C:\BrutisData
3. Exit MS Access.

The database: Pilot\_Data\_KC.mdb is created in the directory: C:\BrutisData. At this point the database is empty. The database has no tables, queries, forms, reports, and so forth.

BRUTIS will create the database tables automatically when it connects to an empty database and wants to check the data.

### Configuring an ODBC Data Source

The user must configure an ODBC "Data Source Name" (DSN) for the database. This is a simple process of choosing a label and applying it to the database. A Windows program: the ODBC Data Source Administrator, is used for this purpose.

The ODBC Data Source Administrator program can be started in several ways:

- choosing BRUTIS menu option: "**Tools / ODBC Administrator**";
- clicking on the Windows Control Panel "ODBC" icon;
- entering "ODBCAD32" and the Windows command prompt;
- consulting Windows Help and Support: search on "ODBC".

These options are presented because the ODBC Data Source Administrator can be difficult to locate on some systems. The program's file name is ODBCAD32.EXE, and it is often (but not always) in the \WINDOWS\SYSTEM32 directory. Contact [www.riodesk.com](http://www.riodesk.com) if you have trouble finding it.

After starting the ODBC Data Source Administrator, a dialog will appear as depicted in figure 3.4.2.

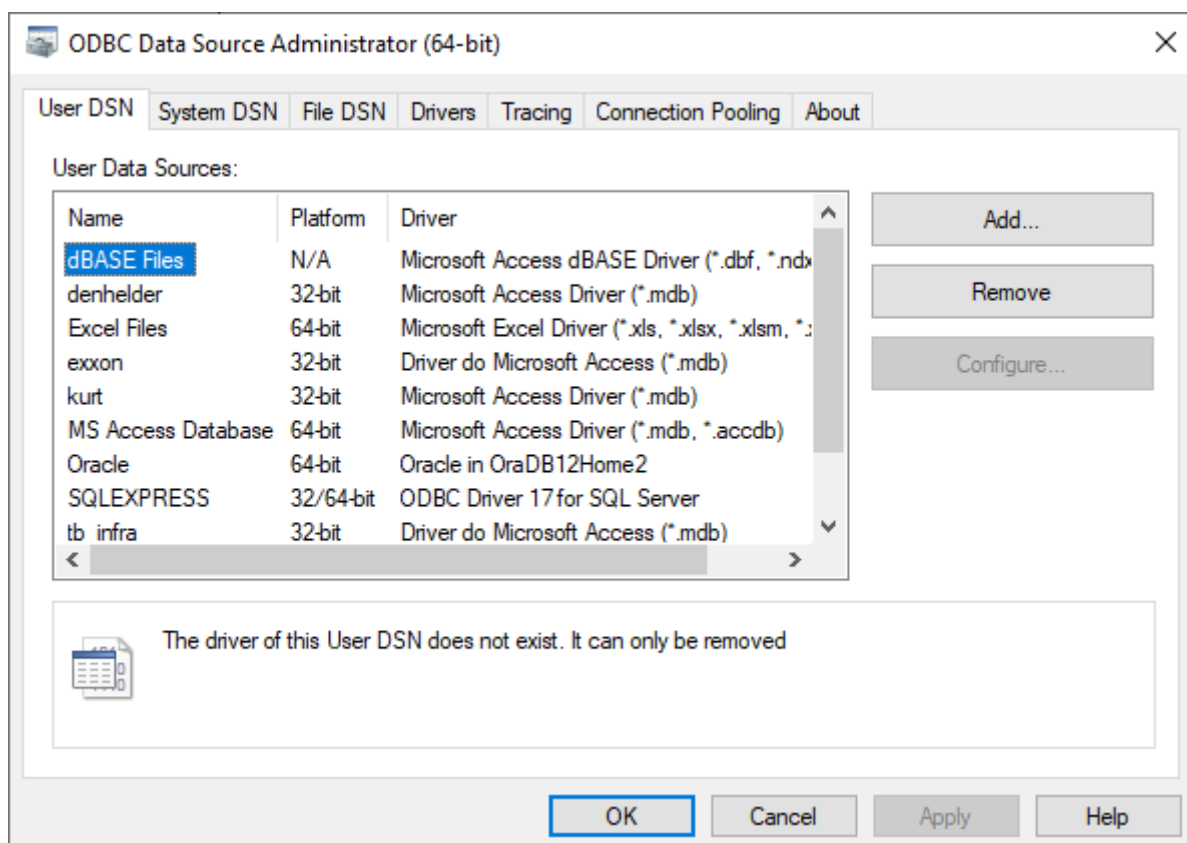


Figure 3.4.2

Once you are running the ODBC Data Source Administrator choose the "**Add**" option. Do add a new Data Source:

A dialog will appear as depicted in figure 3.4.3. Choose the appropriate ODBC driver for your DBMS:

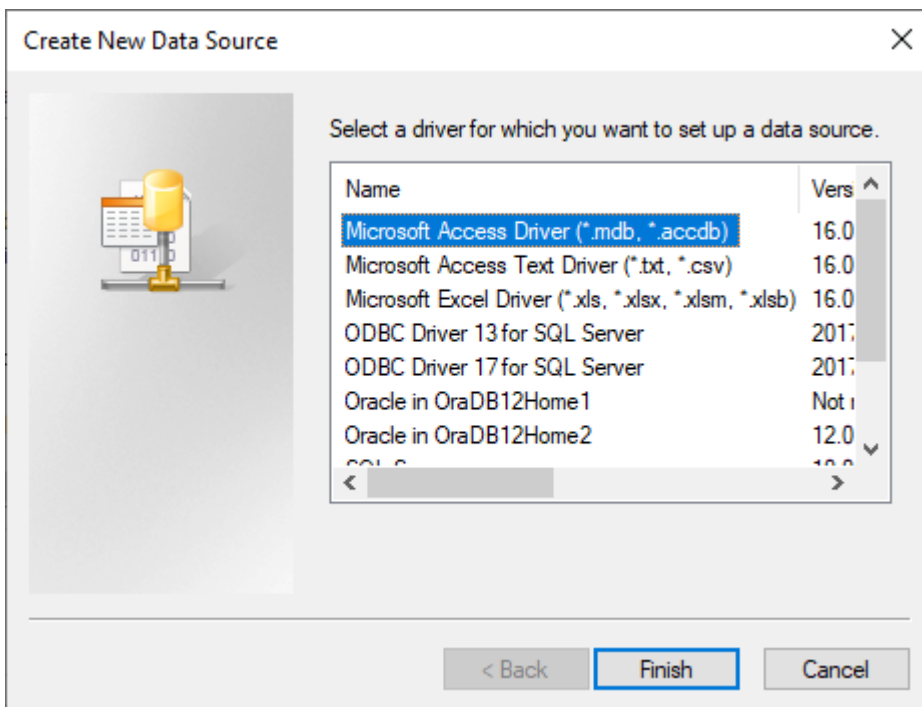


Figure 3.4.3

The next dialog, which is DBMS-specific, allows you to specify the Data Source Name and the location of your database.

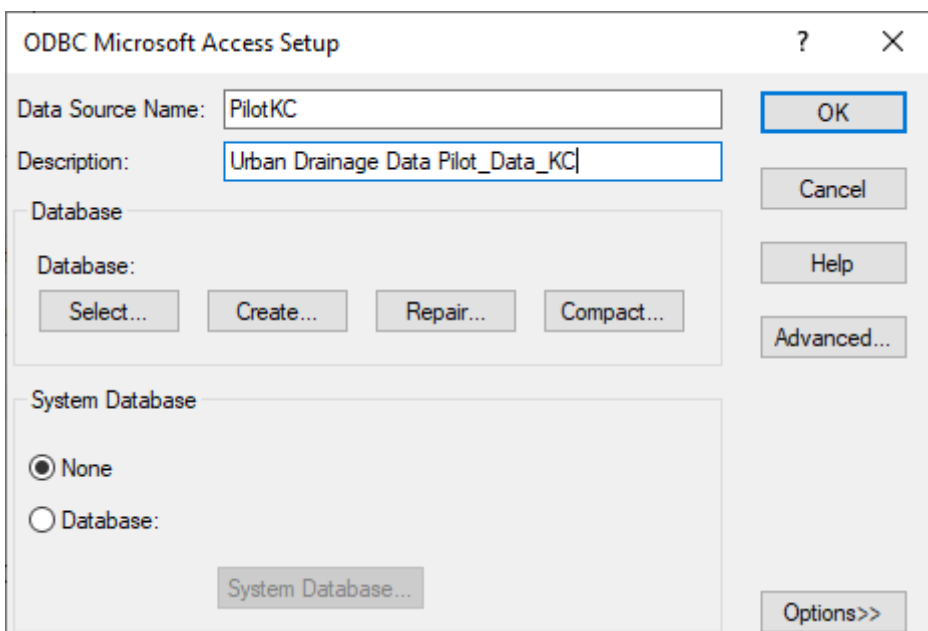


Figure 3.4.4

Enter the data source name and the description of the database. In figure 3.4.4: “PilotKC” and “Urban Drainage Data Pilot\_Data\_KC”

After choosing the Database Select option a dialog will appear as depicted in figure 3.4.5. Select with this dialog the earlier created database file.

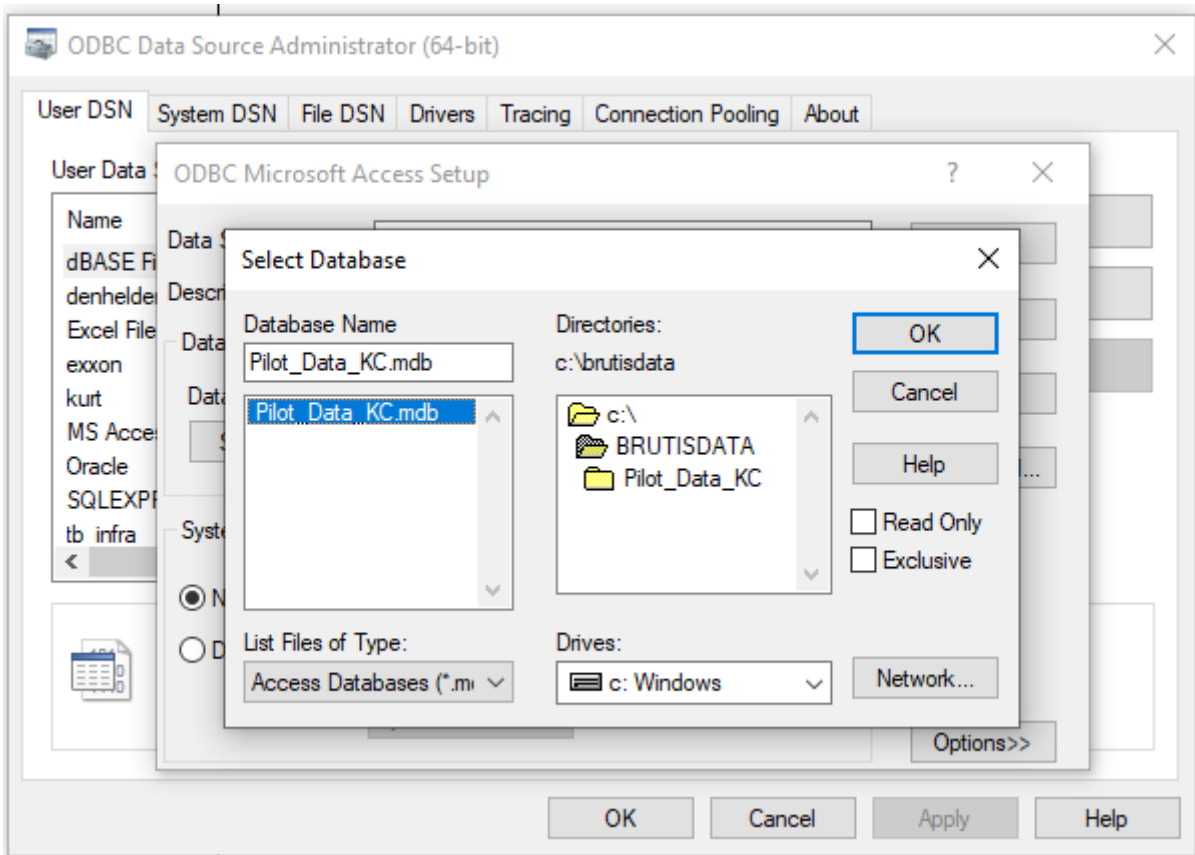


Figure 3.4.5

Once you have specified the Data Source Name, the driver, and the database location you are ready.

### 3.5 Connecting a GPS antenna

For Global Positioning with BRUTIS, you can use:

- The Garmin GPS 18x<sup>2</sup> antenna connected to an available USB port as depicted in figure 3.5.1;
- A GPS antenna using NMEA-0183 protocol connected to an available serial port;

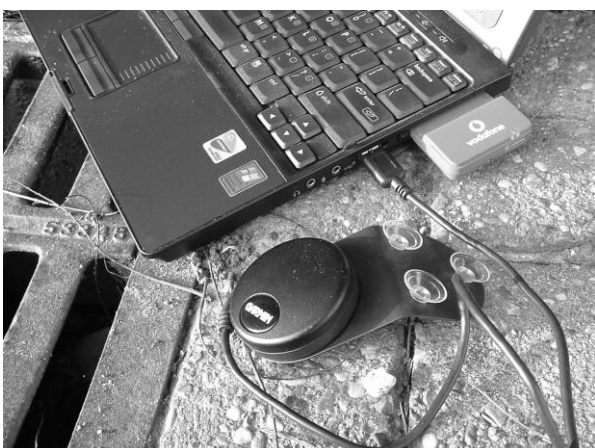


Figure 3.5.1

<sup>2</sup> The Garmin USB 18x is no longer supplied by Garmin

## Garmin GPS 18x

Drivers are available on [www.garmin.com](http://www.garmin.com) for use on Windows computers.

### GPS antenna using NMEA-0183 protocol

For working with these antennas, you need to start BRUTIS with the “gpsport” command line argument with the serial port used for the connection. For example:

```
“C:\Kikker\Kikker.exe” gpsport=COM1:
```

Don’t forget the double points “:” after the port name.

When the command line argument is specified, BRUTIS reads automatically the data received through the defined serial port.

### Global Positioning

BRUTIS starts reading the GPS antenna:

- After start-up and antenna is connected
- choosing BRUTIS menu option: **"Display / Find GPS Position"**
- choosing BRUTIS menu option: **"Display / Display Options"**

BRUTIS checks the serial port for valid data if the command line argument: “gpsport”, is specified. If not specified BRUTIS checks the USB port if there is a Garmin USB 18 connected.

After start-up BRUTIS searches automatically a connected antenna. When a antenna is found BRUTIS displays a notification dialog as depicted in figure 3.11. After clicking **OK** BRUTIS starts reading the position data.

Direct after start up:

- The antenna acquires satellites. The correct position will not be found immediately. The type of position fix will be 1.
- BRUTIS displays the GPS position at the last known position when it had a good satellite reception. (When the fix was 2 or 3).

Wait until BRUTIS displays a fix 3 position quality. In most cases the acquire time takes less than a minute. (Although the initial satellite acquire out of the box takes about ten minutes.)

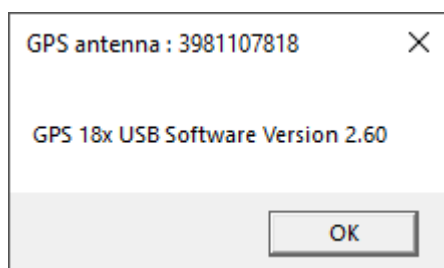


Figure 3.5.2

Check your current position on overhanging trees, rocks or buildings, if no correct position data is found.

When the GPS antenna has a good reception it sends the latitude and longitude to BRUTIS. BRUTIS converts the received data to UTM zone and coordinates. BRUTIS zooms in on the location and displays the coordinates and received information from the antenna as depicted in figure 3.5.3.

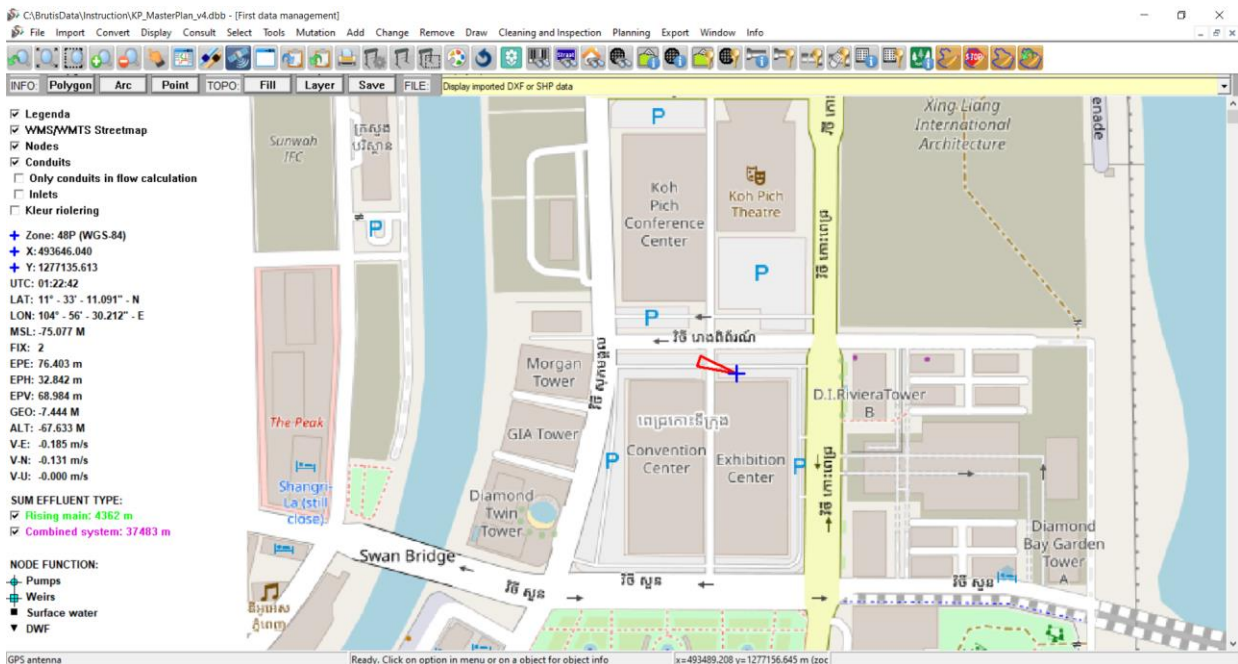


Figure 3.5.3

GPS Antenna information:

- Zone: The UTM zone notification and used translation type (WGS-84 in this example)
- X,Y: The UTM coordinates of the zone in meters
- UTC: UTC Time
- LAT: Latitude in degrees minutes and seconds
- LON: Longitude in degrees minutes and seconds
- MSL: Height of WGS84 ellipsoid above Mean Sea Level MSL (meters)
- FIX: Type of position fix (0 = no fix; 1 = no fix; 2 = 2D; 3 = 3D)
- EPE Estimated position error (meters)
- EPH Estimated position error, horizontal only (meters)
- EPV Estimated position error, vertical only (meters)
- GEO Altitude above WGS 84 ellipsoid (meters)
- ALT Height of WGS84 ellipsoid above MSL (meters)
- V-E Velocity east (meters/second)
- V-N Velocity north (meters/second)
- V-U Velocity up (meters/second)

The usage of the default (WGS-84) parameters for latitude/longitude conversion to UTM zone and coordinates is possible via the usage of command line arguments (See chapter 3.3).

## 4 Getting started

### Contents

- Installing BRUTIS (global)
- Starting BRUTIS
- Opening files and importing Data
- Display options

### 4.1 Installing BRUTIS (global)

Simply copy the BRUTIS64.exe file to a working or project directory on your operating system. The BRUTIS64.exe has an icon as depicted in figure 3.1. In chapter 3 you will find detailed installation information.

### 4.2 Starting BRUTIS

Double-click on the BRUTIS Icon.

When you first start BRUTIS, you will see the welcome dialog as shown in figure 4.2.1

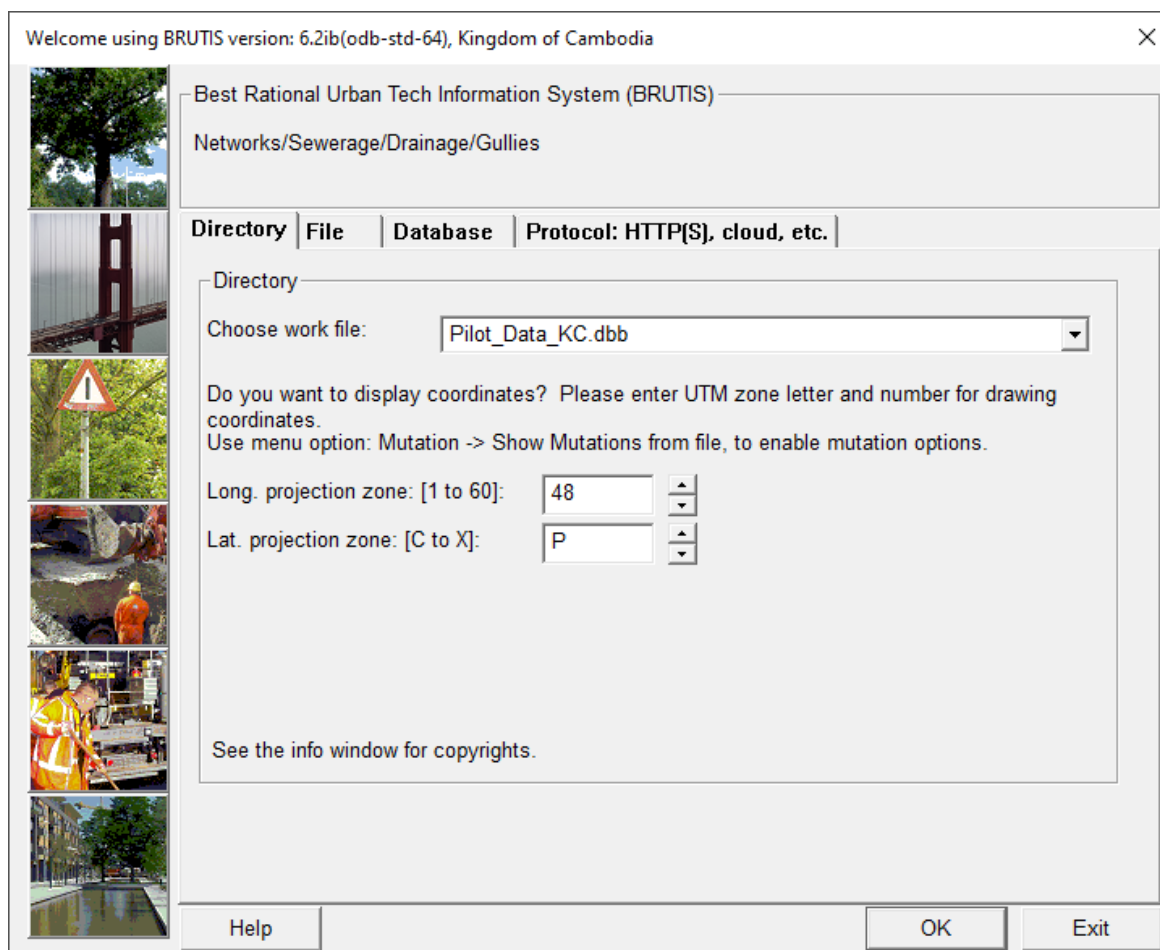


Figure 4.2.1

The welcome dialog has the following 4 tabs:

- **Directory**, you can select a work-file in the folder where BRUTIS64.exe is installed or in the folder defined behind command line argument: address;
- **File**, you can select a work-file, or other suitable file type, from your computer;
- **Database**, you can connect to a database, after which the program will build a work file from this database and display the data from this file;
- **Protocol**, you can connect to the BRUTIS Cloud, after which the program downloads a work-file and displays the data from this file;

Set the correct UTM Zone for displaying the correct coordinate system and the maps from openstreetmap.org. The correct UTM zone for Cambodia is: 48N.

The [OK] button starts the creating of a working file (when tab: Database or Protocol, is selected) and displays the data in the work-file or other selected file type.

The [Exit] button exits the program.

### Database

This tab is used for connecting with a database. When you want to connect to an Oracle or SQL-Server database you need to type your UserName, PassWord and ODBC source name. When connecting with a MS-Access file you only need to type the ODBC source name (See chapter 3.3 or figure 3.5).

For example, type in the ODBC Source name created in chapter 3.5. And click on: **On-Line**

BRUTIS checks if the database has tables for strategic, tactical and operational planning. If not, you will see a dialog as depicted in figure 4.2

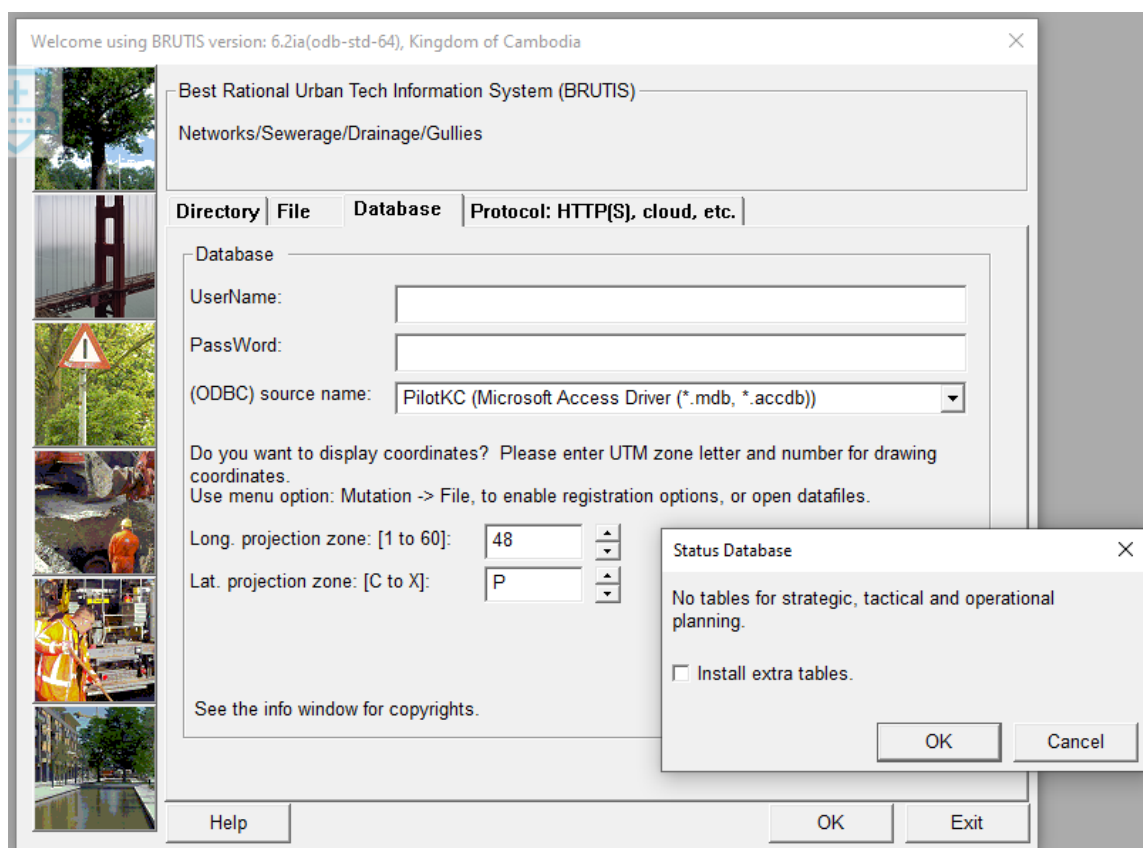
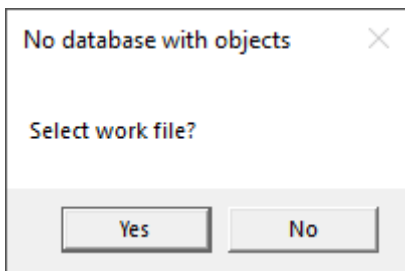


Figure 4.2

Set the check-box on for automatically installing these tables. And Click on **OK**.

BRUTIS creates automatically new work-files if the database contains drainage data.

If the database has no data the dialog in figure 4.3 appears.



Klik [Yes] to change tab, to select a work-file.

### Display data without Global Positioning System (GPS)

BRUTIS displays data from work-files if available. If there are no work-files available a window will appear as depicted in figure 4.3.

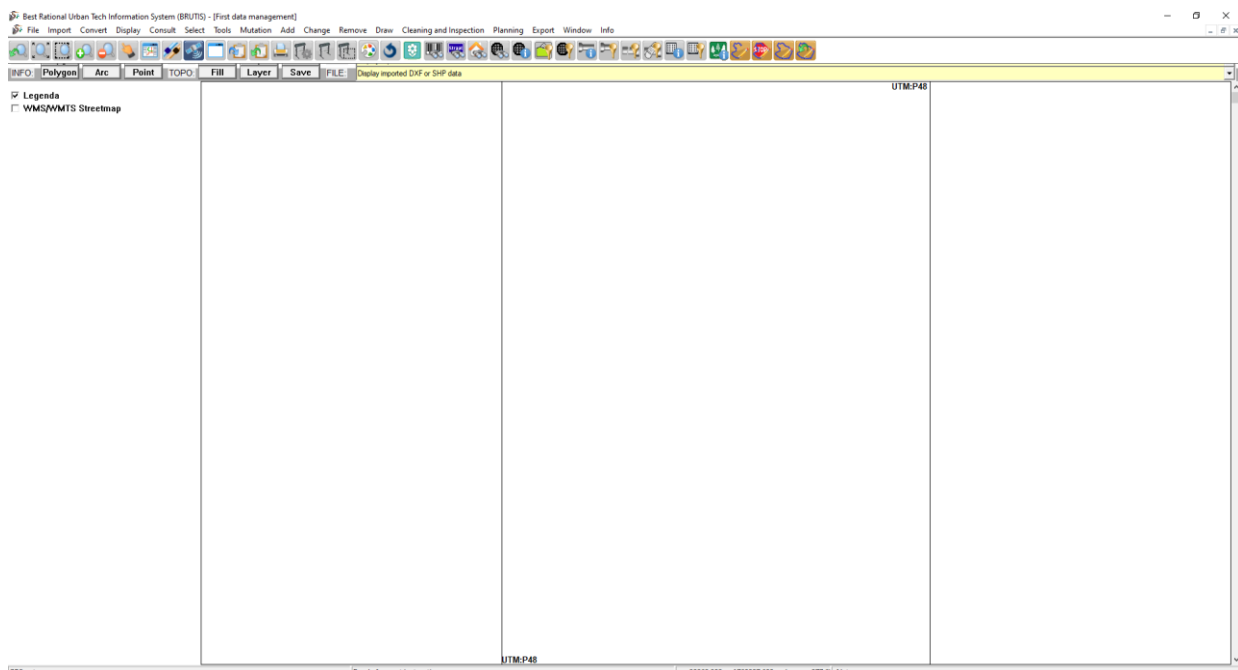


Figure 4.3

### Display data with GPS

BRUTIS automatically starts reading the GPS antenna if the GPS antenna is connected (see chapter 3.5)

When an antenna is found BRUTIS displays a notification dialog as depicted in figure 3.5.2. After clicking **OK** BRUTIS starts reading, and displays the last known position when the GPS fix is 1. Wait for a fix 2 or 3. Fix 3 normally gives an acceptable actual position. In most cases the acquire time takes less than a minute. (Although the initial satellite acquire out of the box takes about ten minutes.)

## 5 Opening and importing files

BRUTIS is a multi-windows program. Each window represents a file. Each file represents an Urban Drainage Network.

The first window (the start-up window) is called: "First data management". In this window you can create or import a mutation-file for experimenting, prototyping or collecting data.

### Contents

- Open and read from files
- Import data from files
- Mutation (global)
- Save in work file or database
- Initial creating tables and data storage to database

### 5.1 Open and read from files

Opening and reading a file can be started in several ways:

- choosing BRUTIS menu option: "**File / Open**";
- clicking on the toolbar button: "**Open**".

BRUTIS displays the data from the opened files in a new window with the filename as window title. An exception is the opening of a BRUTIS data file (.KIK) with nodes or gullies. When the "First data management" window has no nodes or gullies the data will be imported in this window without the creation of a new window.

BRUTIS opens, reads and displays data from files with the extensions:

- KIK BRUTIS data file with Urban Drainage Network in Comma Separated Format (CSV);
- SUF Inspection data (Used in the Netherlands);
- CYC Cyclone hydraulic calculation data;
- HYD Sobek hydraulic calculation data;
- TXT Mouse hydraulic calculation data (old format);
- UND Mouse hydraulic calculation data (only objects);
- MEX Mouse hydraulic calculation data (objects and catchments);
- DSD InfoWorks hydraulic calculation data (old format). New format via importing CSV files choosing menu option: "Import / CSV Object Data...";
- BMP Bitmap. Geo referenced when: ".bpw" world file available in same directory;
- JPG Or JPEG. Geo referenced when: ".jgw" world file available in same directory;
- PNG Portable network Graphics. Geo referenced when: ".pgw" world file available in same directory;
- EMF Enhanced Metafiles and Windows Metafiles

### 5.2 Import data from files

Importing data can be started choosing BRUTIS menu option: "**Import**" followed by one of the following options:

- **From Database**
- **GML, DXF or SHP topography**
- **ECW, BMP, PNG, JPG, GIF, ICO, EMF or WMG Image**
- **Exchange format Inspection File / Start**

- **CSV Object Data / Start.**

**From Database**

This option is used if you want to import drainage data from database:

- to add the data to the current data
- replace the current data with data from the database.

If not connected a dialog will appear as depicted in figure 5.2.1



Figure 5.2.1

After connecting to the database, the window according to figure 5.2.2 appears, in which it is indicated which management system has been found.

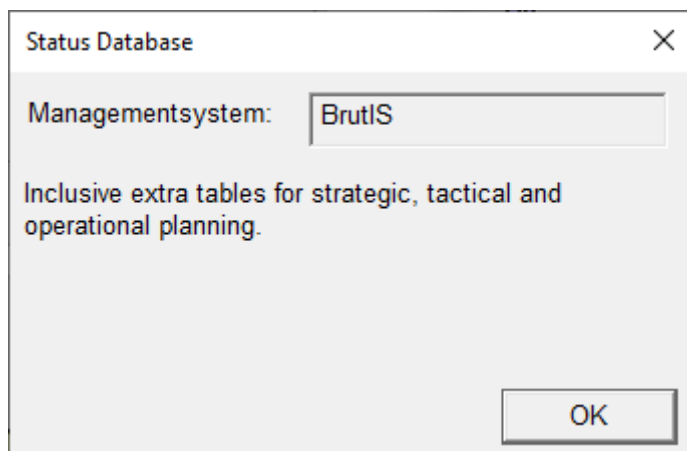


Figure 5.2.2

After which a new work file is created behind the scenes. And a window (figure 5.2.3) appears asking if you want to add the found data or replace the current data.

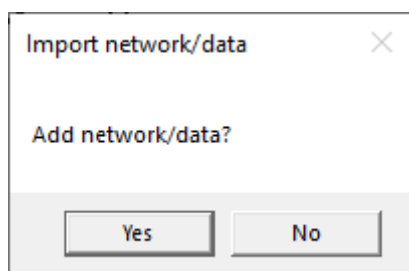


Figure 5.2.3

After which BRUTIS displays the data from the work-files as depicted in figure 5.2.4.

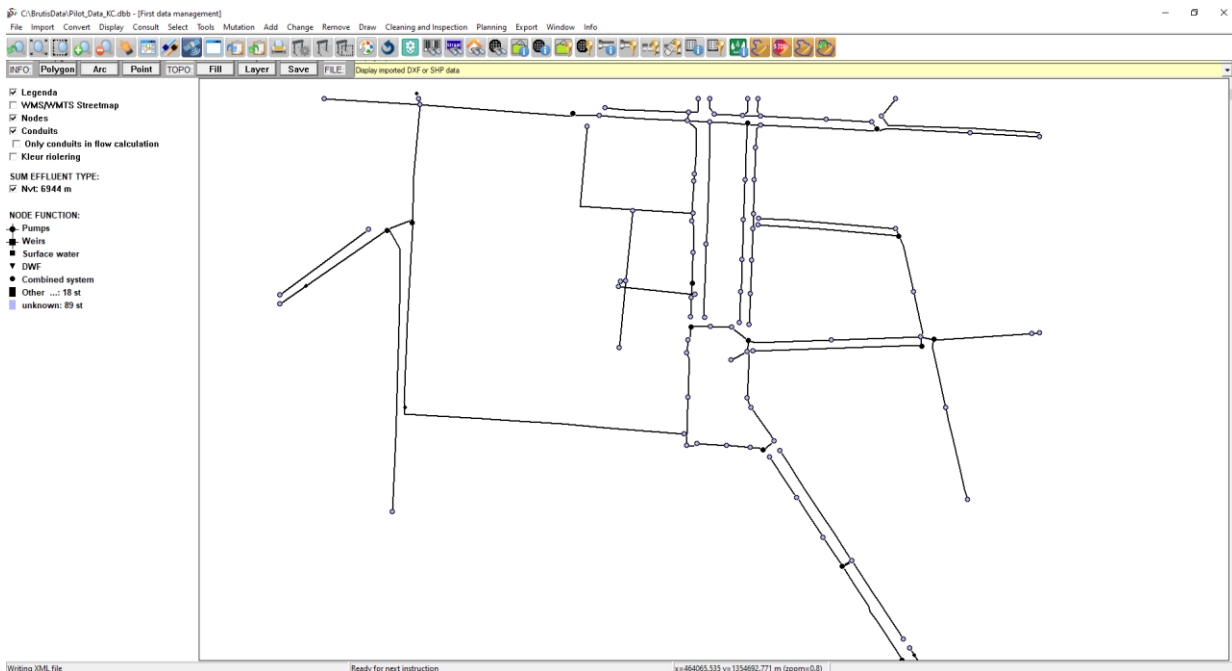


Figure 5.2.4

### GML, DXF or SHP topography

BRUTIS has the ability to import multiple KML files (.kml), GML files (.gml), cad files (.dxf) and ESRI shape files (.shp). The user uses the topography for:

- display behind the urban drainage;
- convert data from geometry to urban drainage;
- digitizing data from the topographic. The user has snap options on circles and near and endpoints of lines;
- converting straight conduits between nodes to curved/bended conduits. Useful for digitizing rising mains;
- registration of catchments;
- divide the catchments areas to the nodes by creating Voronoi Diagrams;
- selecting conduits in shapes (.shp) or closed polygons (.dxf).

After selecting the: **“Import / GML, DXF or SHP topography”**, option the user selects a file with the import DXF or SHP file dialog.

If a cad file (.dxf) is selected a dialog, depicted in figure 5.2.5 will appear.

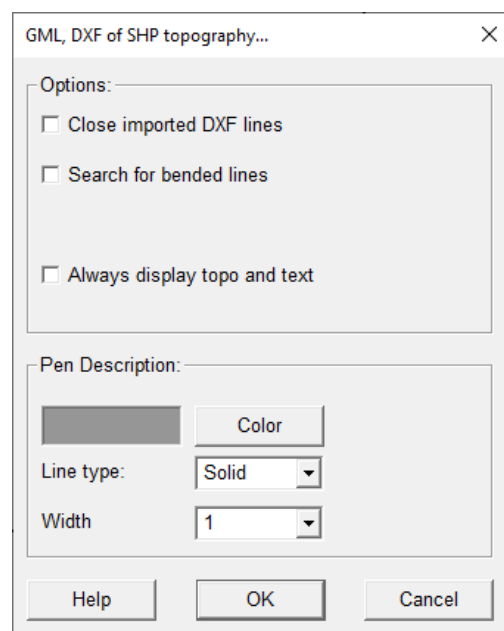


Figure 5.2.5

If a ESRI shape files (.shp). is selected a dialog, depicted in figure 5.2.6 will appear.

Appendix D describes an example of how to convert data from geometry to the BRUTIS Model.

For very large topographies, building the display can take a very long time. This can be accelerated by giving the “slowtopo” option a zoom factor between 0.1 and 2, via the menu option: **Tools -> Start options**. For example, slowtopo=1. This option only displays the topography at the specified zoom factor.

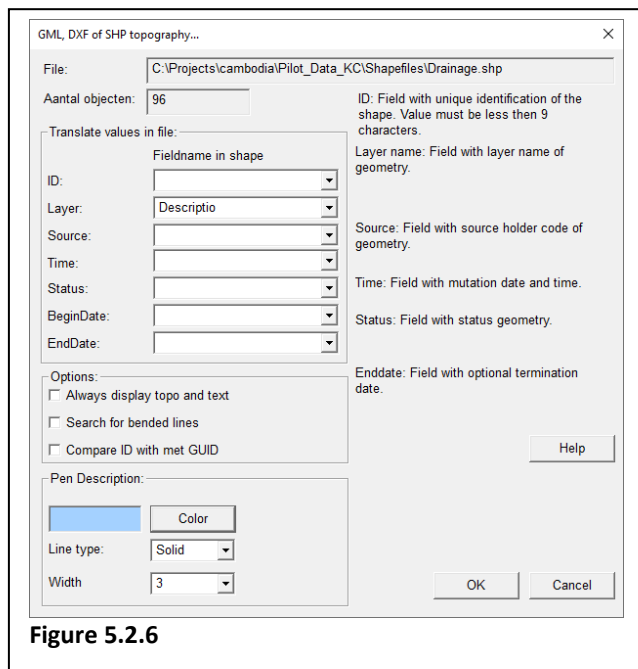


Figure 5.2.6

**ECW, BMP, PNG, JPG, GIF, ICO, EMF or WMG Image**

Another option available to users is the ability to add background images for display behind the urban drainage schematic.

Importing ECW data is the best solution to display background maps.

In other formats the software will automatically look for a companion file to the image, called a world file. This file contains information about the image, including the coordinate system and the extents of the image. If the world file is not available a dialog will appear as depicted in figure 5.2.7. in this dialog the user enters the coordinates of the pictures and the x-y scale factors. Several graphical formats are supported for background maps , including: .bmp and .jpg/jpeg.

An example of the usage of background images is depicted in figure 5.2.8

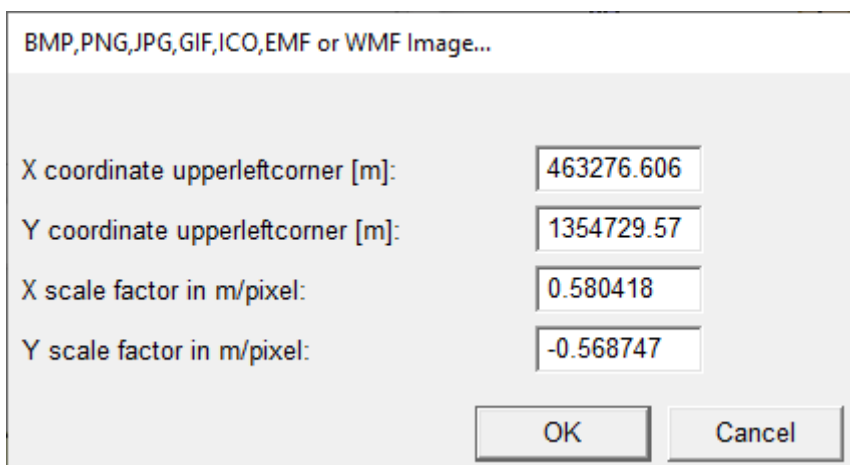


Figure 5.2.7

Menu option: “**File \ Create GeoReference File**”, enables the user to create a world file by digitizing 2 points with known coordinates on the background image.

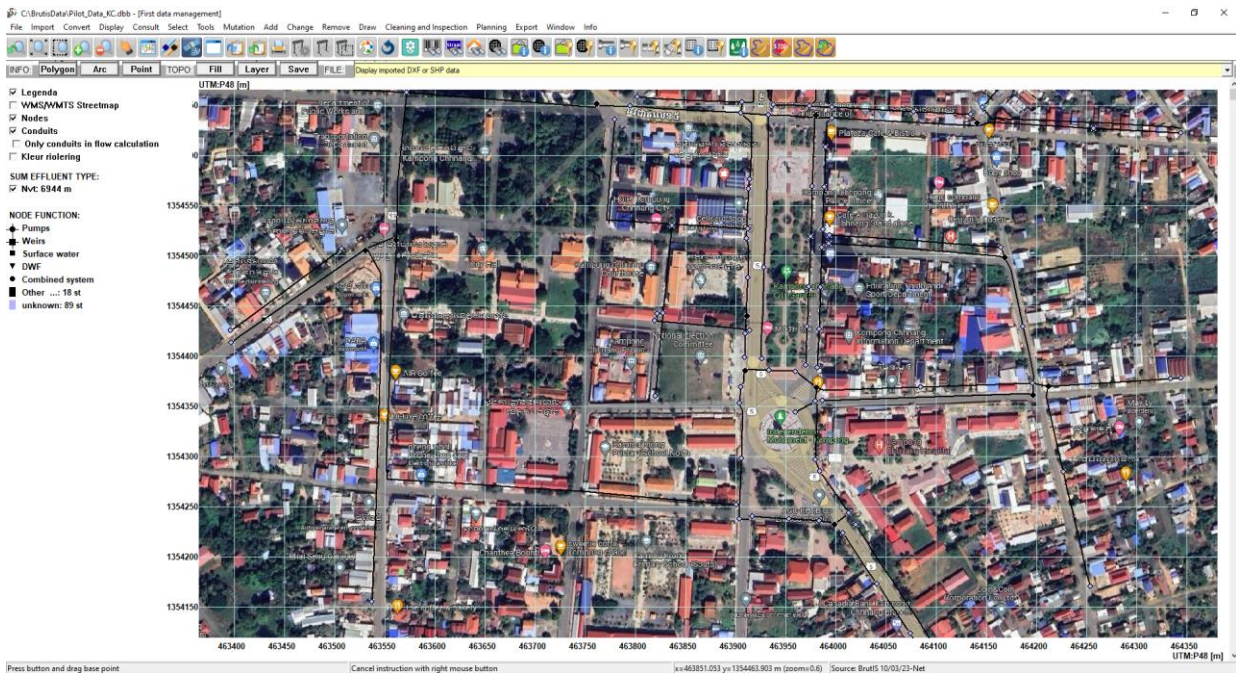


Figure 5.2.8

### Exchange format Inspection File

The exchange of inspection data is based on the NEN-EN 13508-2+A1 Investigation and assessment of drain and sewer systems outside buildings - Part 2: Visual inspection coding system.

The user adds inspection data from standard inspection file formats to the urban drainage schematic. The software checks the inspection data and connects the data to the conduits. BRUTIS uses the inspection data for:

- automatic reviewing and selecting conduits on repair or rehabilitation measurements, with decision support system (DSS);
- displaying location of damages in conduits in combination with video and photographic details.
- manual reviewing conduits and planning of tactical measurements

Inspection data can also be imported via CSV or mutation-files.

An example of the usage of inspection data is depicted in figure 5.2.9.

### CSV Object Data

This option allows you to import spreadsheet data. The spreadsheet must be in the Comma Separated Value (CSV) format. Most spreadsheet programs and some hydraulic calculation programs like InfoWorks and Sobek can read and write this format. These programs convert existing listings of data to CSV format, which you import in a BRUTIS.

The import of CSV data is documented in appendix B. Appendix D reports an example.

The “**Import / CSV Object Data**” option has a direct link with the available “**Export / CSV Object Data**” options. All exported CSV data can be imported directly in BRUTIS, because the CSV headers area known. For a complete overview of the export and import possibilities you should try all options under: “**Export / CSV Object Data**”, and open the resulting CSV export files in a spreadsheet program.

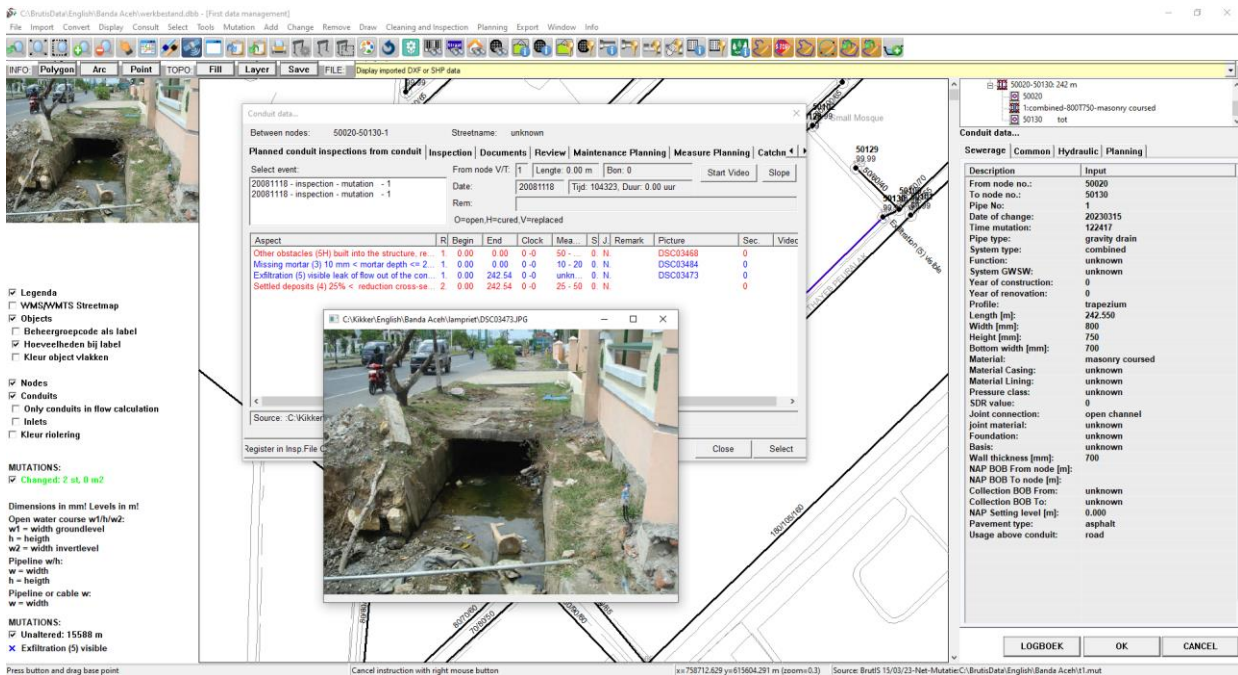


Figure 5.2.9

If the CSV Object data does not have known headers, the program asks what kind of objects it concerns. According to the window in figure 5.2.10.

After choosing the object type, the appropriate window appears to indicate how to copy the CSV data into the BRUTIS model.

In figure 5.2.12. the window of the nodes and in figure 5.2.13 the window of the pipes.

The “how to copy” data is saved in an integration file, for use next time. With the window shown in Figure 5.2.11

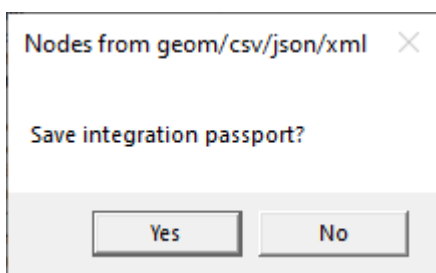


Figure 5.2.11

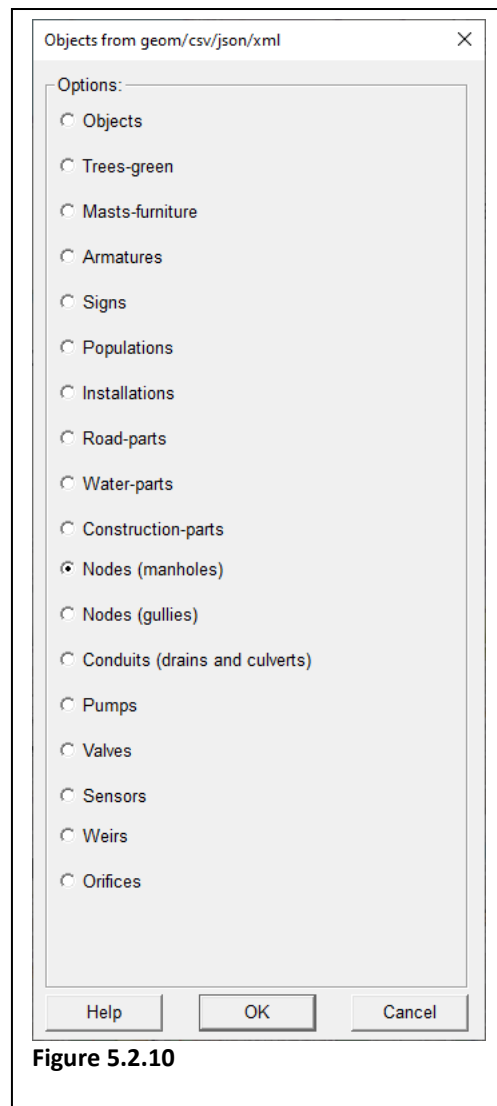


Figure 5.2.10

In figure 5.2.12. the window of the nodes and in figure 5.2.12 the window of the pipes.

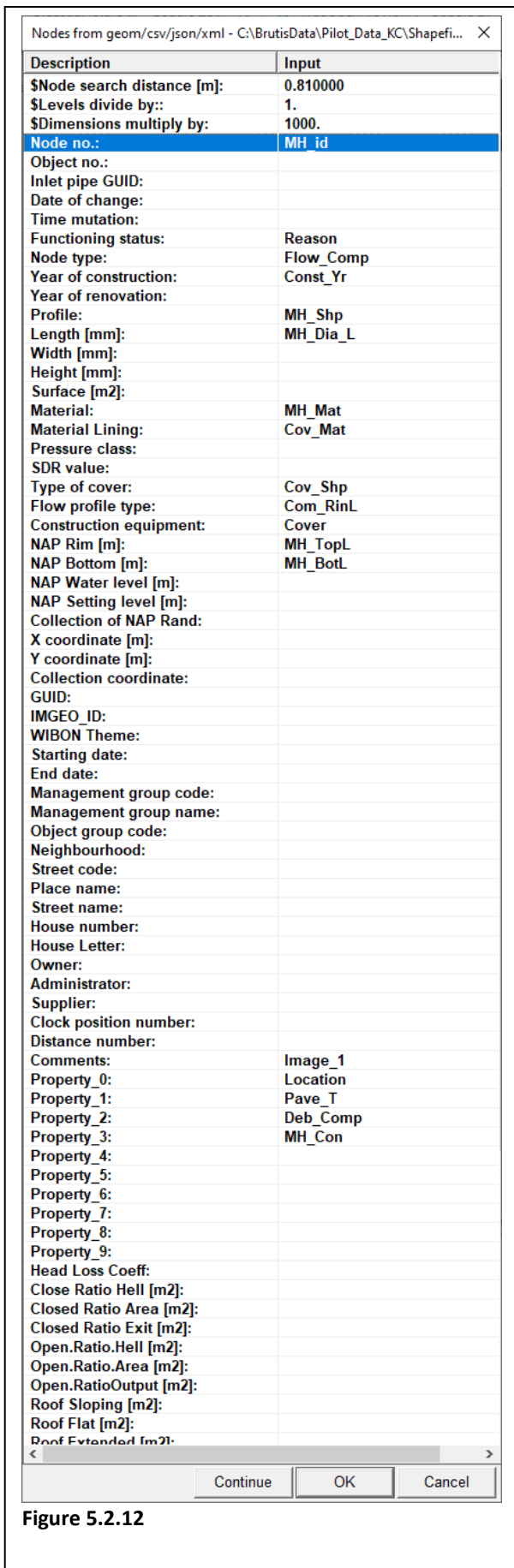


Figure 5.2.12

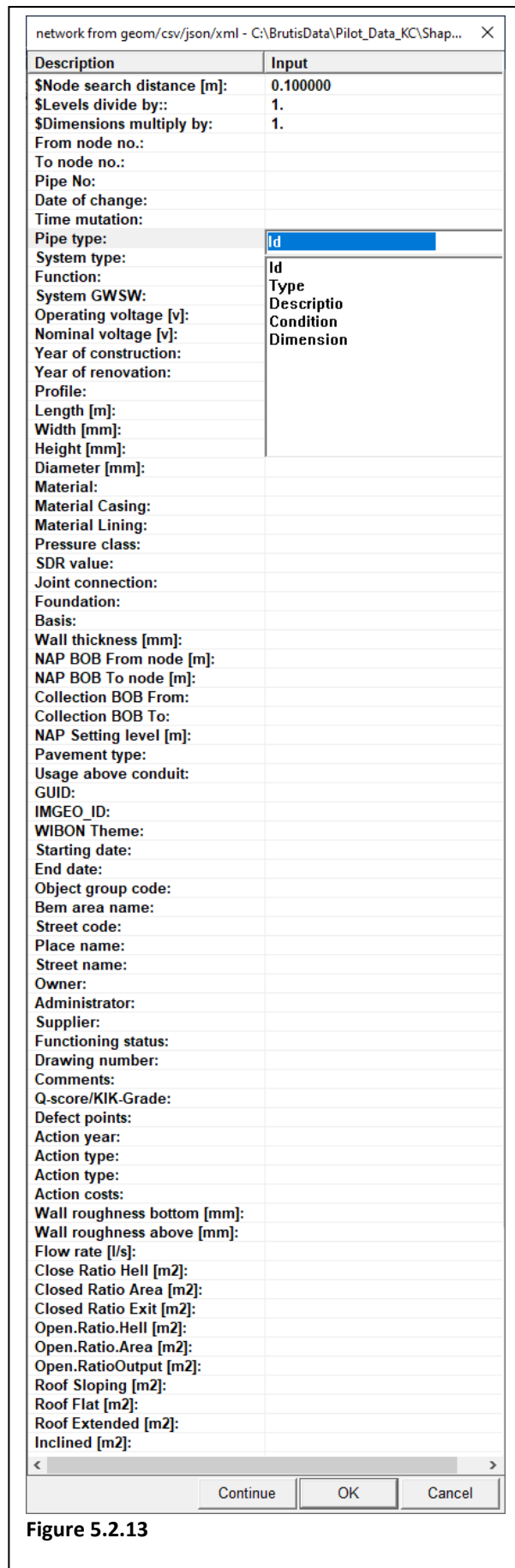


Figure 5.2.13

### 5.3 Mutation (global)

With the option “Mutation / Show mutations from File” a user creates a new, or open and read an existing mutation-file. After selecting this option, a dialog will appear as depicted in figure 5.3.1

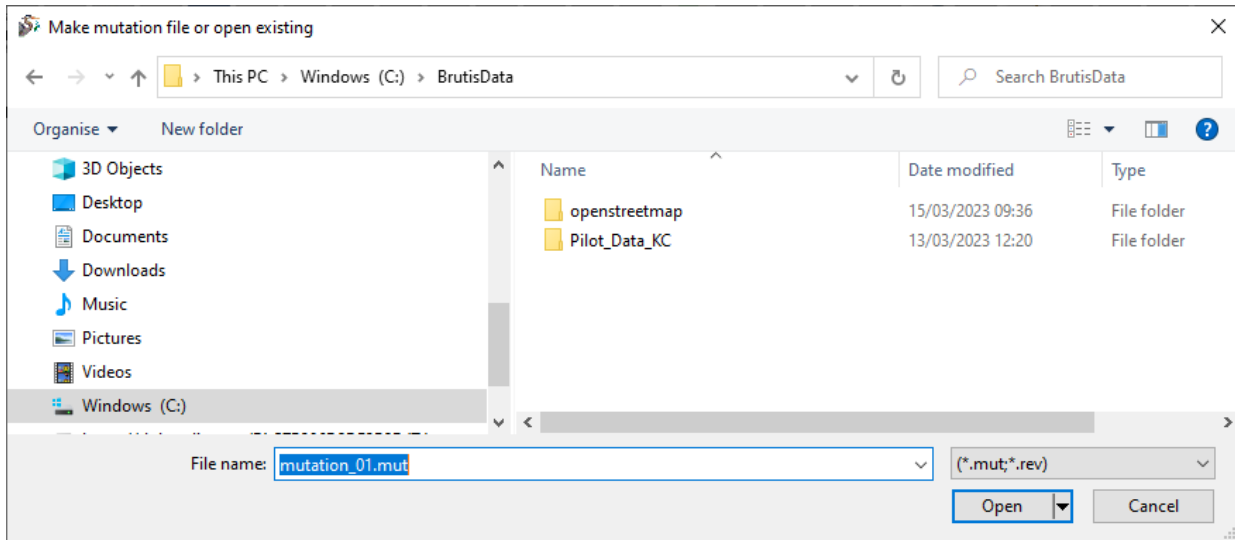


Figure 5.3.1

All data in the mutation-file format is coded in a header line. An example of a file in this format is given in figure 6.1.1

Because BRUTIS does write data directly in a mutation-file and not directly in the database the user cannot damage important data. The user is able to experiment, prototype or collect data in a mutation-file without database connection.

In a shortcut you can use the command line argument: “mut=” to start your BRUTIS with a mutation-file (See chapter 3.2). Or define a mutation file name after start option mutfile. To make life easier when a user collects or digitizes data.

For example, in the command-line:

```
"C:\BrutisData\BrutIS64.exe" mut=C:\BrutisData\mutation_01.mut
```

For example, in the window after menu option: “Tools / Start options”, depicted in figure 5.3.2.

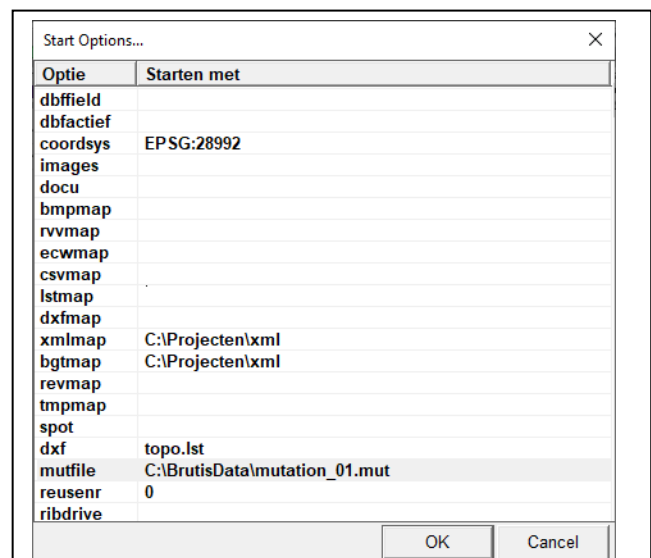


Figure 5.3.2

### Create a new mutation-file

Type in the: "Make mutation-file or open existing", dialog the name of the file. After clicking **OK**, a dialog will appear as depicted in figure 5.3.3. In this dialog the user defines the header information of the mutation-file.

### Open and read an existing mutation-file

After opening an existing file BRUTIS changes the data initially read from work-files or a BRUTIS file, with the data read from the mutation-file. When no initial data is read all data is new.

Inspector information:		General:	
Inspector:	<input type="text"/>	Field separator:	<input type="text" value=","/>
Company:	<input type="text"/>	Number mutations:	
Projectmanager:	<input type="text"/>	Insert:	Update:
Date: [YYYY-MM-DD]	<input type="text" value="2023-03-19"/>	Delete:	
Project information:		Nodes:	<input type="text"/>
Authority:	<input type="text" value="Kingdom of Cambodia"/>	Conduits:	<input type="text"/>
Project/Contract:	<input type="text"/>	Gully:	<input type="text"/>
Company Code:	<input type="text"/>	Connect.:	<input type="text"/>
Code client:	<input type="text"/>		
Cleaning data:		Cancel OK	
Applied cleaning pressure in Bar:	<input type="text"/>		
Type of nozzle:	<input type="text"/>		
License plate vacuum truck or combi:	<input type="text"/>		
High pressure unit license plate:	<input type="text"/>		
Deposit slip number:	<input type="text"/>		

Figure 5.3.3

### After creation / opening

BRUTIS writes all inputted data directly in the mutation-file and saves the data automatically.

## 5.4 Save to work file or database

Save the BRUTIS model to a work file or database after mutation or converting data from files.

- Save to a work-file via menu option: "**File / Save As / Work-File**", so that the data obtained can be opened and viewed directly from the work file, immediately from now on.
- If a database is available. Via menu option: **Mutation / Move mutation to database / Check mutations**. After entering the database connection data, BRUTIS connects to the database and checks whether the changes can be implemented. If the data is acceptable menu option: **Mutation / Move mutation to database / Move mutation to database**, becomes available to store the data in the database.

### Transferring data to the database

When a mutation is finished the database administrator transfers the data from the mutation-file to the database with the option: **“Mutation / Move Mutations to database / Check mutations”**.

After selecting this option the following communication between user and software is started:

1. When BRUTIS is not connected to a database a dialog will appear as depicted in figure 5.4.1. In this dialog the user specifies the Data Source Name, and username/password if needed, and clicks on **OK**.
2. BRUTIS confirms the database connection with a dialog depicted in figure 5.4.2. If no tables for strategic, tactical and operational planning are found. Confirm this by clicking the check box and click on **OK**. Next time these tables are found and the dialog in figure 5.4.3 will be shown.
3. The results of the mutation to database check are displayed via notepad, as depicted in figure 5.4.4.
4. After step 3 menu acceptable menu option: **Mutation / Move mutation to database / Move mutation to database**, becomes available to store the data in the database.
5. BRUTIS transfers the data from mutation-file to temporary tables in the database. In the dialog depicted in figure 5.4.5., the user monitors the data transfer.
6. After storing the data to the database a dialog is shown, figure 5.4.6, asking if the work-file has to be updated with the database data.
7. After the actions above BRUTIS makes a new work-file with actual data from the database, and displays the contents of the work-file.

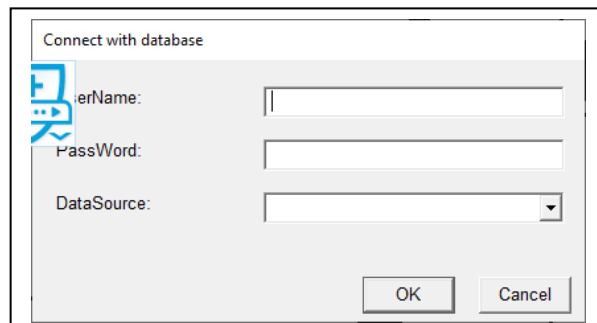


Figure 5.4.1

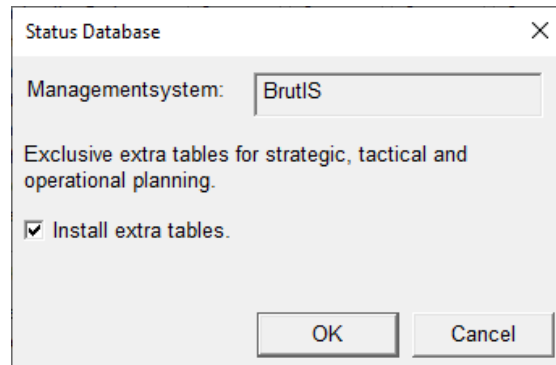


Figure 5.4.2

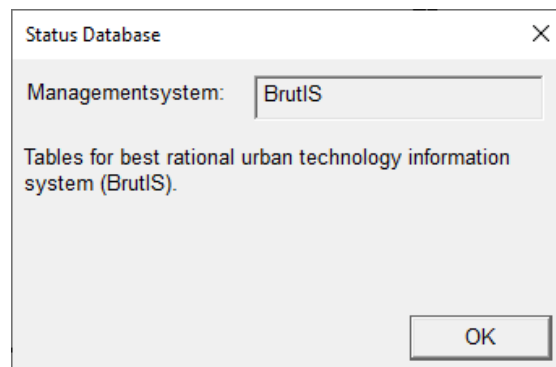


Figure 5.4.3

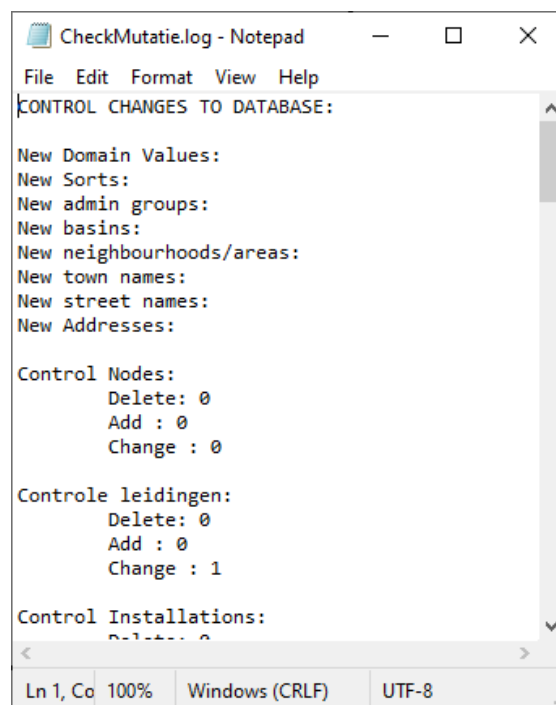


Figure 5.4.4

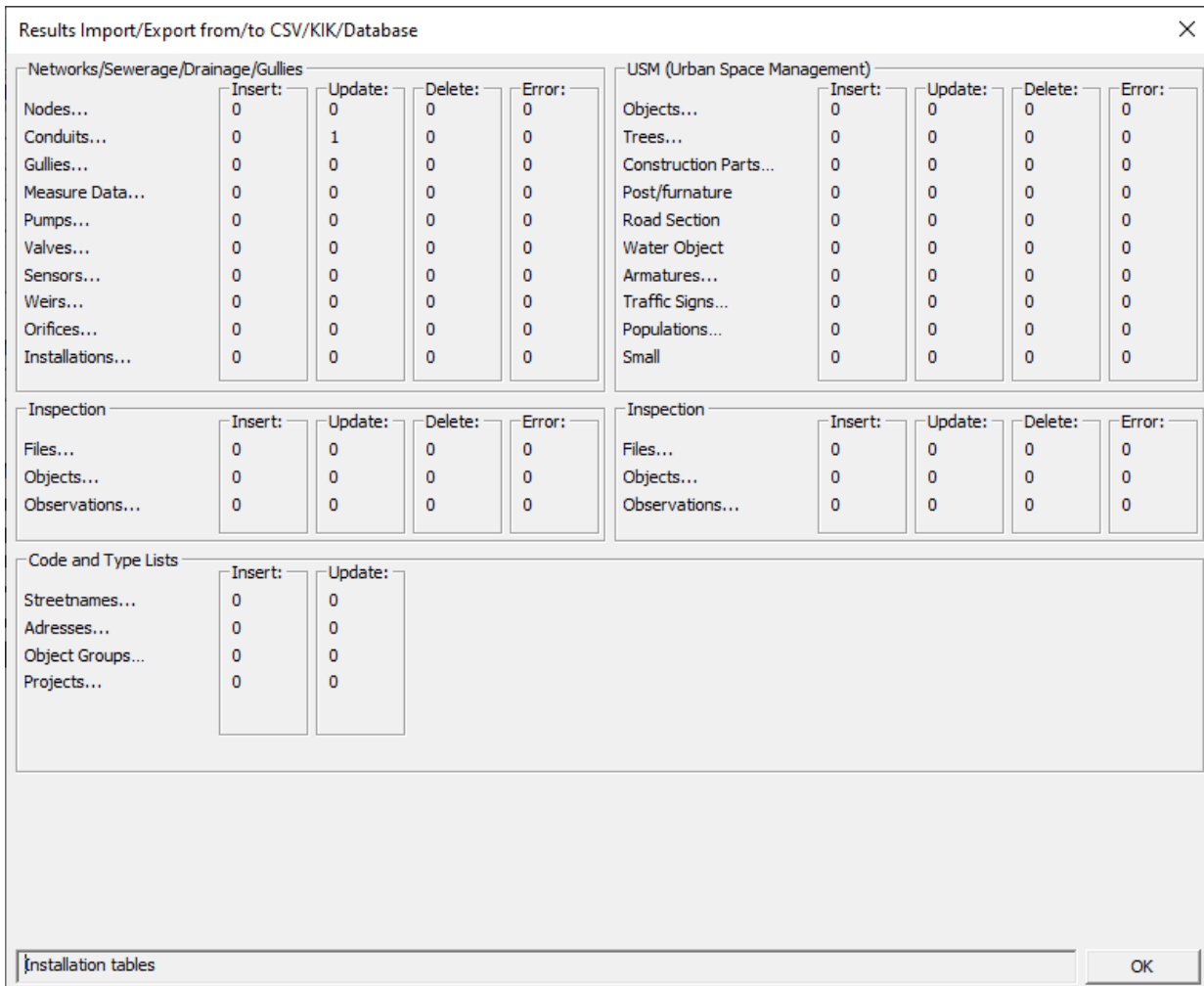


Figure 5.4.5

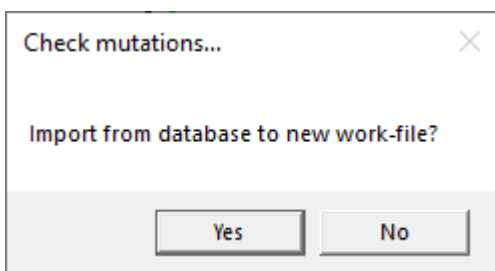


Figure 5.4.6

The work-file has the same name as the MS-Access database file, database name using SQL-Server or Username using a Oracle database.

Mutations have to be done on the work-file imported from the database. If another work-file is used with for example extra data, all these data will also be stored in the database! If the work-file has another name the dialog depicted in figure 5.4.7 will be shown.

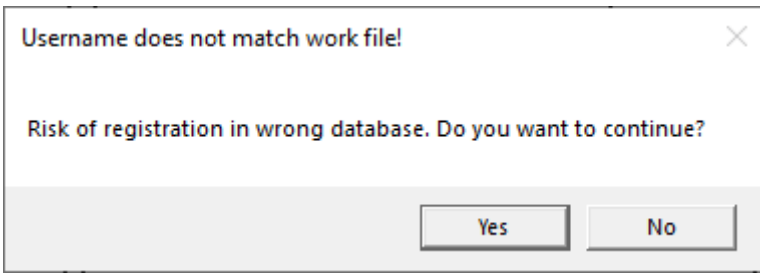


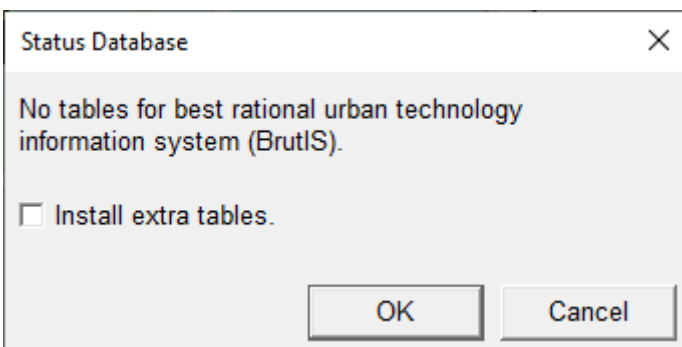
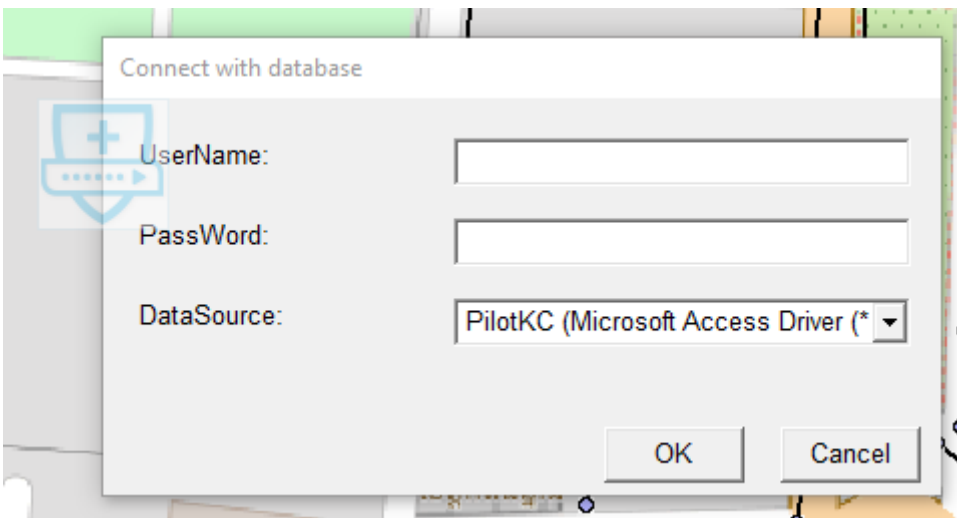
Figure 5.4.7

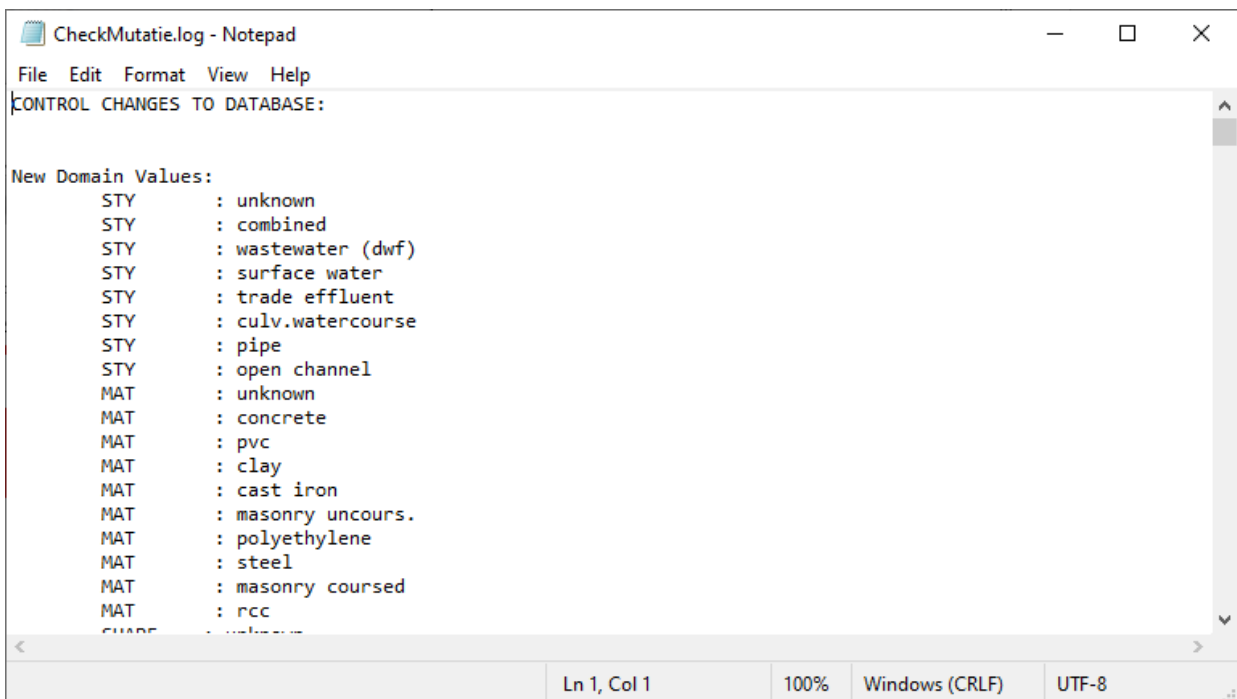
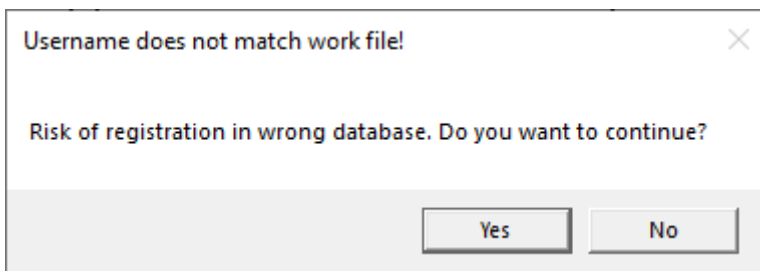
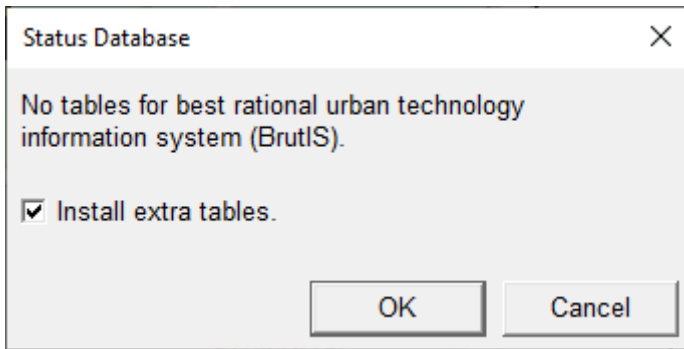
The same procedure can be followed for an initial database filling.

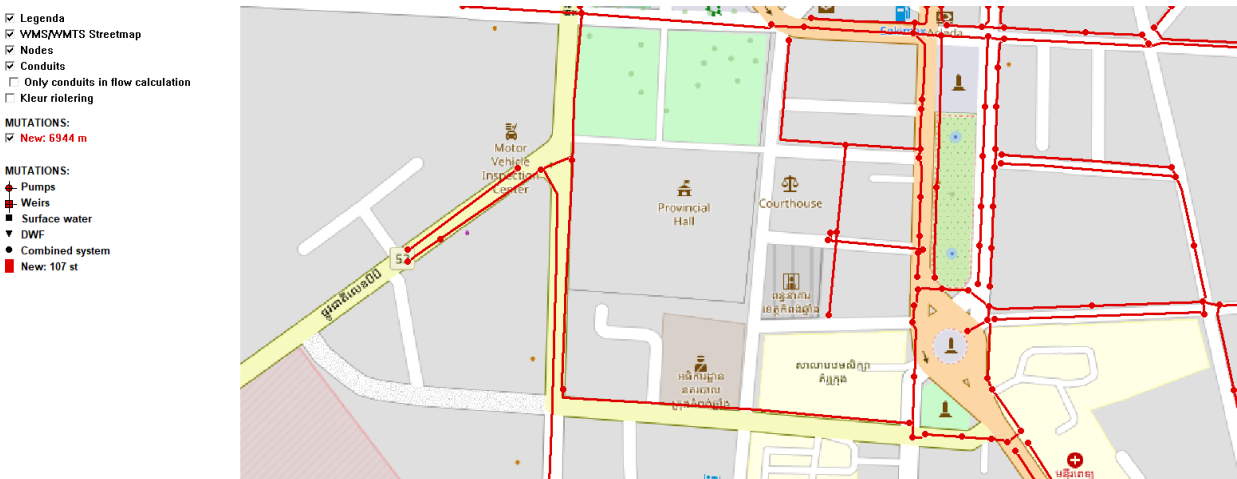
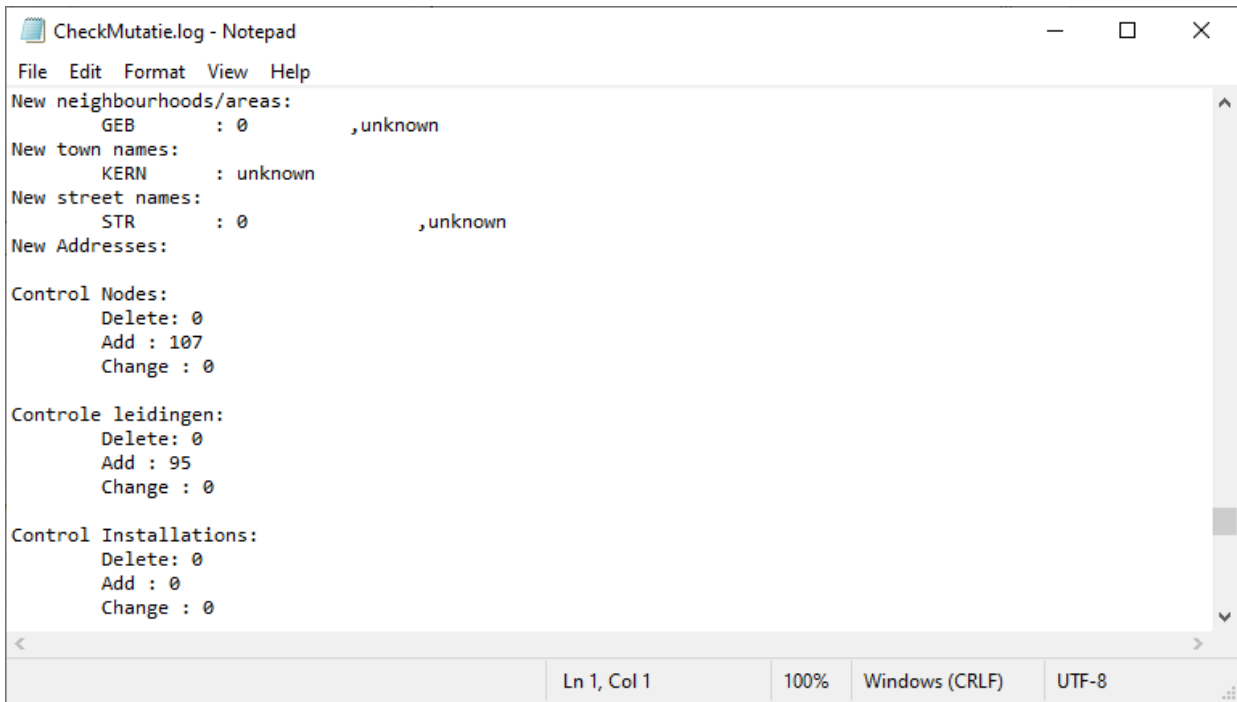
After the data transfer the mutation-file can be placed in a backup directory. For next updates, inserts and deletions of data the user must create a new mutation-file. **Don't go on with a mutation-file with transferred data!**

### 5.5 Initial creating tables and data storage to database

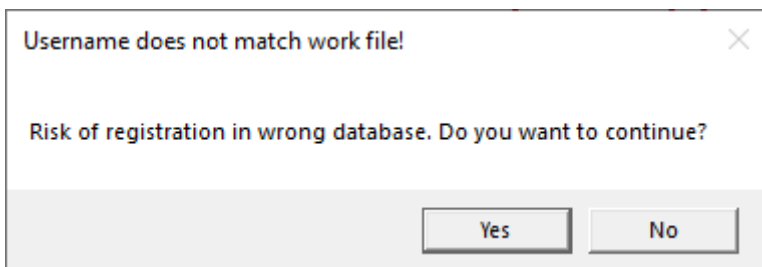
Mutation / Move Mutations to Database / Check Mutations







Mutation / Move Mutations to Database / Move Mutations to Database



Results Import/Export from/to CSV/KIK/Database

Networks/Sewerage/Drainage/Gullies					USM (Urban Space Management)				
	Insert:	Update:	Delete:	Error:		Insert:	Update:	Delete:	Error:
Nodes...	107	0	0	0	Objects...	0	0	0	0
Conduits...	95	0	0	0	Trees...	0	0	0	0
Gullies...	0	0	0	0	Construction Parts...	0	0	0	0
Measure Data...	0	0	0	0	Post/furniture	0	0	0	0
Pumps...	0	0	0	0	Road Section	0	0	0	0
Valves...	0	0	0	0	Water Object	0	0	0	0
Sensors...	0	0	0	0	Armatures...	0	0	0	0
Weirs...	0	0	0	0	Traffic Signs...	0	0	0	0
Orifices...	0	0	0	0	Populations...	0	0	0	0
Installations...	0	0	0	0	Small	0	0	0	0

Inspection					Inspection				
	Insert:	Update:	Delete:	Error:		Insert:	Update:	Delete:	Error:
Files...	0	0	0	0	Files...	0	0	0	0
Objects...	0	0	0	0	Objects...	0	0	0	0
Observations...	0	0	0	0	Observations...	0	0	0	0

Code and Type Lists	
	Insert: Update:
Streetnames...	1 0
Adresses...	0 0
Object Groups...	0 0
Projects...	0 0

Installation tables

OK

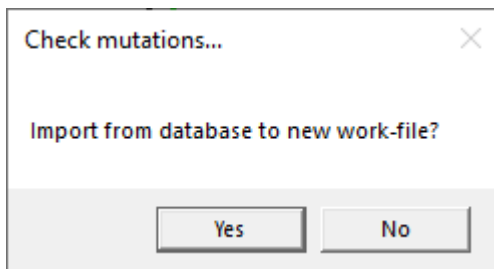
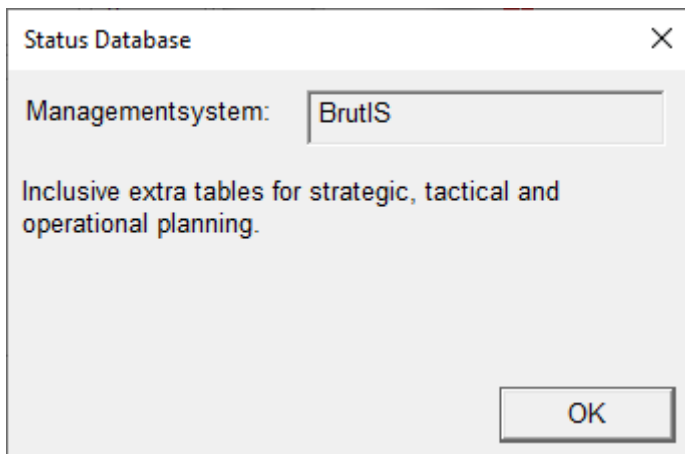
Status Database

Managementsystem: BrutlS

Exclusive extra tables for strategic, tactical and operational planning.

Install extra tables.

OK Cancel



## 6 Mutation (detailed)

The creation of mutation-files and the transferring of data from mutation-files to the database are explained in chapter 5.4. and 5.5. This chapter explains some actions between creation and transferring mutation data to the database. The coding system of mutation-files is based on the European Standard EN 13508-2 and is for practical use defined in appendix B and C.

### Contents

- Mutation files
- Conduit Inspection
- Delete Conduit
- Insert Conduit
- Insert Nodes
- Gully Cleaning

### 6.1 Mutation Files

For updating, deleting or inserting data the user must open a mutation-file. With the option “**Mutation / Show mutations from file**” a user creates a new mutation-file or open and read an existing mutation-file. After selecting this option as dialog will appear as depicted in figure 5.3.3.

All data in the mutation-file format is coded with a header line. An example of a file in this format is given in figure 6.1.1.

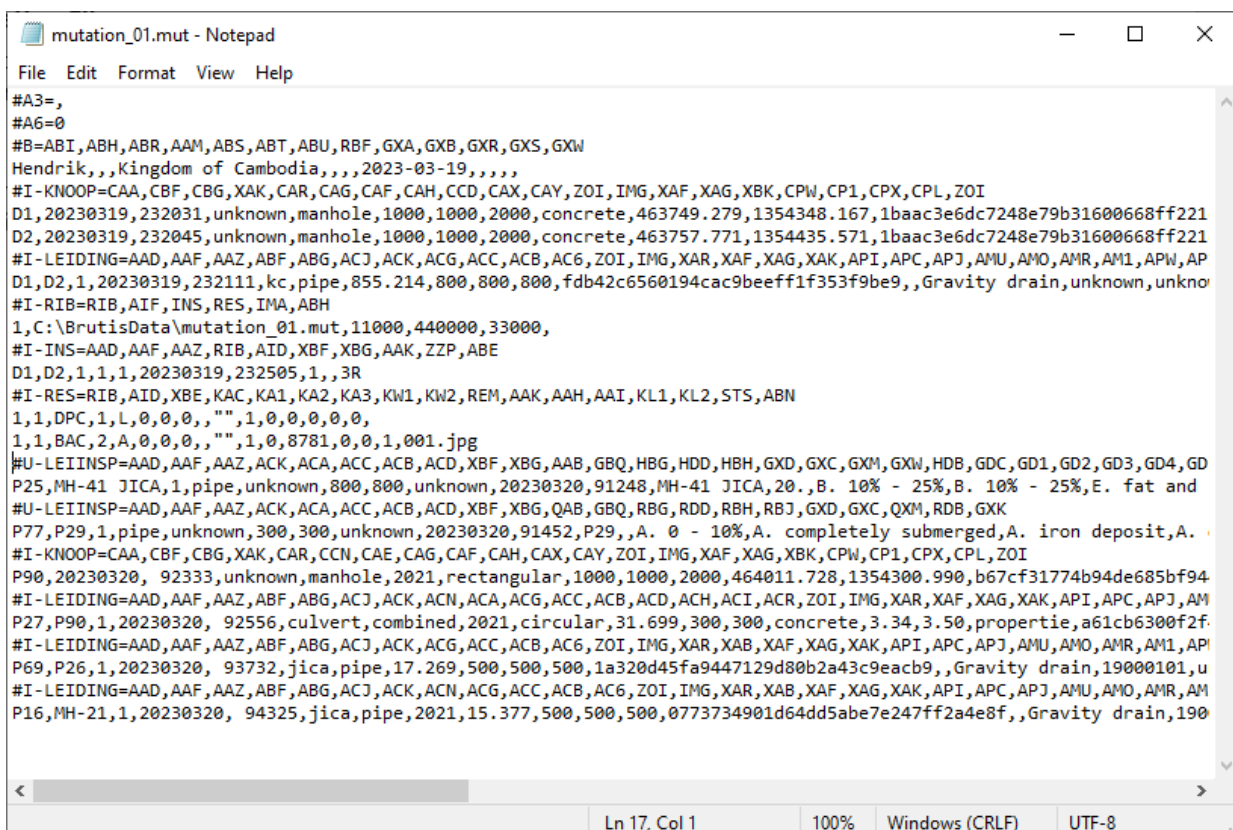


Figure 6.1.1

The connecting with images or videos data is defined in the data under the CSV-header beginning with the text: #I-RIB, defining the name of the mutation file. The mutation filename without extension: “.mut”, defines the location of images, video’s and measured data. After reading these lines BRUTIS searches initially for images and videos in the directory: “C:\BrutisData\mutation\_01”. A user overrules the searching in this directory by using the command line argument: “images=”. (See chapter 3.2).

For example:

```
"C:\ BrutisData\Brutis64.exe" images=C:\BrutisData\images
```

Or

```
Start option: images=C:\BrutisData\images
```

Because BRUTIS writes data directly in a mutation-file and not directly in the database the user can not damage important data. The user is able to experiment, prototype or collect data in a mutation-file without database connection.

When a mutation is finished the database administrator transfers the data from the mutation-file to the database with the options: “**Mutation / Move Mutations to database / Check mutations**”, followed by: “**Mutation / Move Mutations to database / Move Mutations to database**”.

## 6.2 Conduit Inspection

With the options under “**Cleaning and Inspection**” a user adds inspection data to urban drainage schematic.

After selecting this option, the software asks to specify the node from where the inspection is started and the conduit. Select the conduit by clicking on the conduit near the node from which the inspection is started.

A dialog will appear as depicted in figure 6.2.

When there is previous inspection data the data of this inspection is automatically copied in this dialog. The user adds, deletes and updates the inspection data based on the European Standard EN 13508-2 and for practical use on drainage systems defined in appendix C.

Add inspection data by using the next steps:

1. Select a damage observation by expanding the list box behind the **Search** field, and select from the listing the observation.
2. Select the aspect class of the observation by expanding the list box after the **Aspect** field.
3. Specify the other data belonging to the aspect.
4. Click on **Insert** to Add the observation to the listing of registered observations

5. Etc. with next observation
6. Commit the action by clicking: **Commit**.

A user can select a observation from the registered observations listing and delete the observation by clicking **Delete** or Update by Clicking **Update** (Button **Insert** is changed in **Update** after selecting a observation)

In figure 5.14 are the results depicted after entering inspection data. Consult the inspection data by selecting the **Logbook** tab in the Conduit info dialog.



Register inspection Conduit: D1-D2-1-pipe

Node number: D1      Coordinates: 463749.279-1354348.167

**Conduit** | **Delivery**

Register observation:

Search: BAC Break or collapse Ref.: 1 Picture:

Aspect:

Distance:  cm Clock:  Kwant 1  [Getal]

Opm:  Kwant 2  [Tekst/Getal]

Open  
 Cured  
 replaced

Registered observations:

Aspect	R	Begin	End	Clock	Kw1	Kw2	Opmerking	S	Picture
General condition (G ) not detected	1	0	0	0-0	0			0.	
Break or collapse (2) pieces of conduit visibly displaced b...	1	0	8781	0-0	0			0.	001.jpg

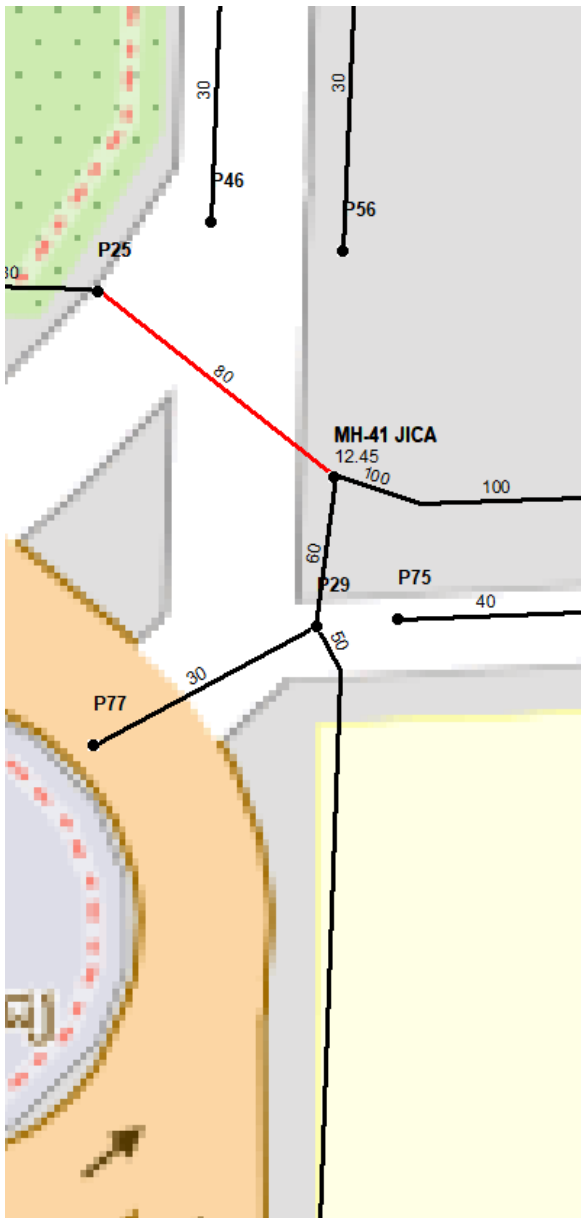
Alg.Opm.:

Figure 6.2

Reserve memory voor inspections:

Number pipe/manhole inspections:





Conduit Cleaning...

Inspection

Description	Input
From node no.:	P25
To node no.:	MH-41 JICA
Pipe No.:	1
System type:	pipe
Profile:	unknown
Width [mm]:	800
Height [mm]:	800
Material:	unknown
Inspection date:	20230320
End time inspection:	91248
From which well:	Select a node
Cleaning length [m]:	
Pollution degree:	Choose level
water level:	Choose level
Abnormal pollution:	not detected
Pipe not cleaned:	Select a reason
Client not commissioned:	No
Time required [hh.mm]:	0.0
Deposit slip number:	unknown
General comment:	
Number of valve installed:	0
Milling roots:	No
Tighten or loosen put:	No
Milling grease:	No
Rabs applied:	No
Well cleaned:	No
Pre-cleaning:	No
Debris/Drill Cores:	No
Cleaning for inspection:	No
Working remotely:	No
Pocket wells:	No
Client present:	No
Start point not reachable:	No
End well not accessible:	No
Applied Pressure [bar]:	unknown
Nozzle:	unknown
Lice-plate suction truck:	unknown
Lice-plate Pressure car:	unknown
Inspector's name:	Hendrik
Command code inspector:	unknown
Client order code:	unknown

LOGBOEK


OK

CANCEL



Description	Input
From node no.:	P77
To node no.:	P29
Pipe No.:	1
System type:	pipe
Profile:	unknown
Width [mm]:	300
Height [mm]:	300
Material:	unknown
Inspection date:	20230320
End time inspection:	91452
From which well:	P29
Cleaning length [m]:	
Pollution degree:	A. 0 - 10%
water level:	A. completely submerged
Abnormal pollution:	A. iron deposit
Operation after cleaning:	A. drainage is flowing
Pipe not cleaned:	Select a reason
Client not commissioned:	No
Time required [hh.mm]:	0.0
General comment:	
Client present:	No

### 6.3 Insert Nodes

Open the “Insert Node” dialog, as depicted in figure: 6.3.1, via button:  or menu option: “**Add / Insert Node**”.

Click on the location of the node before entering the dialog for the direct input of the node coordinates. If the dialog is already entered the cursor has to be positioned in the X- or Y-coordinate field. After the insertion of a node a user can insert the following elements connected to the node:

- Installations by clicking: “**Add / Insert Node Elements / Installation**”
- Pumps by clicking: “**Add / Insert Node Elements / Pump**”
- Weirs by clicking: “**Mutation / Insert Node Elements / Weir**”
- Orifices by clicking: “**Mutation / Insert Node Elements / Orifice**”

Between two nodes a user can define a conduit.

After selecting option: “**Mutation / Insert Node**” a dialog appears as depicted in figure 6.9.

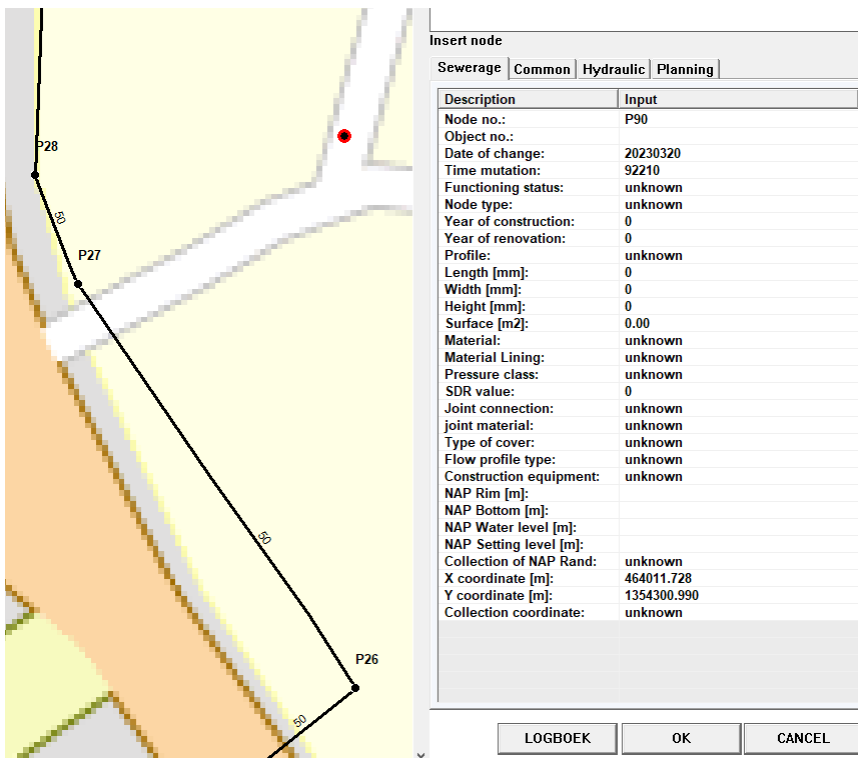


Figure 6.3.1

In the dialog the user specifies the node data. The user copies data from another node by clicking on the option: “Data / Nodes” and clicking on an existing node. All data except the node number will be copied in to the dialog.

Specify the position of the node by clicking on a position in the GUI eventual using the snap options. When changing a position of an existing node a user must locate the cursor in the X- or Y coordinate field.

After saving the data by clicking: **OK** in the, “Insert node” dialog, the dialog is ready for the next node.

## 6.4 Delete Conduit

With the option “**Mutation / Delete Conduit**” a user deletes a conduit. Nodes can’t be deleted if there are still conduits connected.

After selecting this option the software asks to specify the conduit. Select the conduit by clicking on the conduit.

A dialog will appear for confirmation of the removal of the conduit.

Notice the painting of crosses along the removed conduit, depicted in figure 6.4. The conduit will be definitely removed after transferring the deletion action to the database.

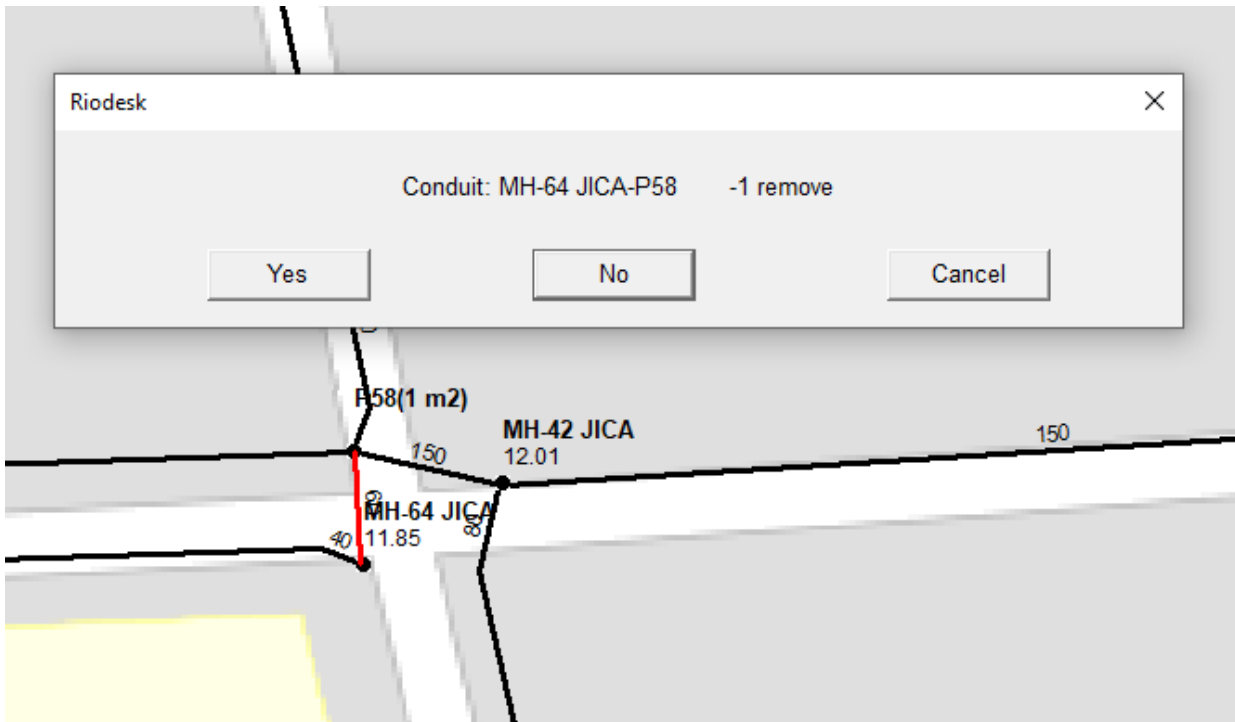


Figure 6.3.1

## 6.5 Insert Conduit

With the option “**Mutation / Insert Conduit**” a user inserts a conduit. In this chapter we describe the insertion of a curved conduit.

After selecting this option, a dialog will appear as depicted in figure 6.4.1 In the dialog the user specifies the conduit data. The user copies data from another conduit by clicking on the option: “Data / Conduits” and clicking on an existing conduit. All data except the node numbers and conduit length will be copied in to the dialog.

If the conduit is a straight line between the nodes, the node can be defined by putting the cursor in the node number fields and clicking on the nodes in the GUI.

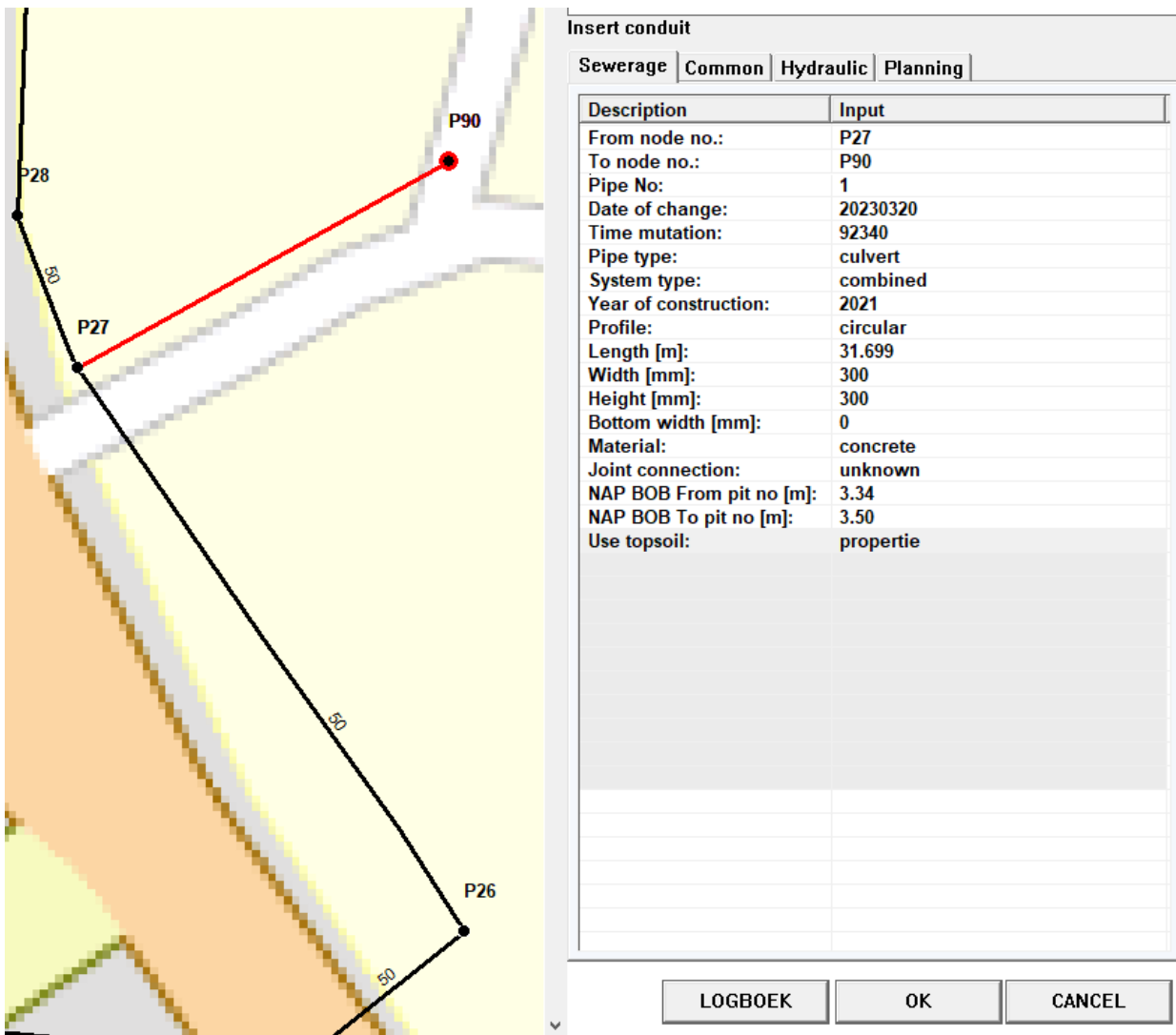
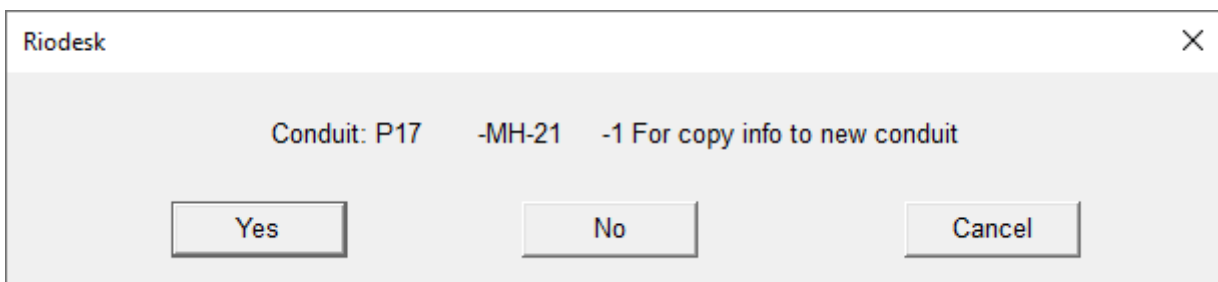


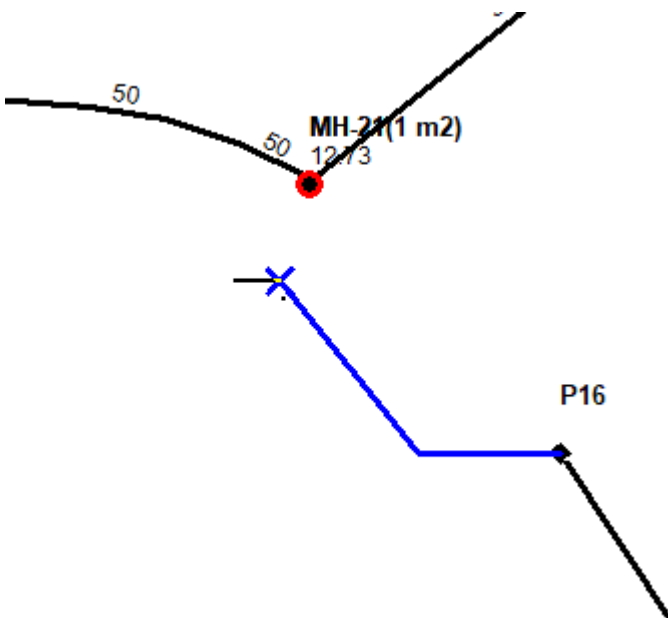
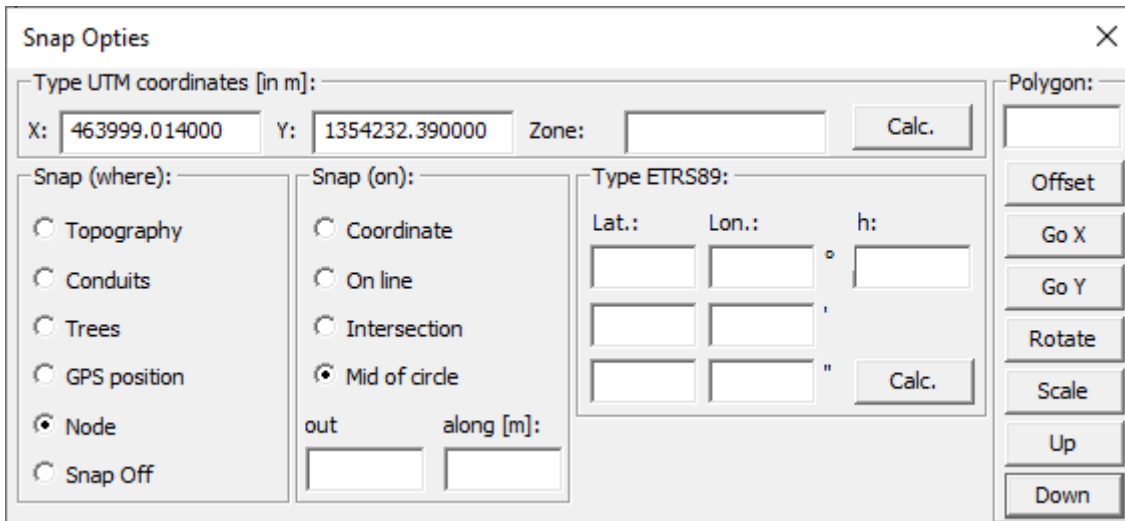
Figure 6.4.1

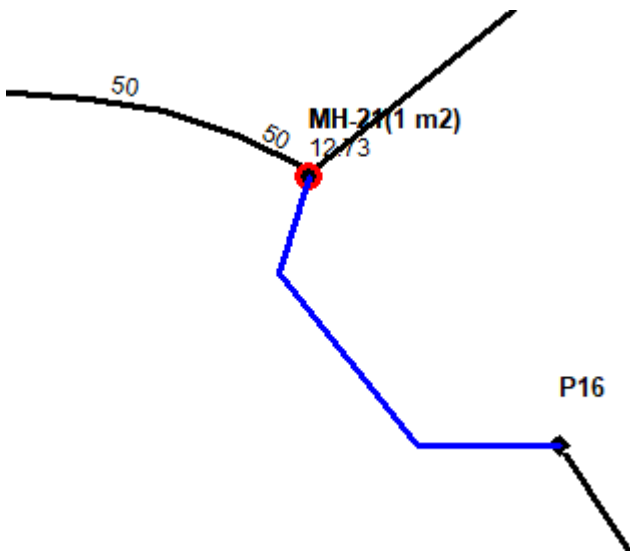


Follow the next steps for entering a curved line between nodes:

1. Open the "Snap Options" dialog by performing a right button click in the GUI. A menu will appear as depicted in figure 6.5. Click **"Snap Options"**.
2. Start drawing a polygon by performing a right button click in the GUI again. Click **"Make Polygon"**.
3. Click on the **Node snap** radio button in the "Snap Options" dialog. Like in figure 6.4
4. Click on the from node in the GUI. The software paints the node as if it is selected as depicted in figure 6.5

5. Click on the **Direct snap** radio button in the “Snap Options” dialog.
6. Specify the route off the polygon by clicking in the GUI. Stop before reaching the to node location. As depicted in figure 6.6.
7. Click on the **Node snap** radio button in the “Snap Options” dialog.
8. Click on the to node location in the GUI.





Riodesk ×

Insert conduit according polygon?

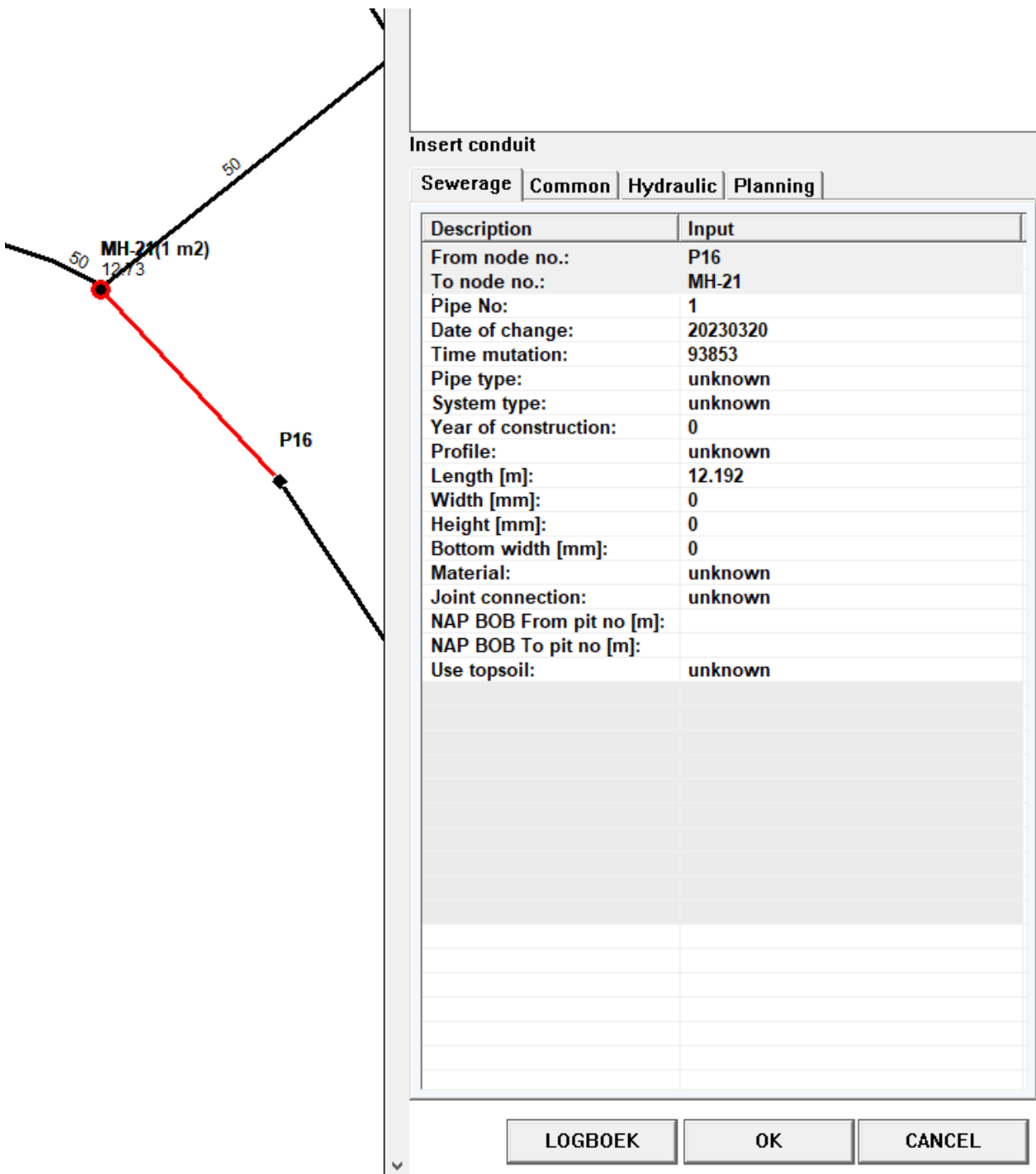


Figure 6.4

Figure 6.5

Figure 6.6

Figure 6.7

The conduit is painted as a curved line. Save the data clicking: **OK** in the, "Insert conduit" dialog

A dialog will appear as depicted in figure 6.7. for confirmation of the insertion of the conduit according the polygon.

The result is shown in figure 6.8.

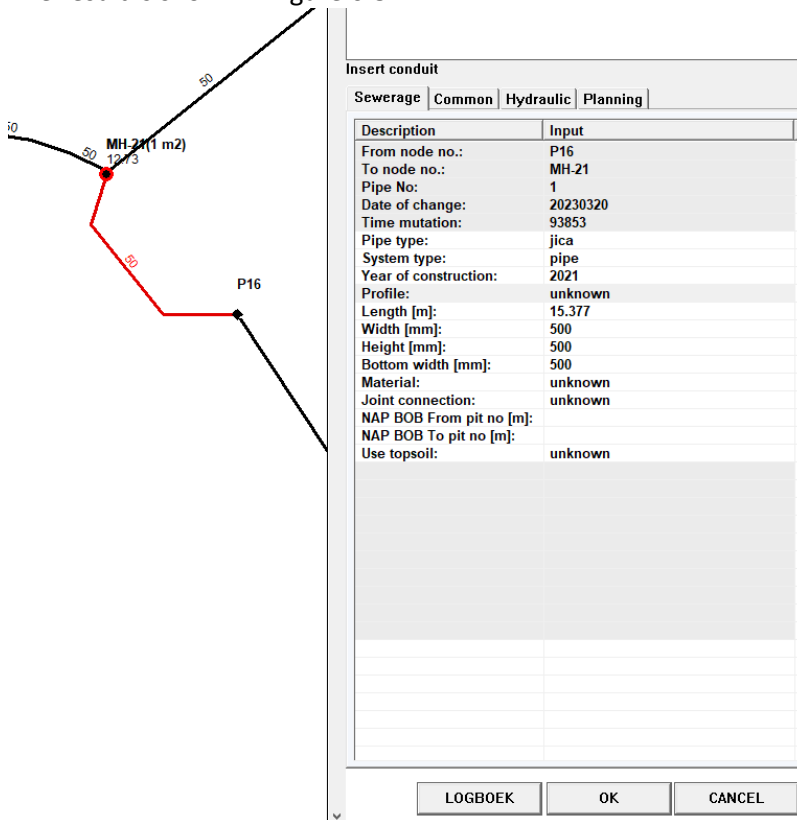


Figure 6.8

### 6.6 Gully Cleaning

With the option “Mutation / Gully Cleaning” a user registers the condition of gullies. This option is very useful operated by the driver of a gully cleaning vehicle in combination with the GPS Antenna. The GPS antenna keeps the location of the vehicle in the mid of the GUI. The drivers places and updates gullies in relation with the topography loaded as background.

After selecting this option a dialog will appear as depicted in figure 6.4. In the dialog the user specifies the observed condition of gullies.

The data is registered in the mutation-file and after finishing the cleaning round transferred to the database. The software generates new work-files as basis for the next cleaning round.

**Add Gully:7, X:759189.438, Y:615918.313**

Update Gully      GPS Placement

Remarks:

Type:

Street:   kg

hand cleaned  
 gully with lock  
 gully trap not present  
 concrete/cement in gully  
 grease in gully  
 bottom is defective  
 cover is defective  
 unable to lift cover  
 cover not present  
 gullypipe obstructed  
 settlement of gully  !  
 settlement of pavement  !  
 vehicle on gully  
 not cleaned

Rem:

Commit [Enter]

**REVISIONS:**  
■ Removed  
■ New  
■ Inspection  
■ Unaltered

**REVISIONS:**  
■ New  
■ Unaltered

**GULLIES:**  
■ Rv. no remarks  
■ Rv. with remarks  
■ Rv. not cleaned

Figure 6.10

## 7 Display Options

The BRUTIS Graphical user Interface (GUI) exists off a:

- pull down menu above;
- status bar below;
- caption/legend on the left;
- tree view on the right;
- button bar. Each button is also defined in the pull-down menu;
- quick menu behind right mouse button click in the GUI.

### Contents

- Adjusting the GUI
- Zoom Options
- Find Options
- Adjust Text Formats

### 7.1 Adjusting the GUI

The display of each window is defined in the “Display Options” dialog.

After clicking the option: “**Display / Display Options**” a tabbed dialog appears as depicted in figure 7.1 and, 7.2.

#### Display Tab (figure 7.1)

Adjust the GUI by clicking the check boxes.

#### Conduits Tab (figure 7.2)

Adjust the thematic display of conduits by clicking the radio buttons. If button: **Mutations** is selected the GUI displays deleted conduits (patterned with crosses).

Set the display of conduit text by clicking the conduit text radio buttons.

#### Other Tabs

As with the conduits, there are tabs for nodes, gullies, notifications and objects, like: road section-, construction-, water-parts, trees, masts.

If a function exists in the data, the tab will be shown.

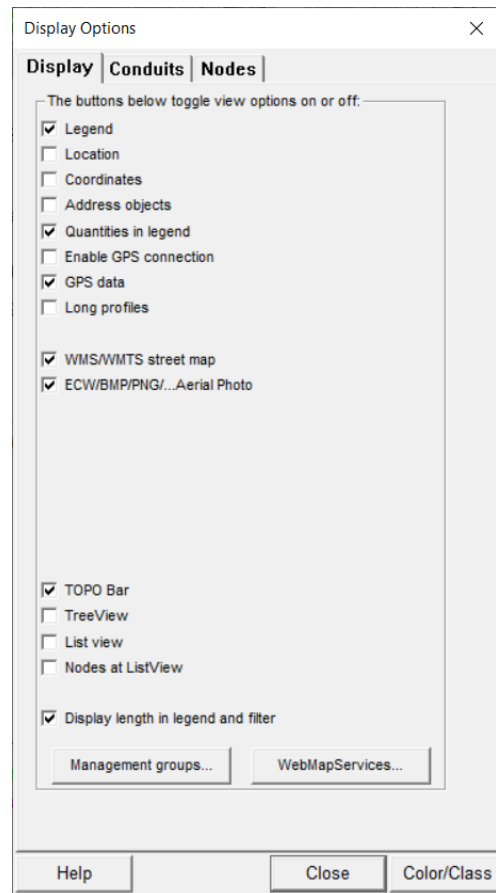


Figure 7.1

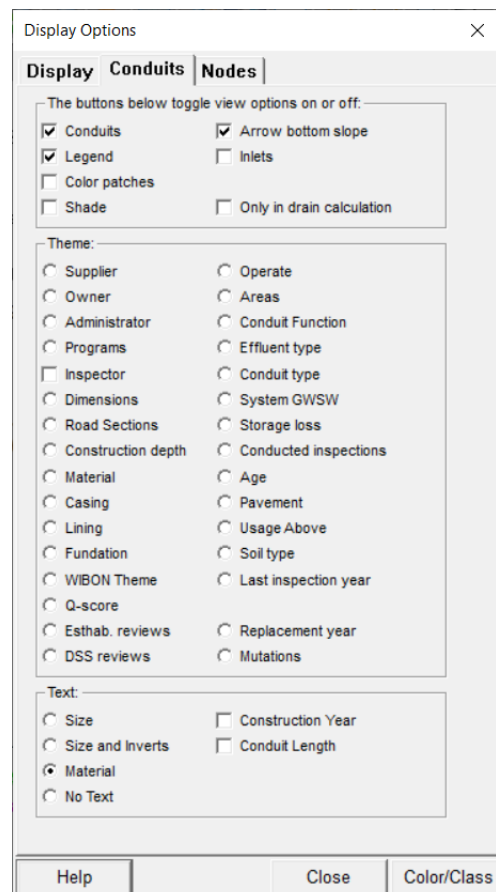


Figure 7.2

## 7.2 Zoom Options

In addition to adjusting the GUI there are options available to zoom and pan through the urban drainage schematic, background topographic and images. These options can be started from the **Display** menu, the button bar and quick menu behind the right mouse button.

The zoomed schematic is displayed in the upper left corner of the caption/legend area. This area contains the conduits of the entire schematic, with a red rectangle defining the area that is zoomed in.

The next zoom options are available:

**Zoom In:** This option allows the user to zoom in on a piece of the schematic. This is accomplished by selecting **Zoom In** from the **Display** Menu, Button Bar or Quick menu. Place the mouse pointer on the centre of the desired area. Then press down on the left mouse button and release the button. This function is repeating when the GPS antenna was not connected starting BRUTIS. The function repeats until the user opens the quick menu with the right mouse button or selects a new option.

**Zoom Out:** This option allows the user to zoom out on a piece of the schematic. This is accomplished by selecting **Zoom Out** from the **Display** Menu, Button Bar or Quick menu. Place the mouse pointer on the centre of the desired area. Then press down on the left mouse button and release the button. This function is repeating when the GPS antenna was not connected starting BRUTIS. The function repeats until the user opens the quick menu with the right mouse button or selects a new option.

**Zoom All:** This option re-draws the schematic or background topographic to its full original size. This is accomplished by selecting **Zoom All** from the **Display** Menu, Button Bar or Quick menu.

**Pan:** This option allows the user to move and zoom around in the schematic. This is accomplished by selecting **Pan** from the **Display** Menu, Button Bar or Quick menu. Move the schematic by moving the mouse pointer around while holding the left mouse button down. Scrolling the mouse wheel causes zooming in and out on the centre of the mouse pointer. This function is repeating when the GPS antenna was not connected starting BRUTIS. The function repeats until the user opens the quick menu with the right mouse button or selects a new option.

**Zoom Window:** This option allows the user to zoom in on a piece of the schematic. This is accomplished by selecting **Zoom Window** from the **Display** Menu or Quick menu. Defining the zoom area is accomplished by placing the mouse pointer in the upper left corner of the desired area. Then press down on the left mouse button and drag the mouse to define a box containing the desired zoom area. Finally, release the left mouse button and the viewing area will display the zoomed in schematic.

**Zoom Dynamic:** This option allows the user to zoom in and out on a piece of the schematic. This is accomplished by selecting **Zoom Dynamic** from the **Display** Menu or Quick menu. Defining the zoom area is accomplished by placing the mouse pointer in the centre of the desired area. Then press the left mouse button down and release the button. Then locate the mouse on a corner of the area. Press the left mouse button down and drag the mouse to and from the centre. Finally, release the left mouse button and the viewing area will display the zoomed in schematic.

### 7.3 Find Options

This option allows the user to have the interface locate a specific feature on the schematic. This is especially useful when very large and complex systems are being modelled.

These options can be started from the **Display** menu, the button bar and quick menu behind the right mouse button.

The next find options are available:

**Find Node:** This option allows the user to specify a node number and zoom in on the area around the node.

**Find Street:** This option allows the user to select/specify a streetname from a listing and zoom in on the area around the street. The conduits in the street are painted red.

**Find Adres:** This option allows the user to select/specify an address from a listing and zoom in on the area around the address. The address is painted with a red cross.

**Find Node:** This option allows the user to specify an EAN Code and zoom in on the area around the node with an installation containing the EAN code.

In addition to adjusting the GUI there are options available to zoom and pan through the urban drainage schematic, background topographic and images. These options can be started from the button bar and quick menu behind the right mouse button.

### 7.4 Adjust Text formats

This option allows the user to change the text format of node, conduit and topographic text.

These options can be started from the **Display / Text Format**, menu.

The next find options are available:

**Node Number:** This option starts a font dialog which allows the user to specify a font, font style, size and effect.

**Dimensions and Levels:** This option starts a font dialog which allows the user to specify a font, font style, size and effect.

**DXF Text:** This option starts a font dialog which allows the user to specify a font, font style, size and effect.

The options above do not save for a next session. Use the next start options, available via menu option: **Tools / Start options**, for fixing text heights for subsequent sessions:

**txtlv:** for the text height in the passports. After changing this option, the program has to be restarted before the change has effect;

**txtadr:**for the text height of address text;

**txtnod:** for the text height of node and object text, like the node number;

**txtstr:** for the text height of conduit text, like the conduit dimension;

**txtdxf:** for the height of text in topograp;  
**txtdef:** for the height of all the other text.

## 8 Data Options

This option allows the user to consult the data of gullies, nodes, conduits and shapes.

### Contents

- Nodes
- Conduits

### 8.1 Nodes

This option allows the user to consult the data of nodes.

1. Start the option **Node** from the **Data** menu, the button bar and quick menu behind the right mouse button.
2. Place the mouse pointer near the node. Then press down on the left mouse button and release the button.
3. a tabbed passport will appear as depicted in figure 8.2.

#### Figure 8.2

4. Change tabs by clicking with left mouse button on a tab.
1. Select a next node as described in step 2 or quit the dialog.

### 8.2 Conduits

This option allows the user to consult the data of conduits.

1. Start the option **Conduit** from the **Data** menu, the button bar and quick menu behind the right mouse button.
2. Place the mouse pointer near the conduit. Then press down on the left mouse button and release the button.
3. a tabbed passport will appear as depicted in figure 8.3.

#### Figure 8.3

4. Change tabs by clicking with left mouse button on a tab.
5. Select a next conduit as described in step 2 or quit the dialog.



## Appendix A Command Line Arguments

Between arguments you should place a comma (,) directly between each command line argument that you wish to use!

### File arguments:

Command	Result	Example
address=	Directory location BRUTIS will use searching and creating work-files	address =C:\BrutisData
images=	Directory location for searching data files connected to inspection data. For example images, spreadsheets, pdf and datafiles containing HEC RAS: Cross sections, Bridges/Culverts and Lateral structures.	images=C:\BrutisData\HEC\Tando
dxfile=	Start-up with displaying geographical data from defined file.	dxfile=C:\BrutisData\DXF\Lampriet tertier_channel.dxf
rev=	Open defined mutation-file after start-up. Display mutation data and set filepointer to end of file for adding new mutations. Mutations are written in ASCII format.	rev=C:\BrutisData\REV\check01.rev
way=	Open defined way-point registration file. GPS way-point data will be written in DXF format	way=C:\BrutisData\WAY\wasehere.dxf
ribdrive=	Defines drive letter of medium with inspection video and photo data. BRUTIS replaces the default drive letter with this letter.	Ribdrive=f

### Database arguments

Command	Result	Example
rbtype=	When exploring a database first look for tables of defined management system.	rbtype=DHV
sectie=	BRUTIS selects only data off defined section from DG-DIALOG database.	sectie=xx
timeout=	Database selection or and connection timeout parameter in seconds	timeout=60
username=	Automatically connect with database with specified username.	username=scott
password=	Automatically connect with database with specified password.	password=tiger
datasource=	Automatically connect with database with specified data source name.	datasource=BRUTIS
insrddb	Also install Riodesk Database tables and indexes when they do not exist in an database with concurrent tables. Default BRUTIS does not install tables in a database with existing management tables.	insrddb
nonode	Node data will not be checked and saved when transferring data from mutation-file to database.	nonode
nopipe	Conduit data will not be checked and saved when transferring data from mutation-file to database.	nopipe
doadres (new)	From version 4.3 and newer by default BRUTIS does not check the database for inserting address data. When this option is added to the command line BRUTIS will check the database and insert address data.	doadres

## Appendix A Command Line Arguments

### GPS arguments

Command	Result	Example
<code>gpsd</code> ( <i>new</i> )	Get GPS data from <code>gpsd</code> daemon when running BRUTIS under Linux/Wine operating system.	<code>gpsd</code>
<code>gpsport=</code>	Defines serial port for connecting a serial GPS antenna. Antenna must send NMEA \$GPGAA data line through serial port. Don't forget the double points ":" after the serial port.	<code>gpsport=COM1 :</code>
<code>frq=</code>	Defines repaint frequency in milliseconds. Default is 2000. Only active when GPS antenna is connected	<code>frq=5000</code>
<code>stp=</code>	Defines repaint distance of new GPS location. When GPS position is moved more then defined value the data will be repainted. Default distance is 5. m	<code>stp=2.</code>
<code>utm=</code>	<p>Defines latitude/longitude to UTM coordinate translation type. English versions have default type 0.</p> <p>Possible entries are:</p> <ul style="list-style-type: none"> <li>0 or WE: WGS-84</li> <li>1 or AA: Airy</li> <li>2 or AN: Australian National</li> <li>3 or BR: Bessel 1841</li> <li>4 or BN: Bessel 1841 (Nambia</li> <li>5 or CC: Clarke 1866</li> <li>6 or CD: Clarke 1880</li> <li>7: Everest</li> <li>8: Fischer 1960 (Mercury</li> <li>9: Fischer 1968</li> <li>10: GRS 1967</li> <li>11 or RF: GRS 1980</li> <li>12 or HE: Helmert 1906</li> <li>13 or HO: Hough</li> <li>14 or IN: International</li> <li>15 or KA: Krassovsky</li> <li>16 or AM: Modified Airy</li> <li>17: Modified Everest</li> <li>18 or FA: Modified Fischer 1960</li> <li>19 or SA: South American 1969</li> <li>20: WGS 60</li> <li>21: WGS 66</li> <li>22 or WD: WGS-72</li> </ul>	<code>utm=BR</code>

## Appendix A Command Line Arguments

Internet arguments (applies only to internet version of BRUTIS):

Command	Result	Example
send=	Internet timeout value in milliseconds for sending data	send=60000
receive=	Internet timeout value in milliseconds for receiving data	receive=60000
url=	After start-up BRUTIS selects automatically data from internet database and opens a default mutation-filename.  Possible entries are: <b>1</b> select only gully data from internet database <b>2</b> select only conduit and node data from internet database <b>3</b> select all data from internet database	url=1
revurl	When reading mutation-file BRUTIS sends all found data to internet database.	

Display arguments:

Command	Result	Example
pen=	Defines the thickness off the painted conduits.	pen=2
slowtopo=	Display DXF of SHP depends on zoom factor. Only the box defined with maximum and minimum coordinates of geographical data will not be painted if the users zooms out to a certain level.	slowtopo=4.
noblock	Block (or AutoCAD object data) will not be painted	noblock
dispspu	Always display nodetype instead of node number	dispspu
dispnode	Always display node numbers	dispnode

DXF Export arguments (new in BRUTIS version 4.3):

Command	Result	Example
dimnode= <i>(new)</i>	Defines the height of nodes in to be exported DXF. Default value is 0.8	dimnode=1.
dimtxt1= <i>(new)</i>	Defines the height of dimension text in to be exported DXF. Default value is 1.3	dimtxt1=1.5
dimtxt2= <i>(new)</i>	Defines the height of level text (invert, cover or surface levels) in to be exported DXF. Default value is 1.2	dimtxt2=1.3
dimtxt3= <i>(new)</i>	Defines the height of node numbers in to be exported DXF. Default value is 1.8	dimtxt3=2.0

## Appendix A Command Line Arguments

Data manipulation arguments (new in BRUTIS version 4.3):

Command	Result	Example
<code>adjustnode</code> <i>(new)</i>	Menu option: "Tools / Get Sewage from DXF" creates new conduits and nodes. If an endpoint of DXF/SHP line or poly line is near an existing node. The coordinates of that node will be updated with the coordinates of the endpoint of the line or poly line.	<code>adjustnode</code>
<code>mvhsnap</code> <i>(new)</i>	Snaps the found Z coordinate to node Coverlevel (only when snapping to midpoint of circle or snapping to GPS position).	<code>mvhsnap</code>
<code>stripnull</code> <i>(new)</i>	Strips leading zero's (0) from node numbers when reading work-files or SUFRIB inspection files. Don't use this function when you want to change data in the database.	<code>stripnull</code>
<code>spurename</code> <i>(new)</i>	Sets node types automatically to External Weir, Internal Weir or Pump when BRUTIS has evidence that the node is such type. In previous versions this was done by default.	<code>spurename</code>
<code>begend</code> <i>(new)</i>	When defined a polyline/trace conduit trace must be connected to centerpoints of nodes. When not connected an error message is displayed.	<code>begend</code>

Menu and dialog behaviour arguments:

Command	Result	Example
<code>kolkgps</code>	Display gully cleaning menu options, adjust and display gully cleaning dialog. Search for GPS antenna.	<code>kolkgps</code>
<code>slibgps</code>	Display gully cleaning menu options, adjust and display gully cleaning dialog. Fill the conduit inspection dialog with thickness of sediment aspect data, so the operator has only to fill in the thickness. Always set default conduit cleaning and search for GPS antenna.	<code>slibgps</code>
<code>instgps</code>	Display installation mutation buttons in menu	<code>instgps</code>
<code>viewgps</code>	Display buttons for outdoor usage in menu	<code>viewgps</code>
<code>revigps</code>	Display node and conduit mutation buttons in menu	<code>revigps</code>
<code>autonum</code>	BRUTIS automatically numbers nodes when a conduit is added as a polyline.	<code>autonum</code>
<code>norepeat</code>	Don't automatically repeat the zoon in, zoom out and pan zoom functions.	<code>norepeat</code>
<code>sumcatch</code>	Before importing catchments data the existing data in memory will not be set to 0. So the imported amount of catchments will be added.	<code>sumcatch</code>
<code>rioscoop</code>	After selecting a conduit the data of the conduit is copied in the file: RioscoopKikker.rib in the TEMP directory.	<code>rioscoop</code>
<code>glbinsp</code>	Only display global inspection aspects. Only implicated in road management version of BRUTIS.	<code>glbinsp</code>
<code>newcode</code>	User can add new descriptions. In English version of BRUTIS always on.	<code>newcode</code>

## Appendix B CSV and Revision file coding system

This appendix describes the CSV and mutation-file coding system for survey of the inventory and visual inspection of drainage systems.

The purpose, method and codes related to the inventory and visual inspection are defined in appendix C.

The coding system is used to:

- transfer data from surveyor to the database of the BRUTIS management system.
- exchange data between databases.

The BRUTIS mutation system rules the transfer of data from surveyor to the database. The BRUTIS CSV file export and import system rules the exchange of data between databases. If the surveyor uses a spreadsheet program, the CSV export and import system can also be used to transfer data from spreadsheet to the database.

The header information of mutation and CSV file types is coded in appendix C section 3.

Both file formats have a variable length. Only the underlined headers are mandatory. The order of headers can be changed.

By default BRUTIS uses a comma as field separator. Changing the field separator is possible by defining the next field separator identification on the first line. Before the headers.

**#A3=**                      Example:                      **#A3=;**

BRUTIS uses as a rule a decimal point for the decimal point.

BRUTIS uses no surround character (example: "). Normally surround characters are used before and after text fields where text contains the field separator. As a rule in BRUTIS, **text fields must not contain field separator characters!**

Each data row contains a mutation date and optionally a mutation time. When importing CSV or mutation data BRUTIS checks if the date and time are newer then those registered in the data set. If the to be imported data has an older date and time the data will not be imported in BRUTIS. When transferring to the database this check is also performed between data set and database contents.

### **Caution!**

**BRUTIS does not read regional settings defined in Microsoft (MS) Windows!**

In the regional settings the field separator and decimal point characters are defined.

BRUTIS does not read CSV files if MS Excel exports with the wrong field separators. Also has MS Excel the bad habit of losing end of line field separators when fields near the end of line are empty

### 1. CSV files

An example of a CSV file is given in figure D.4 and D.5. How to import and export is documented in chapter 5.

CSV files contain data of one object type. The data fields are defined by the headers. Each row contains one object. The object type is defined by the Field description header. Thanks to the headers and field description it is possible to place the contents of CSV files in one file. Like in a file created with the menu option: **"File / Save As / KIK BRUTIS File"**. BRUTIS copies in this file all CSV file data contents depicted with menu option: **"Export / CSV Object Data"**. This is called a BRUTIS file. It has all the data (except inspection data when saved in a new window). In fact the BRUTIS file is a whole database in CSV format.

#### **Tip:**

First export an example CSV file when creating new CSV files. Use the options depicted with menu option: **"Export / CSV Object Data"**, to get the format of CSV files.

## Appendix B CSV and Revision file coding system

### 2. Mutation files

An example of a Mutation file is given in figure 6.1. The creation of mutation-files and the transferring of data from mutation-files to the database are explained in chapter 5.1. Chapter 6 explains how to note data in the mutation-file and to transfer data to the database.

The first part of the data for a visual inspection or inventory of geometric data contains information about the format of the data. Each item of data appears in on a separate record. Each record is prefixed with the character # followed by the identification code for the information, the = sign and the code for the data. The header information is described in table B.1

Identification	Description	Example
#A3=	The field separator. This is a single character used to separate the items of data in a record	#A3=,
#A6=	Defines a start id for identifying gullies. The first inserted gully will have this id. The next will have this id +1, the next id +2 etc.	#A6=1001
#B=	Identifies the record with mutation-file information	#B=ABI, ABH, ABR, AAM, ABS, ABT, ABU, RBF , , , Pilot_Data_KC, , , , 2008-11-18
#I=	Identifies a record with an object and data to be inserted.	#I=CAA, CAB, CBF, CBG Node1, 758417.500-615311.000, 20081119, 94130
#U=	Identifies a record with an object identification and to the to be updated data.	#U=CAA, CAB, CBF, CBG Node1, 758182.250-615210.500, 20081119, 93943
#D=	Identifies a record with a to be deleted object.	#D=CAA, CBF, CBG Node1, 20081126, 94309

Table B.1

## Appendix C Coding system related to inventory and visual inspection

This appendix describes the purpose, method and coding system related to the inventory, condition and visual inspection of drainage systems.

The coding system is:

- based on the European Standard EN 13508-2 and is made practical for use with drainage.
- used to:
  - transfer data from surveyor to the database of the BRUTIS management system.
  - exchange data between databases.

Appendix B describes the BRUTIS mutation and CSV file export and import system which rules the data exchange from inspector to the database. Or the exchange of data between databases

The next sections describe the:

1. Purpose
2. Method
3. Codes related to the inventory and condition of drainage
4. Codes related to the visual inspection (to assess the condition) of drainage

### 1. Purpose

The information about the condition of the drainage can be used for the following purposes:

- to assess the performance of the drainage as part of the development of a rehabilitation plan;
- to provide information for use in the planning of maintenance activities, e.g. drainage cleaning programmes;
- to investigate specific maintenance or operational problems;
- the recording of inventory data.

### 2. Method

Each drain is defined by a conduit between two nodes with a unique number. The geometric data of nodes and conduits are defined in table C.1 and C.2.

The **nodes** define drainage:

- junctions;
- changes of cross section, not caused by conditional aspects;
- changes of material and year of construction.

The **conduits** define the alignment of the drainage.

Not all the geometric data in the tables is needed for the purpose. The minimum geometric data for assessing the condition and needed maintenance and operational problems are painted dark grey (orange). The minimum extra geometric data for assessing the hydraulic capacity are painted light grey (yellow).

The survey of the geometric data of drainage is done once. The visual inspection of the condition of the drainage is done frequently. The frequency is depending of the management goals.

Part of the visual inspection of the drainage condition is the registration of damages, sediment, obstacles and bridges. These conditional aspects influence the hydraulic capacity of the drainage and have to be counted for when performing hydraulic calculations. Do not locate nodes at conditional aspects because the maintenance of the geometric data will be a struggle and a punishment.

In **micro** drainage (neighbourhood level) systems it is not applicable:

- to locate nodes at conditional aspects like bridges or obstacles
- to perform advanced hydraulic calculations. Calculations should be based on judgement of the condition and geometric data.

In **macro** drainage (village/city level) systems it is more applicable:

- to locate nodes where bridges or obstacles changes the cross section.
- to perform advanced hydraulic calculations.

## Appendix C Coding system related to inventory and visual inspection

The visual inspection can be carried out in one of the following ways:

- inspection of the not covered drainage from the surface;
- inspection of covered drainage or culverts with mirrors or photographic camera
- With a laptop, notebook or tablet computer. Installed on the computer the program BRUTIS with the drainage network, topography and Global Positioning System (GPS). The BRUTIS program employs the personnel with a system to register inventory and condition aspect locations, extends, characterisations, quantifications and photos.

The inspection shall be carried out sufficiently slowly to enable all features to be observed. A photographic camera is used to register aspects.

## Appendix C Coding system related to inventory and visual inspection

### 3. Codes related to the inventory of drainage

The tables in this section define the codes in the mutation-files and the headers in the CSV files. The key values are underlined. The minimum geometric data for assessing the condition and needed maintenance and operational problems are painted dark grey (orange). The minimum extra geometric data for assessing the hydraulic capacity are painted light grey (yellow).

The tables C.1 through C.12 define the geometric data.

The tables C.13 through C.15 define the condition data.

The coding system related to the visual inspection of drainage is defined in section 4

<b>Nodes</b>		
FieldDescription	:	rd_node
<b>CSV</b>		<b>Revision</b>
<u>Node MutDate (yyyymmdd)</u>		<u>CBF</u>
<u>Node.MutTime (hhmmss)</u>		<u>CBG</u>
<u>Node ID</u>		<u>CAA</u>
<u>x (m)</u>		<u>CAX</u>
<u>y (m)</u>		<u>CAY</u>
Quality coordinates		CKC
<u>Ground Level</u>		<u>CAC</u>
Quality Ground Level		CKM
Chamber Floor Level		CAD
Water Level		CFJ
Chamber Shape		CAE
Chamber Width (mm)		CAF
Chamber Length (mm)		CAG
Node Type		CAR
Node Material		CCD
Chamber Plan Area		CFG
System Type		CCU
Node Cover Type		CCO
Node Flow Profile		CFH
Node Construction		CFI
Node Adresses		CZA
Node Inflow (l/h)		CZB
Head Loss coefficient		CZC
Node Remarks		CDE

**Table C.1**

#### Conduits

FieldDescription : rd\_pipe

#### CSV

#### Revision

<u>Cond.MutDate (yyyymmdd)</u>	<u>ABF</u>
<u>Cond.MutTime (hhmmss)</u>	<u>ABG</u>
<u>US Node ID</u>	<u>AAD</u>
<u>DS Node ID</u>	<u>AAF</u>
<u>Conduit ID</u>	<u>AAZ</u>
Offset Distance (m)	AAY
Conduit Type	ACJ
System Type	ACK
Year of Construction	ACN
<u>Conduit Material</u>	<u>ACD</u>
Shape ID	ACA
Joint Construction	ACO
Soil Type	ACX
Foundation Type	ACS
<u>US Invert Level (m AD)</u>	<u>ACH</u>
<u>DS Invert Level (m AD)</u>	<u>ACI</u>
Quality Invert Levels	AKB
Street Code	AAS
Street Name	AAJ
Street Type	ACR
Pavement Type	ACQ
<u>Width</u>	<u>ACC</u>
<u>Height</u>	<u>ACB</u>
<u>Invert Width</u>	<u>ACP</u>
<u>Length</u>	<u>ACG</u>
Quality Length	AKL
Bottom Roughness	ACV
Top Roughness	ACW
District Code	BOM
District Name	AAO
Inspection Date	API
Year of Measure	
Review	AMO
Tactical Measure	AMR
Replacement direct (m)	AM1
Replacement < 5 y. (m)	AM5
Replacement < 10 y. (m)	A10
No Replacement (m)	AM0
No inspect/review (m)	NOI
Operational Measure	APL
Projectname	APW
Replacement Cost	APC
Conduit Remarks	ADE

**Table C.2**

## Appendix C Coding system related to inventory and visual inspection

### Conduit points on poly line

FieldDescription : rd\_trace

#### CSV

Cond.MutDate (yyyymmdd)

Cond.MutTime (hhmmss)

US Node ID

DS Node ID

Conduit ID

Pline X

Pline Y

Pline Z

#### Revision

ABF

ABG

AAD

AAF

AAZ

ATX

ATY

ATZ

### Pumps

FieldDescription : hw\_pump

#### CSV

Link Suffix

Link Type

Pump MutDate (yyyymmdd)

Pump.MutTime (hhmmss)

US Node ID

DS Node ID

Pump ID

Tag ID

Switch on Level

Switch off level

DS Switch on Level

DS Switch off level

Base level

Discharge

Pump Type

Date Install.(yyyymmdd)

Design

I/O Type

Year of construction

Serial Number

Impeller Type

Impeller Dimension

Demand

Voltage

Cos Phi 1-0

Revs

Inominaal (mA)

Oil Filling

Foot Rack

Hour Meter

Kwh Indicator

Frequency Transvormer

Telemetry

Overhaul

Disch. Necessary (l/s)

Discharge 2010 (l/s)

Discharge 2020 (l/s)

Q/H1 Discharge (l/s)

Q/H1 Water Level (m AD)

Q/H2 Discharge (l/s)

Q/H2 Water Level (m AD)

Q/H3 Discharge (l/s)

Q/H3 Water Level (m AD)

Q/H4 Discharge (l/s)

Q/H4 Water Level (m AD)

Q/H5 Discharge (l/s)

Q/H5 Water Level (m AD)

Q/H6 Discharge (l/s)

Q/H6 Water Level (m AD)

Q/H7 Discharge (l/s)

Q/H7 Water Level (m AD)

Q/H8 Discharge (l/s)

Q/H8 Water Level (m AD)

#### Revision

ACT

ACU

PIZ

PIT

PAD

PAF

PID

PNR

PUN

PUF

PDN

PDF

PAB

PCA

PMP

PDA

PWU

PNI

PJV

PSE

PWA

PWD

PAV

PSV

PAM

PRF

PIN

POL

PVR

PUT

PKM

PFO

PTE

PRV

PNO

P10

P20

PC1

PN1

PC2

PN2

PC3

PN3

PC4

PN4

PC5

PN5

PC6

PN6

PC7

PN7

PC8

PN8

Table C.3

### Electro Mechanical Installations

FieldDescription : rd\_inst

#### CSV

Inst.MutDate (yyyymmdd)

Inst.MutTime (hhmmss)

Installation Node Nr

Installation Name

Installation Number

Installation Year

Housing Year

Phone Number

Meter Number

Location Meter

Frequency Maintenance

Town Name

Installation Type

Lock Type

Control Type

Installer

Owner

Storage (m3)

Housing Width (mm)

Housing Heigth (mm)

Housing Length (mm)

Ann. Type Malfunction

Ann. Type Thermal

Ann. Type Phase Gone

Ann. Type High Water

Ann. Type Low Water

Overhaul Installation

Date NEN3140

#### Revision

IAZ

IAT

INO

INA

IPO

IJI

IJK

ITN

IMN

ILM

IOF

IKR

ITY

ISL

IBS

IIN

IEI

IPB

IKW

IKH

IKL

IST

ITE

IFA

IHO

ILA

IRV

INE

Table C.5

## Appendix C Coding system related to inventory and visual inspection

**Weirs**  
FieldDescription : hw\_weir

CSV	Revision
Link Suffix	ACT
Shape ID	ACA
Link Type	ACU
Weir MutDate (yyyymmdd)	WIZ
Weir.MutTime (hhmmss)	WIT
US Node ID	WAD
DS Node ID	WAF
Weir ID	WID
Crest	WAH
Weir Width	WAW
Discharge Coefficient	WAC
Flow Direction	WAL

**Table C.6**

**Orifices**  
FieldDescription : hw\_orifice

CSV	Revision
Link Suffix	ACT
Shape ID	ACA
Width	ACC
Height	ACB
Link Type	ACU
US Node ID	WAD
DS Node ID	WAF
Weir ID	WID
Discharge Coefficient	WAC
Flow Direction	WAL
Orif.MutDate (yyyymmdd)	WCZ
Orif.MutTime (hhmmss)	WCT
Invert Level	WBO
Discharge Coefficient	WAO
Limiting Discharge(l/s)	WCL

**Table C.7**

**Catchments**  
FieldDescription : hw\_subcatchment

CSV	Revision
Node ID	CAA
x	CAX
y	CAY
System Type	CCU
US Node ID	AAD
DS Node ID	AAF
Subcatchment ID	CFI
Total Area (ha)	CFT
Contributing Area (ha)	CFC
Closed Pav	
Steep(%/ha)	C01
Closed Pav Flat(%/ha)	C02
Closed Pav	
Stretc(%/ha)	C03
Open Pav Steep(%/ha)	C04
Open Pav Flat(%/ha)	C05
Open Pav Stretc(%/ha)	C06
Unpaved Steep(%/ha)	C07
Unpaved Flat(%/ha)	C08
Unpaved	
Stretched(%/ha)	C09
Roof Steep(%/ha)	C10
Roof Flat(%/ha)	C11
Roof Stretched(%/ha)	C12
Closed Pav Steep(m2)	M01
Closed Pav Flat(m2)	M02
Closed Pav Stretc(m2)	M03
Open Pav Steep(m2)	M04
Open Pav Flat(m2)	M05
Open Pav	
Stretched(m2)	M06
Unpaved Steep(m2)	M07
Unpaved Flat(m2)	M08
Unpaved Stretched(m2)	M09
Roof Steep(m2)	M10
Roof Flat(m2)	M11
Roof Stretched(m2)	M12

**Table C.8**

## Appendix C Coding system related to inventory and visual inspection

**Gullies**  
FieldDescription : rd\_con

CSV	Revision
Gull.MutDate (yyyymmdd)	HAZ
Gull.MutTime (hhmmss)	HAT
Gully ID	HAA
Gully Street Name	HAJ
x (m)	HAX
y (m)	HAY
Gully Type	HAR
Gully Remarks	HDE
Deposit weight	HDM
Hand Cleaned	HA1
Gully With Lock	HB4
Gully Trap Not Present	HA2
Cement In Gully	HA3
Grease In Gully	HA4
Bottom Is Defective	HA5
Cover Is Defective	HA6
Unable To Lift Cover	HA7
Cover Not Present	HA8
Gully Pipe Obstructed	HA9
Settlement Of Gully	HB0
Settlement Of Pavement	HB1
Vehicle On Gully	HB3
Not Cleaned	HB2

**Table C.9**

**Connections between gullies**  
FieldDescription : rd\_col

CSV	Revision
Conn.MutDate (yyyymmdd)	SAZ
US Gully ID	SAD
DS Gully ID	SAF
Connector Material	SCD
Connector Width (mm)	SCC
Connector Type	SCK
US Invert Level (m AD)	SCH
DS Invert Level (m AD)	SCI
Year of Construction	SCN

**Table C.10**

**Addresses**  
FieldDescription : rd\_adr

CSV	Revision
Street Code	AAS
Street Name	AAJ
Adres Number	ONR
Adres Letter	OLE
Adres Addition	OAD
Adres x (m)	OCX
Adres y (m)	OCY
Adres Type	OTY
Adres Outflow (l/h)	OLH

**Table C.11**

**Street names**  
FieldDescription : rd\_str

CSV	Revision
Street Code	AAS
Street Name	AAJ

**Table C.12**

**Theme/Area/District names**  
FieldDescription : rd\_bem

CSV	Revision
District Code	BOM
District Name	AAO
Colour number	LCO
District Theme	MKL

**Table C.13**

## Appendix C Coding system related to inventory and visual inspection

### Inspection mutation file

FieldDescription : rd\_rib

CSV	Revision
Inspection File ID	RIB
Inspection FileName	AIF
Number of Inspections	INS
Number of Results	RES
Number of Images	IMA
Company Name	ABH

**Table C.14**

### Inspections

FieldDescription : rd\_ins

CSV	Revision
US Node ID	AAD
DS Node ID	AAF
Conduit ID	AAZ
Inspection File ID	RIB
Inspection ID	AID
Insp.Date (yyyymmdd)	XBF
Insp.MutTime (hhmmss)	XBG
Inspection Type	ABE
Inspection Remarks	ZZP
Node Reference	AAK

**Table C.15**

### Inspection results

FieldDescription : rd\_res

CSV	Revision
Inspection File ID	RIB
Inspection ID	AID
Node Reference	AAK
Axial begin location	AAH
Axial end location	AAI
Radial begin location	KL1
Radial end location	KL2
Damage Type	XBE
Classification	KAC
First characteristic	KA1
Second characteristic	KA2
Picture FileName	ABN
Video FileName	ABO
Video Position	ABM
Kwantification 1	KW1
Kwantification 2	KW2
Status	STS

**Table C.16**

## Appendix C Coding system related to inventory and visual inspection

### 4. Codes related to the visual inspection of drainage

This section defines the coding system for the visual inspection. How to perform visual inspection is documented in chapter 6.2.

The coding system is based on the European Standard EN 13508-2 and is made practical for use with drainage.

For sewer systems BRUTIS uses an extended coding system based on the European Standard.

The tables C.21 through C.39 define the coding system for visual inspection of the drainage. The aspects are observed with:

- the characterisation and quantification code (column: C1 and C2) of aspects;
- the location and extends of the aspects along the alignment measured from a node;
- Optional:
  - a measure of the aspects (in mm, for example the height of settled deposits)
  - a photographic picture to visualize the aspect

BRUTIS adds automatically the seriousness (column: S) of aspects. The seriousness and the extend of aspects are used in the decision support system for rehabilitation and the maintenance planning.

The tables C.13 through C.15 define the condition data.

Aspect:		Fissure		
Code	S	C1	C2	Description
BAB	1	0	0	no fissure detected
	2	A	0	surface crack
	4	B	0	visible crack on the conduit wall
	5	C	0	fracture or visibly open crack in a conduit wall

**Example:**

BAB      4    B    0



Table C.21

# Appendix C Coding system related to inventory and visual inspection

**Aspect:** Break or collapse

Code	S	C1	C2	Description
BAC	1	0	0	no break or collapse detected
	2	A	0	pieces of conduit visibly displaced but not missing
	4	B	0	missing pieces of wall
	5	C	0	complete loss of structural integrity

**Example:**

BAC 4 B 0



**Example:**

BAC 5 C 0



Table C.22

## Appendix C Coding system related to inventory and visual inspection

<b>Aspect:</b>		<b>Defective brickwork</b>		
<b>Code</b>	<b>S</b>	<b>C1</b>	<b>C2</b>	<b>Description</b>
BAD	1	0	0	no defective brickwork or masonry detected
	2	A	0	displaced
	3	B	0	missing
	4	C	0	dropped invert
	5	D	A	collapse

**Example:**

BAD      3    B    0



Table C.23

<b>Aspect:</b>		<b>Missing Mortar</b>		
<b>Code</b>	<b>S</b>	<b>C1</b>	<b>C2</b>	<b>Description</b>
BAE	1	0	0	no missing mortar detected
	2	0	0	mortar depth $\leq$ 10 mm
	3	0	0	10 mm < mortar depth $\leq$ 20 mm
	4	0	0	20 mm < mortar depth $\leq$ 40 mm
	5	0	0	mortar depth > 40 mm

**Example:**

No example of missing mortar

Table C.24

## Appendix C Coding system related to inventory and visual inspection

Aspect:		Surface damage		
Code	S	C1	C2	Description
BAF	1	0	0	no surface damage detected
	2	A	0	increased roughness
	2	B	0	breaking away of small fragments
	2	C	0	visible aggregate
	2	J	0	corrosion products on surface
	3	D	0	aggregate projecting from surface
	3	F	0	visible reinforcement
	4	E	0	missing aggregate
	4	G	0	reinforcement projecting from surface
	5	H	0	corroded reinforcement
	5	I	0	missing wall

**Example:**

BAF 3 D 0



Table C.25

Aspect:		Intruding connection		
Code	S	C1	C2	Description
BAG	1	0	0	length of intrusion <= 10% height of conduit
	3	0	0	10% < length of intrusion <= 25 % height of conduit
	5	0	0	length of intrusion > 25% height of conduit

**Example:**

BAG 5 0 0



Table C.26

## Appendix C Coding system related to inventory and visual inspection

Aspect:		Defective connection		
Code	S	C1	C2	Description
BAH	1	0	0	no defect detected
	2	A	0	the position of the connection is incorrect
	3	B	0	there is a gap between end of connection and conduit
	3	C	0	there is a gap around connection
	4	D	0	the connection is damaged
	5	E	0	the connection is blocked

**Example:**

BAH      2    A    0



Table C.27

Aspect:		Defective repair		
Code	S	C1	C2	Description
BAL	1	0	0	no defective repair detected
	2	A	0	part of the wall is missing
	3	B	0	a deliberately made hole has become defective
	5	Z	0	other

**Example:**

No example of defective repair

Table C.28

## Appendix C Coding system related to inventory and visual inspection

Aspect:		Vegetation		
Code	S	C1	C2	Description
BBA	1	0	0	no Vegetation detected
	2	0	0	reduction cross-sectional area $\leq$ 10%
	3	0	0	10% < reduction cross-sectional area $\leq$ 25%
	4	0	0	25% < reduction cross-sectional area $\leq$ 50%
	5	0	0	reduction cross-sectional area > 50%

**Example:**

BBA      5    0    0



Table C.29

Aspect:		Settled deposits		
Code	S	C1	C2	Description
BBC	1	0	0	reduction cross-sect area $\leq$ 5%
	2	0	0	5% < reduction cross-sect area $\leq$ 10%
	3	0	0	10% < reduction cross-sect area $\leq$ 25%
	4	0	0	25% < reduction cross-sect area $\leq$ 50%
	5	0	0	reduction cross-sect area > 50%

**Example:**

BBC      4    0    0



Table C.30

## Appendix C Coding system related to inventory and visual inspection

**Aspect:** Ingress of soil

Code	S	C1	C2	Description
BBD	1	0	0	no ingress of soil detected
	2	0	0	reduction cross-sectional area $\leq$ 5%
	3	0	0	5% < reduction cross-sectional area $\leq$ 15%
	4	0	0	15% < reduction cross-sectional area $\leq$ 25%
	5	0	0	reduction cross-sectional area > 25%

**Example:**

BBD 5 0 0



Table C.31

**Aspect:** A Bridge Culvert

Code	S	C1	C2	Description
BEB	1	0	0	reduction cross-sectional area $\leq$ 5%
	2	0	0	5% < reduction cross-sectional area $\leq$ 10%
	3	0	0	10% < reduction cross-sectional area $\leq$ 25%
	4	0	0	25% < reduction cross-sectional area $\leq$ 50%
	5	0	0	reduction cross-sectional area > 50%

**Example:**

BEB 2 0 0



Table C.32

## Appendix C Coding system related to inventory and visual inspection

Aspect:		Other obstacles		
Code	S	C1	C2	Description
BBE	1	0	0	reduction cross-sectional area $\leq$ 5%
	2	0	0	5% < reduction cross-sectional area $\leq$ 10%
	3	0	0	10% < reduction cross-sectional area $\leq$ 25%
	4	0	0	25% < reduction cross-sectional area $\leq$ 50%
	5	0	0	reduction cross-sectional area > 50%

**Example:**

BBE	3	0	0
-----	---	---	---



Table C.33

Aspect:		Infiltration		
Code	S	C1	C2	Description
BBF	1	0	0	no ingress of water through the wall or joints detected
	2	A	0	sweating - slow ingress of water - no visible drips
	3	B	0	dripping - dripping in - not continuous flow
	4	C	0	flowing - a continuous flow
	5	D	0	gushing - entering under pressure

**Example:**

No example of infiltration

Table C.34

## Appendix C Coding system related to inventory and visual inspection

<b>Aspect:</b>		<b>Exfiltration</b>		
<b>Code</b>	<b>S</b>	<b>C1</b>	<b>C2</b>	<b>Description</b>
BBG	1	0	0	no visible leak detected
	5	0	0	visible leak of flow out of the conduit

**Example:**

No example of exfiltration

**Table C.35**

<b>Aspect:</b>		<b>Photograph</b>		
<b>Code</b>	<b>S</b>	<b>C1</b>	<b>C2</b>	<b>Description</b>
BDA	1	0	0	General photograph

**Table C.36**

<b>Aspect:</b>		<b>Remarks</b>		
<b>Code</b>	<b>S</b>	<b>C1</b>	<b>C2</b>	<b>Description</b>
BDB	1	0	0	General remark

**Table C.37**

## Appendix C Coding system related to inventory and visual inspection

Aspect:		Water level		
Code	S	C1	C2	Description
BDD	1	0	0	height $\leq$ 10% of cross-section height
	2	0	0	10% < height $\leq$ 25% of cross-section height
	3	0	0	25% < height $\leq$ 50% of cross-section height
	4	0	0	50% < height $\leq$ 75% of cross-section height
	5	0	0	height > 75% of cross-section height

**Example:**

BDD      5   0   0



Table C.38

Aspect:		Loss of vision		
Code	S	C1	C2	Description
BDG	1	A	0	bridge, culvert or slab
	1	B	0	silt
	1	Z	0	other, details should be recorded in remarks section

**Example:**

BDG      1   A   0



Table C.39

## Appendix D Example of how to convert data from geometry to the BRUTIS Model

An important feature of BRUTIS is the ability to import geometric data, and convert data from the geometry to a BRUTIS Model. This feature makes it easy for a user to import data sets and start using BRUTIS immediately.

In this example: Converting data from SHP files to data in BRUTIS work file. Adding data from old BRUTIS work files and importing inspection data from KML and CSV file.

### Example: Re-inventory of sewerage management data Kampot

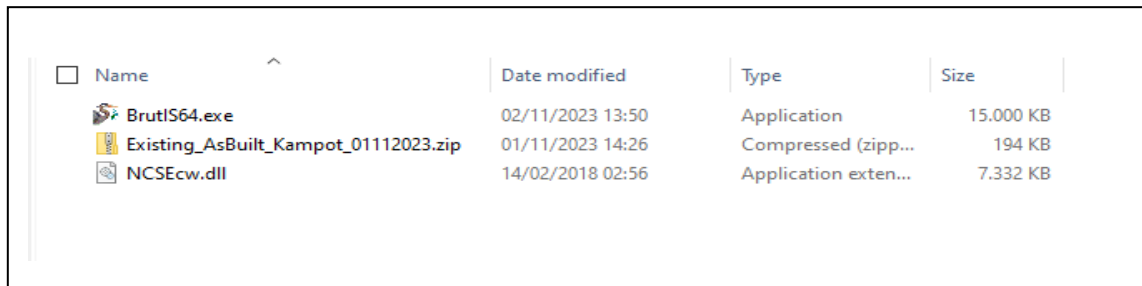
Received: SHP- file containing the results of a sewer re-inventory. The assignment is to convert these results into a BRUTIS work file. Add data not in SHP-files and available inspection data.

This can be done in the following steps:

1. Assess data;
2. Start BRUTIS64.exe and open/create mutation file;
3. Transfer of data from source file 1 (nodes);
4. Transfer of data from source file 2 (conduit);
5. Save the result in a work file or database;
6. Create work file with data not in SHP-files and add to the data obtained from the SHP-files;
7. Add inspection-data from KML, to link photos to nodes;
8. Add inspection data from CSV, to link condition data and photos to nodes.

#### 1. Assess data:

- a. Place the zip file in a folder, for example as below, at brutis64.exe



- b. Then extract the zip file. It contains shapefiles (SHP files): KP\_Conduits and KP\_Nodes.

# Appendix D Example of how to convert data from geometry to the BRUTIS Model

Name	Date modified	Type	Size
KP_Conduits.cpg	01/11/2023 15:10	CPG File	1 KB
KP_Conduits.dbf	01/11/2023 15:10	DBF File	628 KB
KP_Conduits.prj	01/11/2023 08:43	PRJ File	1 KB
KP_Conduits.sbn	01/11/2023 15:10	SBN File	17 KB
KP_Conduits.sbx	01/11/2023 15:10	SBX File	2 KB
KP_Conduits.shp	01/11/2023 15:10	AutoCAD Shape S...	157 KB
KP_Conduits.shp.xml	01/11/2023 15:08	XML Document	30 KB
KP_Conduits.shx	01/11/2023 15:10	AutoCAD Compil...	14 KB
KP_Nodes.cpg	01/11/2023 15:10	CPG File	1 KB
KP_Nodes.dbf	01/11/2023 15:10	DBF File	383 KB
KP_Nodes.prj	01/11/2023 08:42	PRJ File	1 KB
KP_Nodes.sbn	01/11/2023 15:10	SBN File	17 KB
KP_Nodes.sbx	01/11/2023 15:10	SBX File	1 KB
KP_Nodes.shp	01/11/2023 15:10	AutoCAD Shape S...	48 KB
KP_Nodes.shp.xml	01/11/2023 14:55	XML Document	16 KB
KP_Nodes.shx	01/11/2023 15:10	AutoCAD Compil...	14 KB

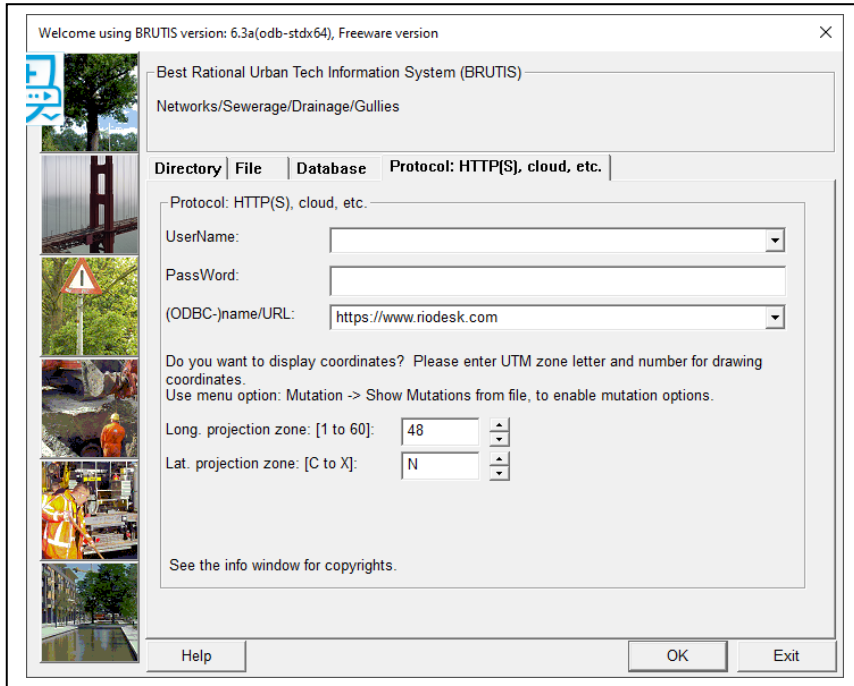
- c. Open the .dbf files with, for example, MS-Excel and assess what data is included with the node and conduit geometry SHP files. Find out where the node numbers are. And under which column is what.

The top screenshot shows the 'KP\_Nodes.dbf' file in Excel. The data table has the following columns: NAME, X, Y, INVERTELEV, RIMELEV, DEPTH, Type, and Note. The data rows list various node identifiers and their corresponding coordinates and levels.

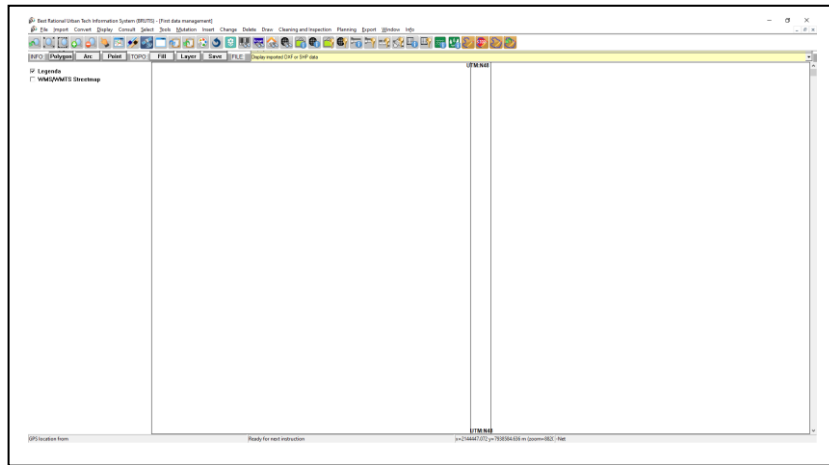
The bottom screenshot shows the 'KP\_Conduits.dbf' file in Excel. The data table has the following columns: NAME, INLETNODE, OUTLETNODE, LENGTH, ROUGHNESS, BARRELS, SLOPE, Width\_mm, Height\_mm, BW\_mm, Note, Type, and Material. The data rows list conduit identifiers and their physical characteristics.

## 2. Start BRUTIS64.exe and open/create mutation file:

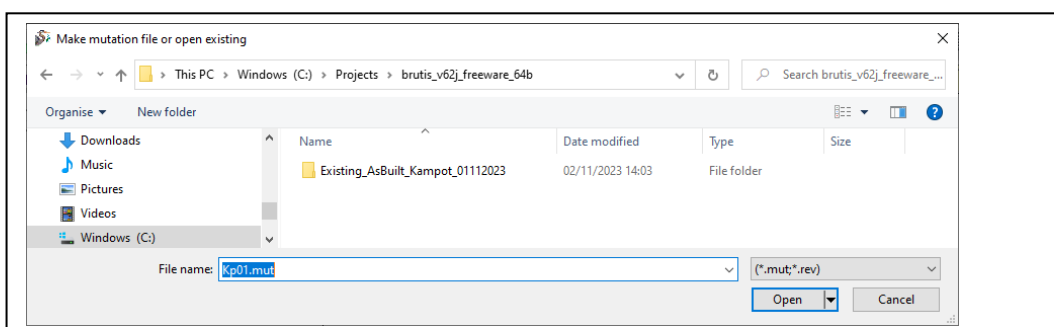
- a. Run BRUTIS64.exe. Tab: Directory or File. Don't choose a file to start without data. Click button: [OK]



- b. The management window is started, without data:



- c. Open a mutation file to add and mutate data, via menu option: **Mutation->Show mutations from file....** The “Make mutation file” window appears, with which you can choose a location and name of the file, with extension . mut. Click button: [Open] to open or create the mutation file.



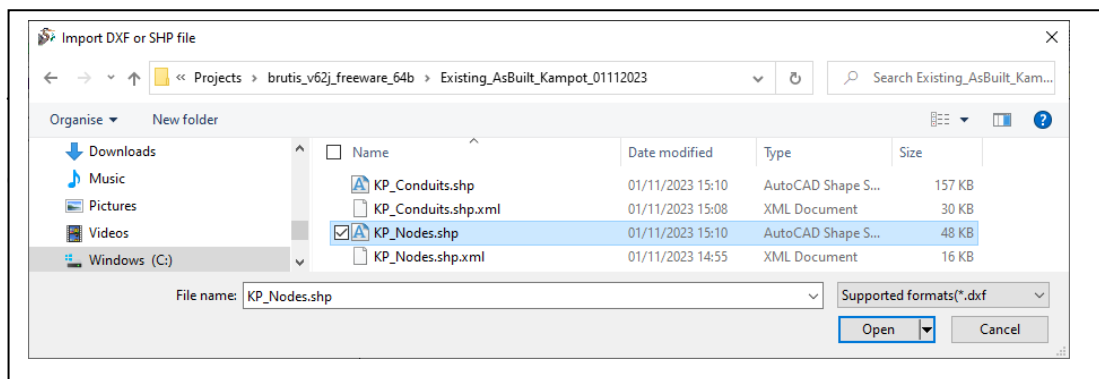
## Appendix D Example of how to convert data from geometry to the BRUTIS Model

- d. You will then be given the opportunity to enter basic data and default values. Entry is not required. Click [OK]

From now on, all mutations according to the EN13508 coding system will be stored in this file.

### 3. Importing the nodes from SHP-File: KP\_Nodes (always the nodes first, if available)

- a. Start menuoption: **Import->GML, DXF of SHP Topography**, to Import the geometry from SHP file: KP\_Nodes.



O

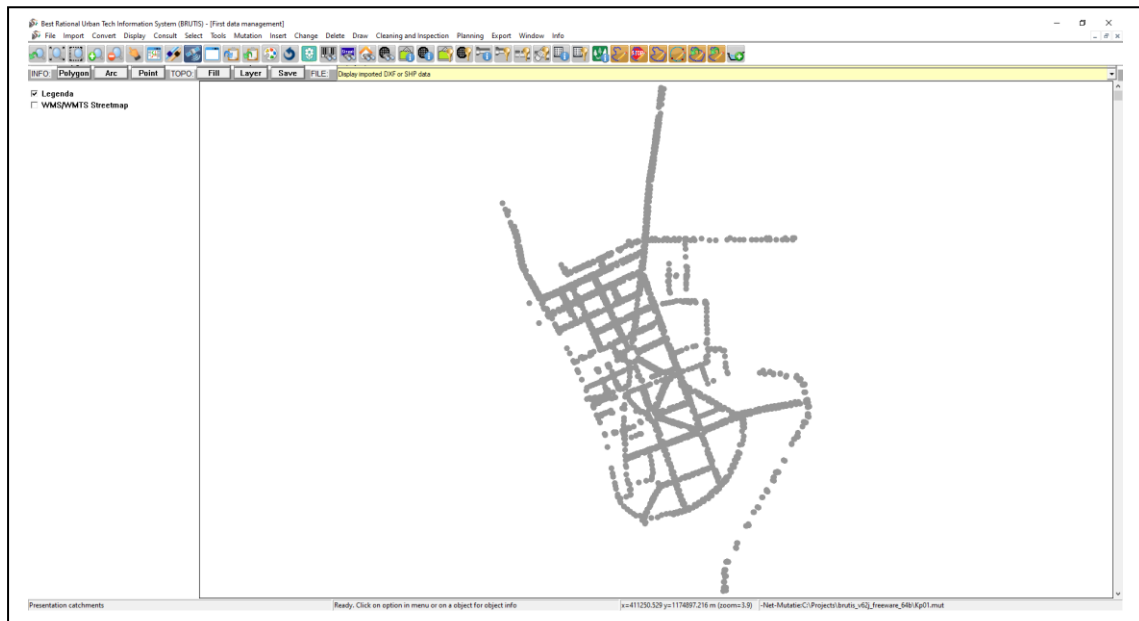
The "Import DXF or SHP file" window appears, go to the location where you can find the SHP-File, select it and import the geometry from the file with the [Open] button.

- b. When importing geometry from SHP files, the program displays a window that allows you to indicate which column determines the layer name of the geometry. So that you can later select geometry on this layer name. In the adjacent window, the column: Type, is used to extract the layer name.

It is not mandatory to indicate layer name. You can also leave the field blank. The same goes for the other fields. It is useful to indicate a thickness, so that the knots are immediately visible. Start the import with the [OK] button.

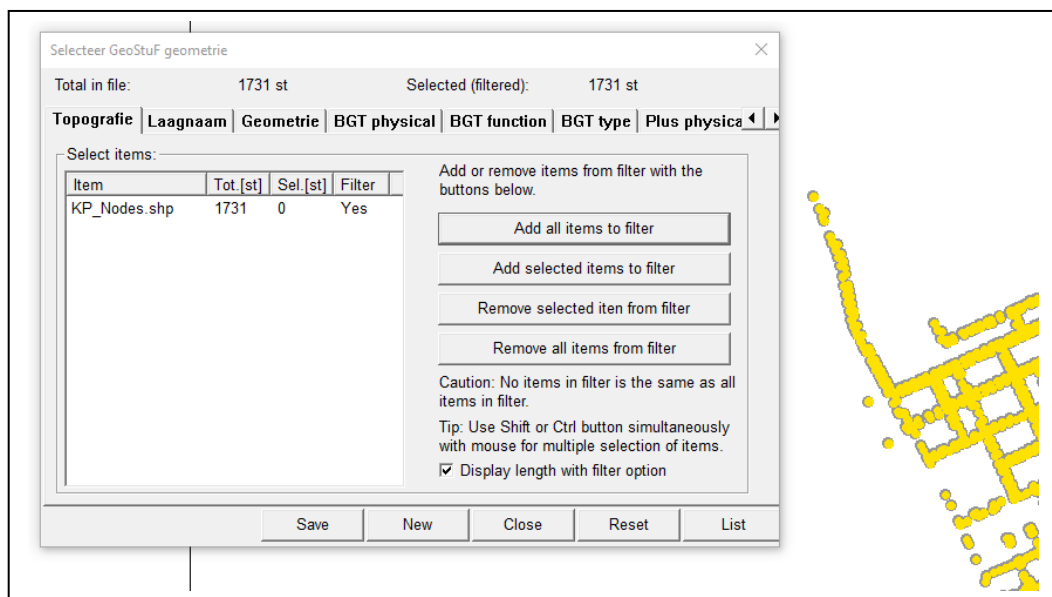
- c. The node geometry has been imported:

## Appendix D Example of how to convert data from geometry to the BRUTIS Model





- d. Select the geometry from which the data should be taken. This can be done via menu option: **Select -> Select Geometry -> With Filter...**

And click button: [Add all items to filter] in the “Select geometry” window, to select all manhole geometry. This one turns yellow. Close the window with button: [Close].



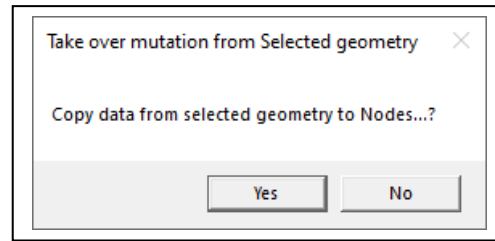
It is also possible to select geometry within a polygon. To do this, first draw a polygon

using button:  and button:  to close the polygon. You also close the polygon with a double click on the before last polygon point. And then menu option: **Select -> Select Geometry -> Select geometry in polygon...**

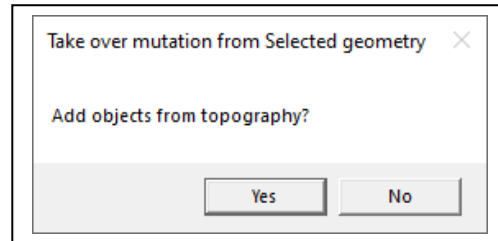
- e. Click menu option: **Mutation -> Take over mutation from selected geometry -> Nodes...** , to extract the nodes from the selected geometry.

## Appendix D Example of how to convert data from geometry to the BRUTIS Model

Click: [Yes], to transfer the data of selected geometry to the nodes.



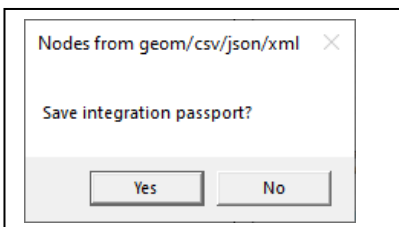
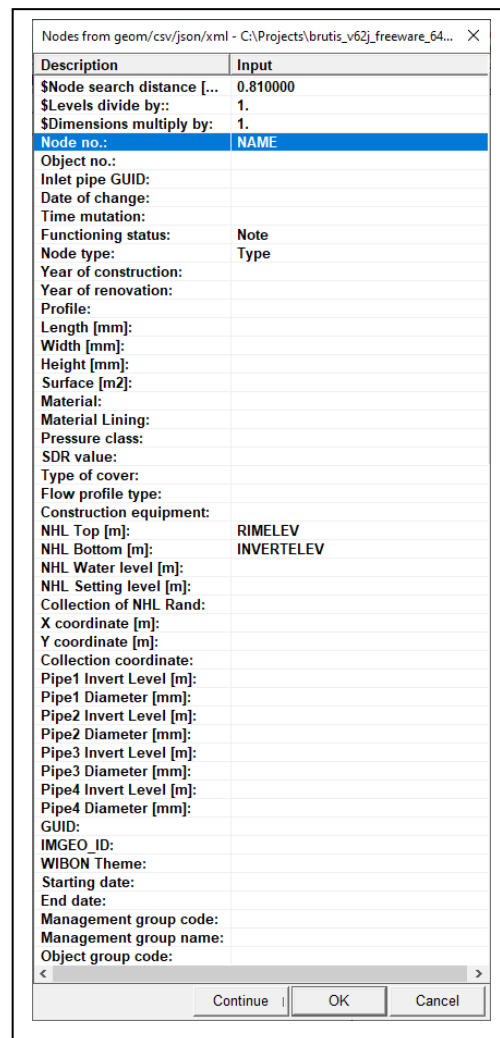
Click: [Yes], to add nodes from geometry.



For the BRUTIS fields, choose the correct columns from the SHP file. So that the data from the SHP-File ends up in the correct BRUTIS data field.


If dimensions are specified in meters in the SHP file, these can be converted to mm via the “\$Dimensions multiply by” factor, by entering the value 1000 here.

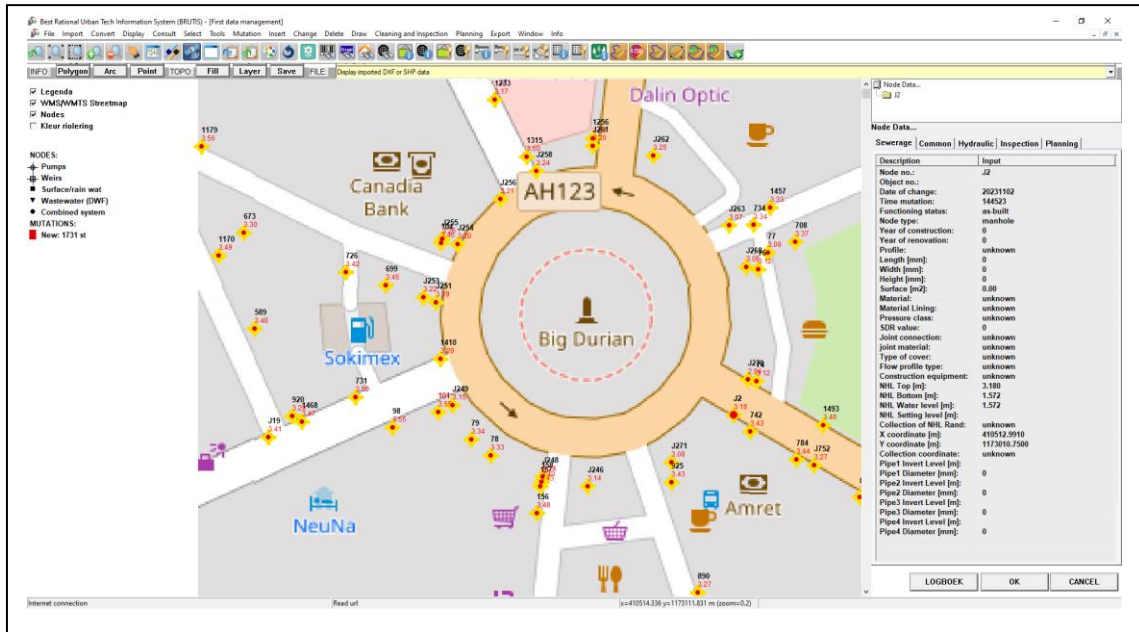
Click: [OK], as soon as, as many BRUTIS data fields as possible have been provided with the columns from the SHP-File.



Click: [Yes], to save the choices in the integration file. The integration file is saved with the SHP-File, ready to automatically populate the integration window next time. Or to use for an automated conversion of data, with a batch-file.

- f. The result with WMS/WMTS Streetmap button checked, registration of the location of the

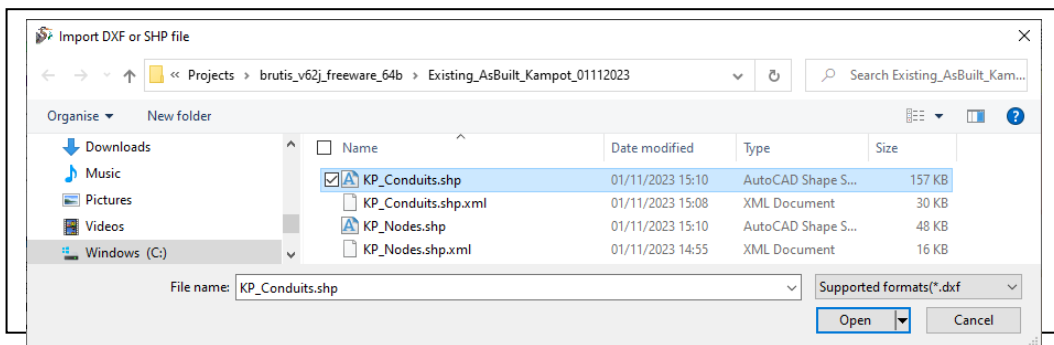
images in start option: images, and the via button:  , consult of a node:



## 4. Importing the conduit from SHP-File: KP\_Conduits

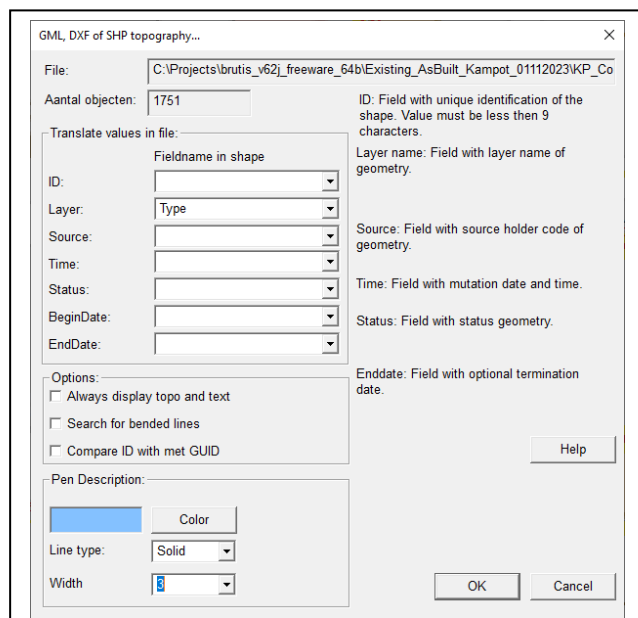
- a. Start menu option: **Import -> GML, DXF of SHP Topografie**, to Import the geometry from SHP file: KP\_Conduits.

The “Import DXF or SHP file” window appears, with which you can find the SHP-File, select it and import the geometry from the file with the [Open] button.



- b. When importing geometry from SHP files, the program displays a window that allows you to indicate which column determines the layer name of the geometry. So that you can later select geometry on this layer name. In the adjacent window, the column: Type, is used to extract the layer name.

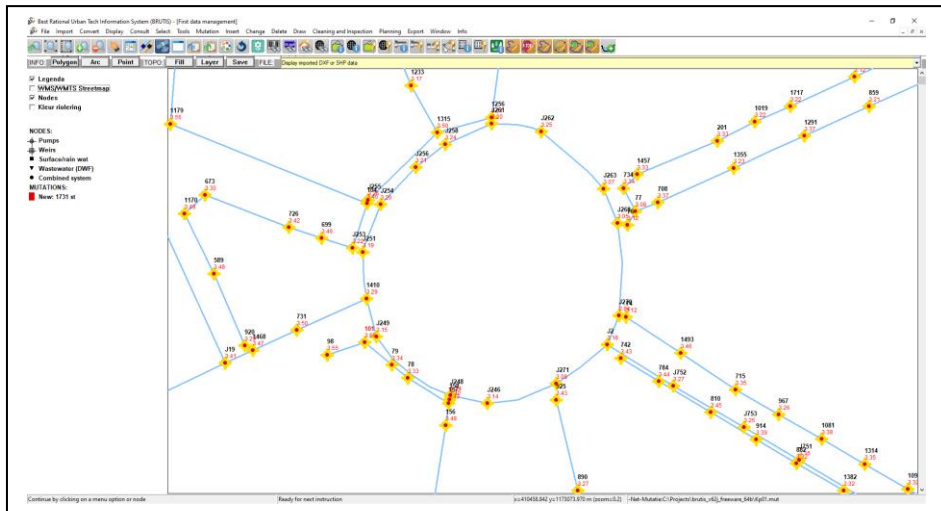
It is not mandatory to indicate layer name. You can also leave the field blank. The same goes



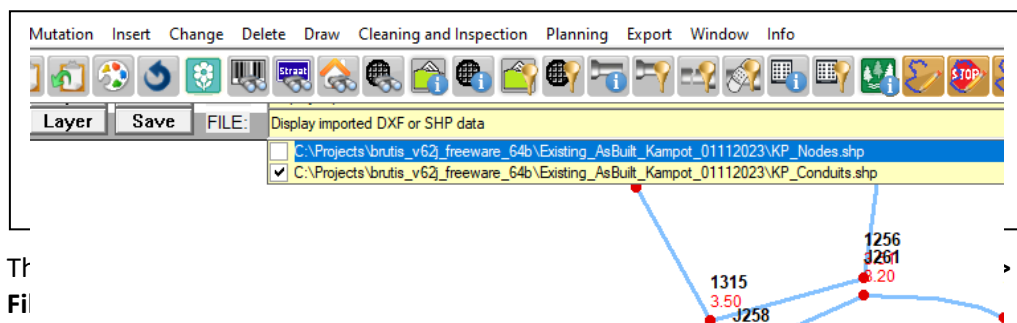
## Appendix D Example of how to convert data from geometry to the BRUTIS Model

for the other fields. It is useful to indicate a thickness and a different colour, so that the conduits are immediately visible. Start the import with the [OK] button.

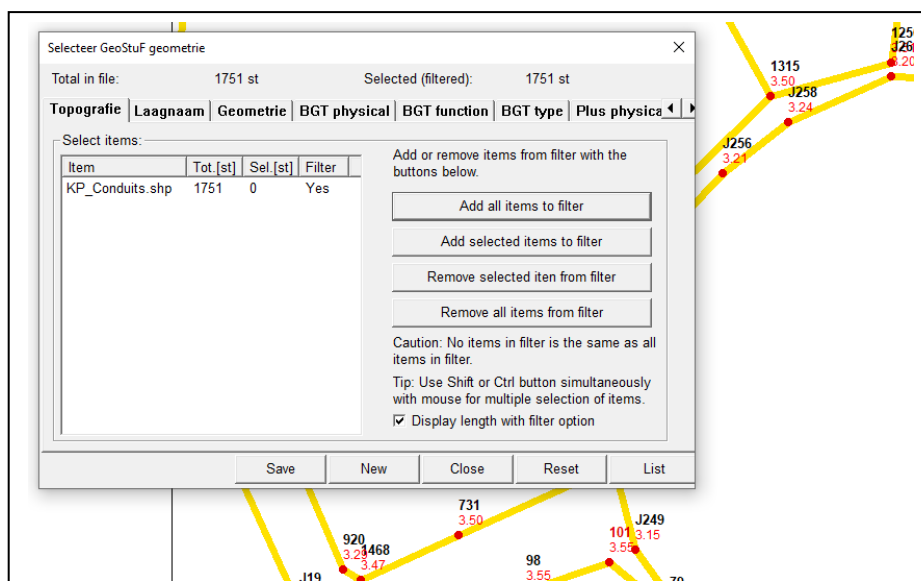
- c. The conduit geometry has been imported:



- d. Select the geometry from which the data should be taken. First of all, by turning off the geometry with the nodes by removing the check mark in front of the file name in the topography bar.



And click button: [Add all items to filter] in the “Select geometry” window, to select all conduit geometry. These turns yellow. Close the window with button: [Close].



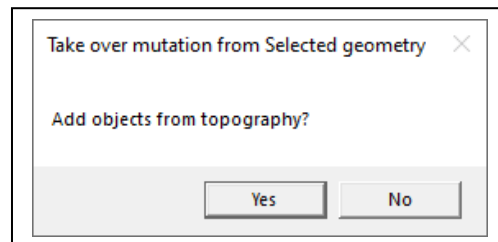
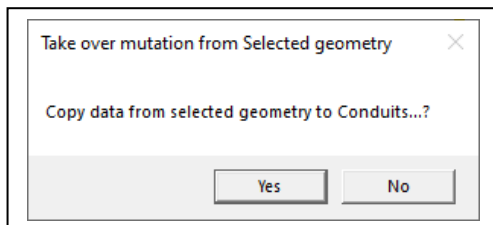
## Appendix D Example of how to convert data from geometry to the BRUTIS Model

It is also possible to select geometry within a polygon. To do this, first draw a polygon via



the button: and then button: to close the polygon. You also close the polygon with a double click on the before last polygon point. And then menu option: **Select -> Select Geometry -> Select geometry in polygon...**

- e. Click menu option: **Mutation -> Take over mutation from selected geometry -> Conduits...** , to extract the conduits from the selected geometry.



Click: [Yes], to transfer the data of selected geometry to the conduit.

Click: [Yes], to add conduits from geometry.

For the BRUTIS fields, choose the correct columns from the SHP file. So that the data from the SHP-File ends up in the correct BRUTIS data field.

When converting the conduits, BRUTIS searches for nodes that can be connected based on the start and end coordinates of the conduit geometry. Factor: "\$ Node Search distance [m]", is used here. Only nodes within this distance are linked. If a node is not present, it will be created. If no "From Node no" and "To node no" are specified, the program creates new node numbers starting with the letter indicated after start option: letter.

If dimensions in cm are specified in the SHP file, these can be converted to mm via the "\$Dimensions multiply by" factor, by entering the value 10 here.

Click: [OK], as soon as, as many BRUTIS data fields as possible have been provided with the columns from the SHP-File.

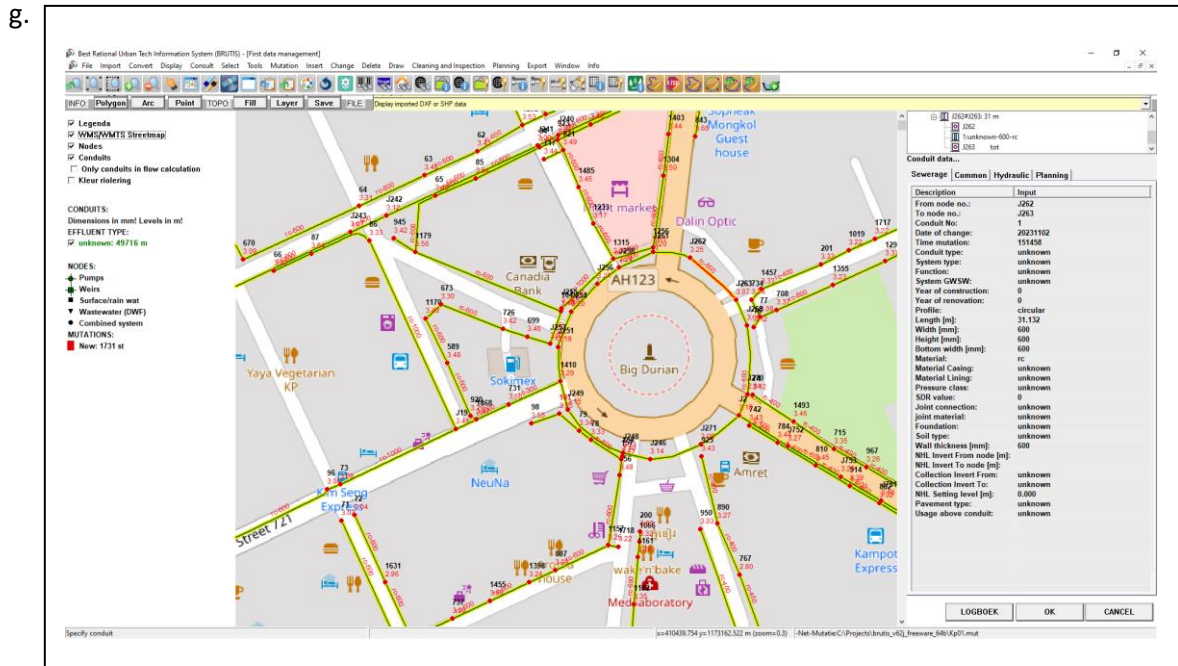
Click: [Yes], to save the choices in the integration file. The integration file is saved with the SHP-File, ready to automatically populate the integration window next time. Or to use for an automated conversion of data.

- f. On the next page the image with the result with

Description	Input
\$Node search distance [...]	0.810000
\$Levels divide by::	1.
\$Dimensions multiply by:	1.
From node no.:	
To node no.:	
Conduit No:	
Date of change:	
Time mutation:	
Conduit type:	
System type:	
Function:	
System GWSW:	
Operating voltage [v]:	
Nominal voltage [v]:	
Year of construction:	
Year of renovation:	
Profile:	Type
Length [m]:	LENGTH
Width [mm]:	Width_mm
Height [mm]:	Height_mm
Diameter [mm]:	BW_mm
Material:	Material
Material Casing:	
Material Lining:	
Pressure class:	
SDR value:	
Joint connection:	
Foundation:	
Soil type:	
Wall thickness [mm]:	
NHL Invert From node [m]:	
NHL Invert To node [m]:	
Collection Invert From:	
Collection Invert To:	
NHL Setting level [m]:	
Pavement type:	
Usage above conduit:	
GUID:	
IMGEO_ID:	
WIBON Theme:	
Starting date:	
End date:	
Object group code:	
Bem area name:	
Street code:	
Place name:	
Street name:	
Owner:	
Administrator:	
Supplier:	
Functioning status:	Note
Drawing number:	

# Appendix D Example of how to convert data from geometry to the BRUTIS Model

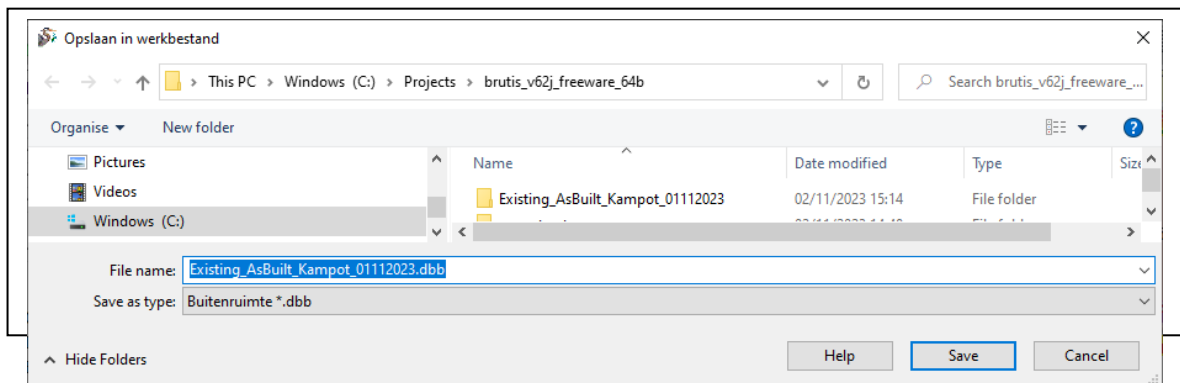
WMS/WMTS Streetmap button checked and consulting the conduit, via button:



If in the invert levels of the conduits are missing, BRUTIS uses the node invert levels for the registration of the conduit invert levels.

## 5. Store the results in a work file or database

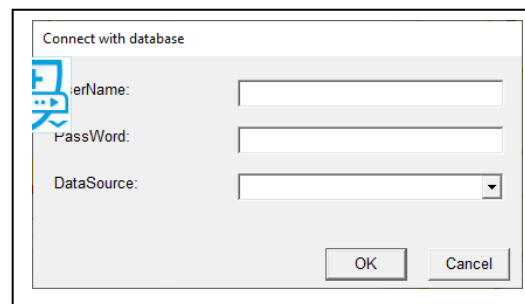
- a. Save to a work-file via menu option: **File -> Save As -> Work-File**, so that the data obtained can be opened and viewed immediately from now on.



Or

If a database is available. Via menu option: **Mutation -> Move mutation to database -> Check mutations.**

After entering the database connection data, BRUTIS connects to the database and checks whether the changes can be implemented.

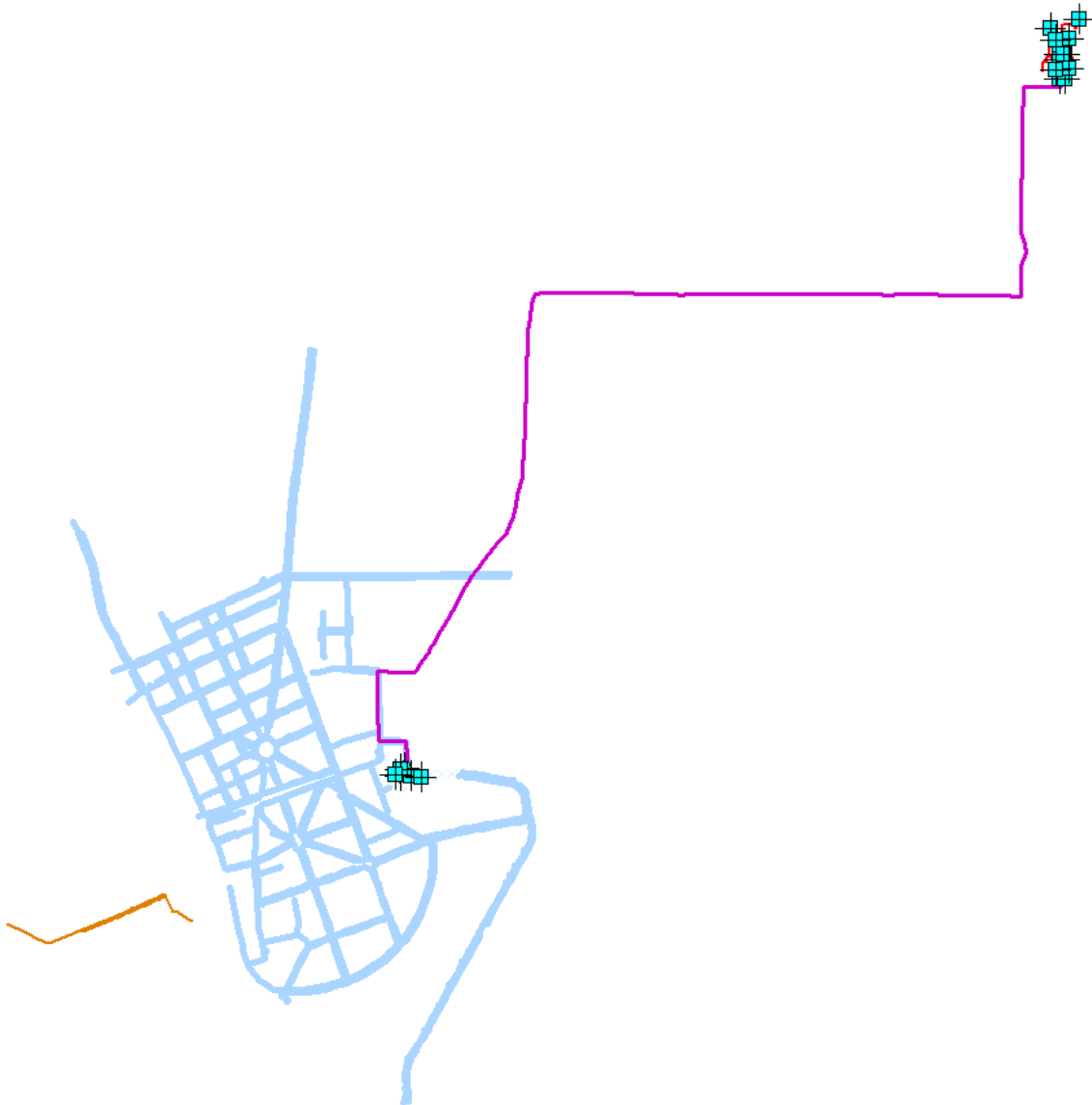


## Appendix D Example of how to convert data from geometry to the BRUTIS Model

After this menu option: **Mutation -> Move mutation to database -> Move mutation to database**, to store the data in the database.

### 6. Create work file with data not in SHP-files and add to the data obtained from the SHP-files


the light blue lines in the view below represent the conduits obtained from the SHP file. Not in the SHP-files is the data of a pumping station, rising main (purple) to a waste water treatment plant and some conduits on the other side of the river (brown). The data of these objects is in another work file and we want to add it to the data.

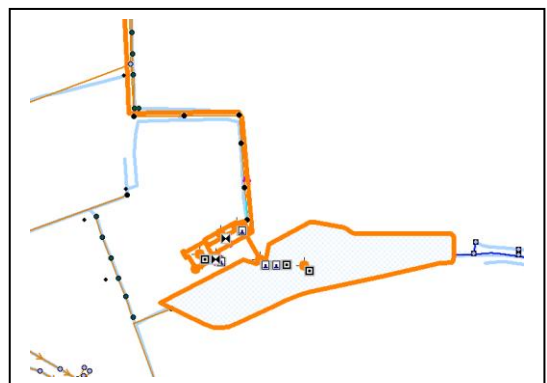


a. Start BRUTIS with the other work file with the extra data above.

b. Select the parts above, by drawing a polygon

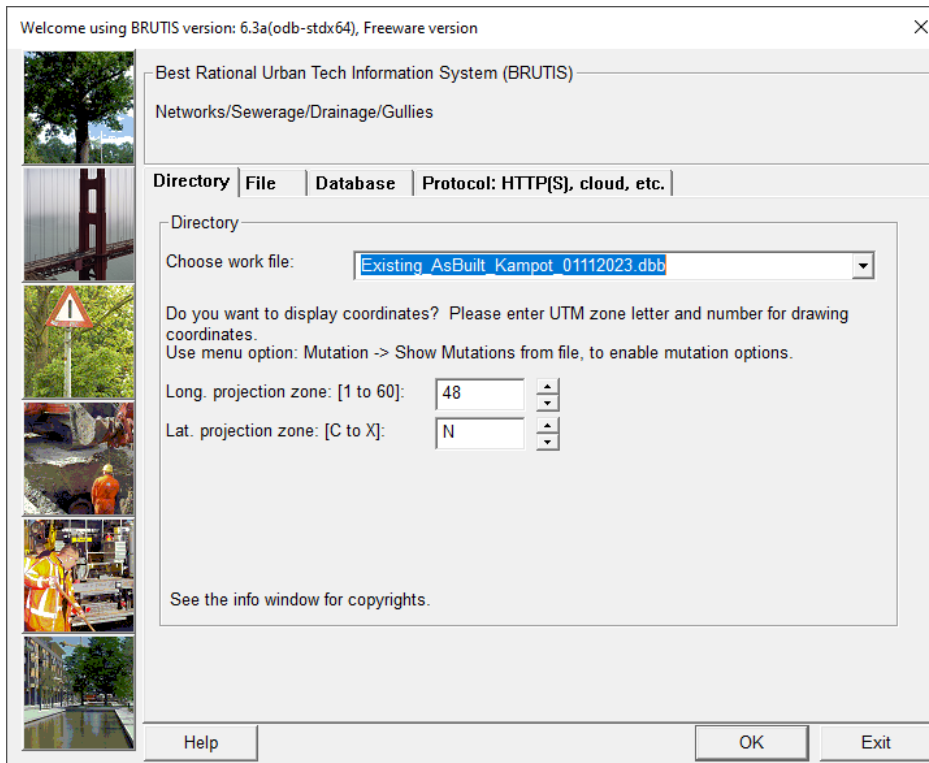


around those parts, using the button: , and double click to close the polygon. Select the objects in the polygon with menu option: **Select -> Select Object in polygon -> All Objects**. Until all to be added objects are coloured orange.

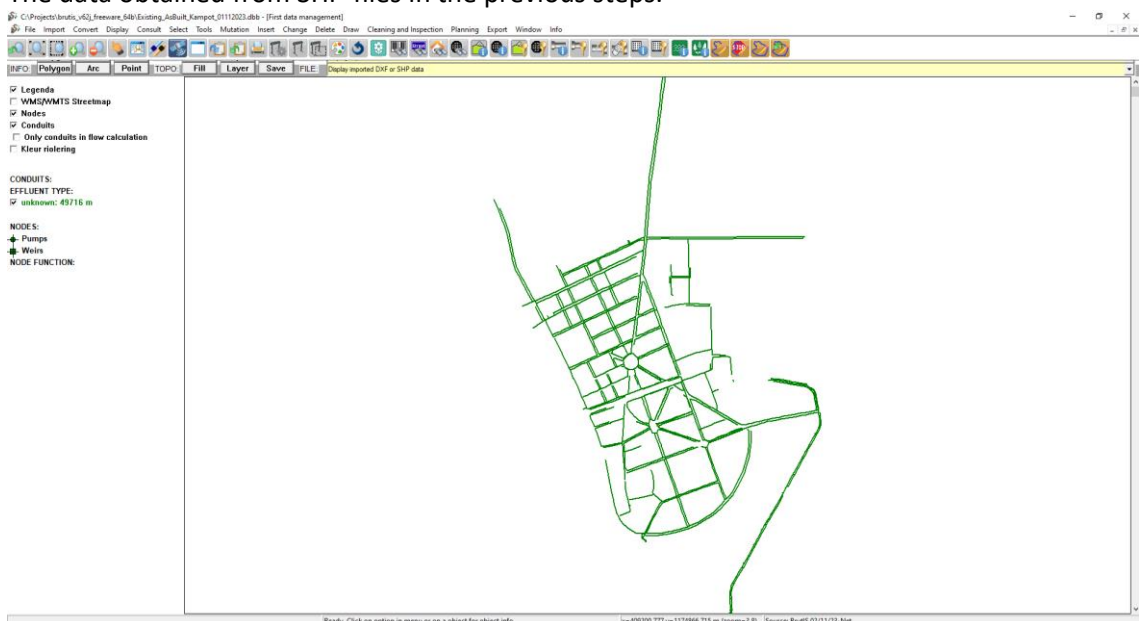


## Appendix D Example of how to convert data from geometry to the BRUTIS Model

- c. Copy the selected objects to the clipboard, with menu option: **Tools -> Copy to Clipboard**.
- d. Open a new window with men option: **File -> New**.
- e. And paste from clipboard, with menu option: **Tools -> Paste from Clipboard**.
- f. Save to a work-file via menu option: **File -> Save As -> Work-File**, so that the data obtained can be imported in the work-file with the data obtained from SHP-files.
- g. Exit BRUTIS and restart with the data obtained from the SHP-files:



- h. The data obtained from SHP-files in the previous steps:



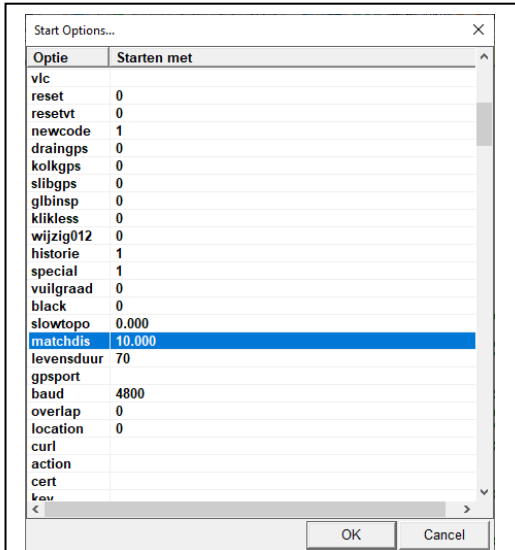


# Appendix D Example of how to convert data from geometry to the BRUTIS Model

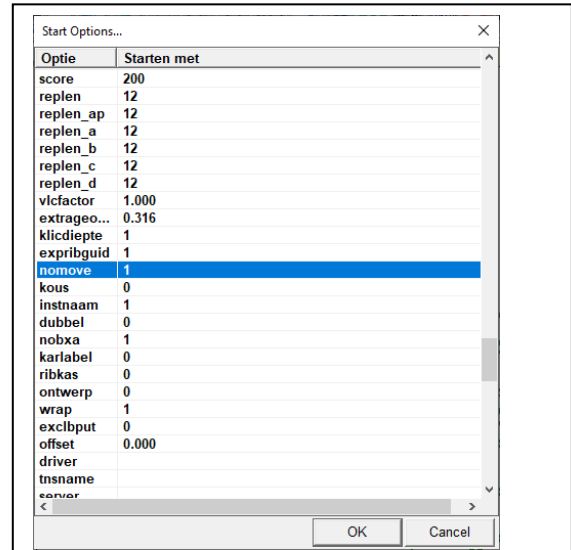
## 7. Add inspection-data from KML

There is a KML file available with photos of nodes. In this step we connect the photos to the nodes in the work file by importing the KML as topography and match the nodes in the KML with the nodes in the work file by using the coordinates.

Via menu option: **Tools -> Start options**, it is important to set a match distance and to set the option to avoid replacing nodes coordinates with coordinates from the KML.

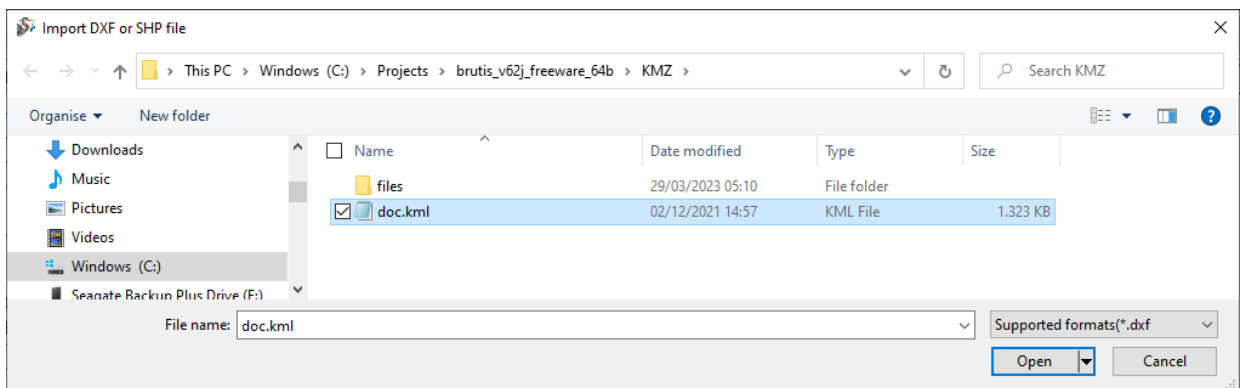


Option: **matchdis** sets the distance for matching coordinates in the KML with coordinates of nodes in the work file.



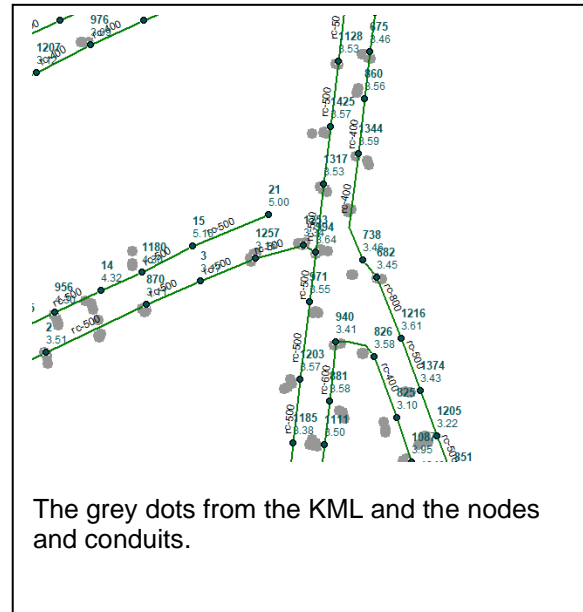
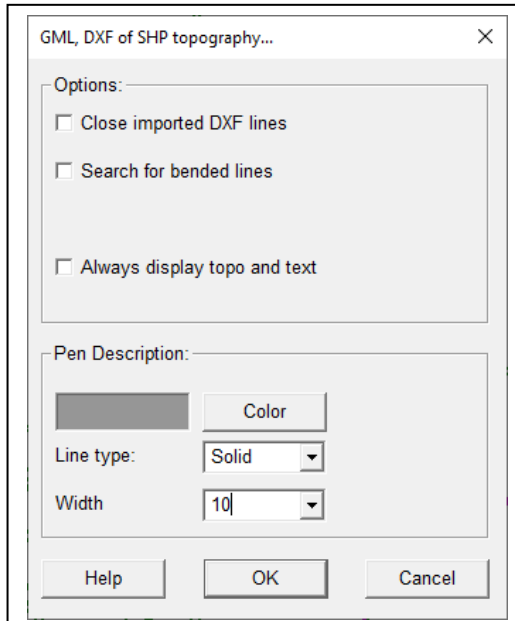
Option: **nomove=1**, avoids the replacement of node coordinates by the coordinated in the KML, because the coordiantes in the KML are not precise.

- a. Import the KML as topography, with menu option: **Import -> GML, DXF or SHP Topography**.

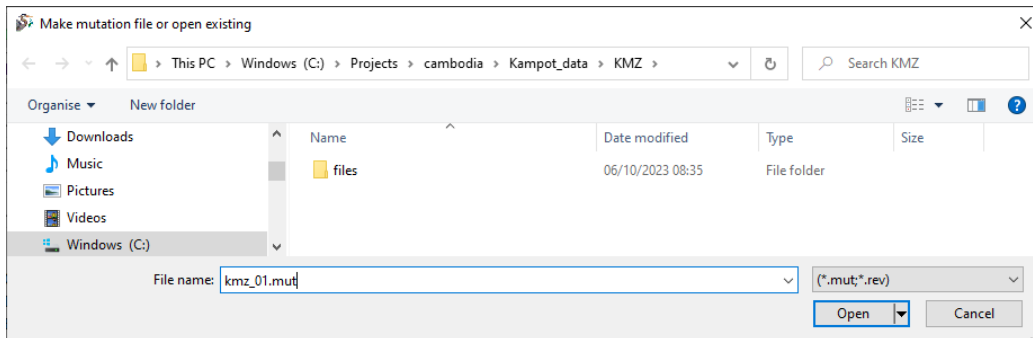


- b. Select the KML file. And Click [Open].
- c. dialog appears that allows you to set the colour and thickness of the topography to be imported. In this example we choose a grey colour with a thickness of 10 pixels. hat the data obtained can be opened and viewed immediately from now on.

# Appendix D Example of how to convert data from geometry to the BRUTIS Model

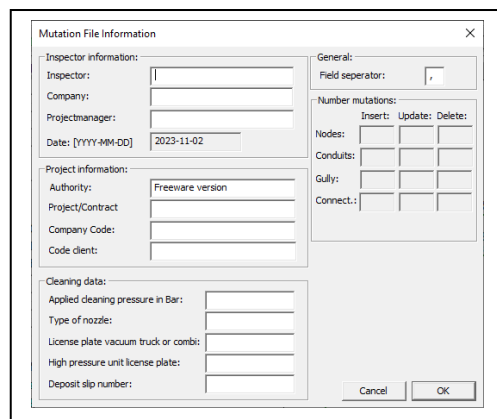


- e. Open a mutation file to catch all KML inspection data, via menu option: **Mutation->Show mutations from file....** The “Make mutation file” window appears, with which you can choose a location and name of the file, with extension . mut. Click button: [Open] to open or create the mutation file.

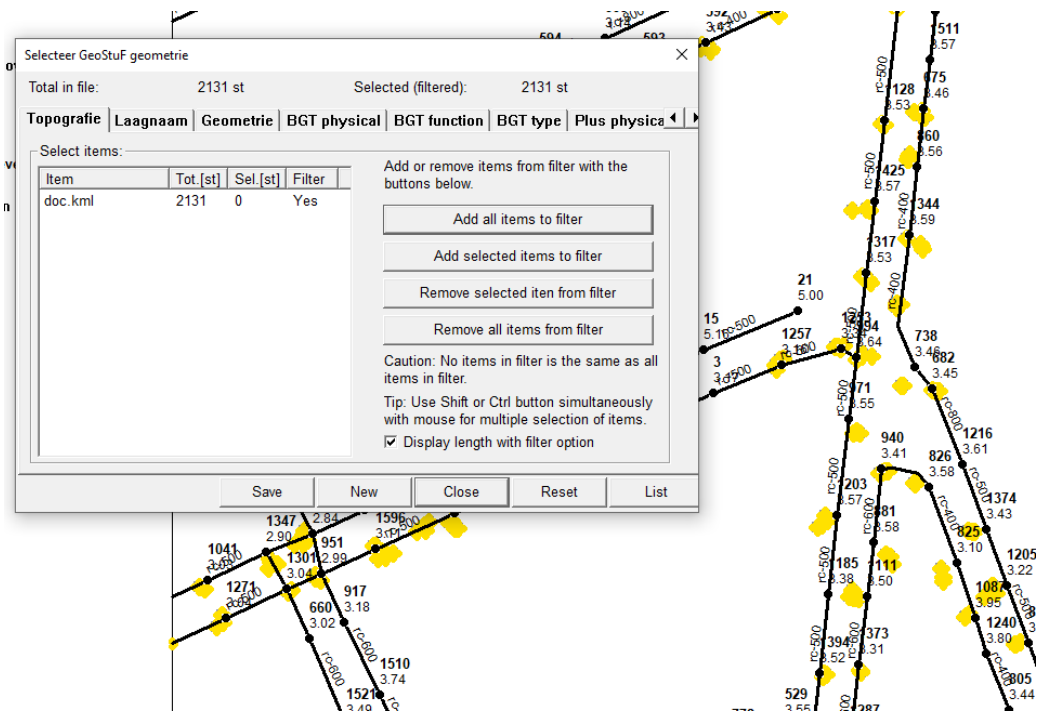


- f. You will then be given the opportunity to enter basic data and default values. Entry is not required. Click [OK]
- d. Select the geometry from which the data should be taken. This can be done via menu option: **Select -> Select Geometry -> With Filter...**

And click button: [Add all items to filter] in the “Select geometry” window, to select all manhole geometry. These turns yellow. Close the window with button: [Close].



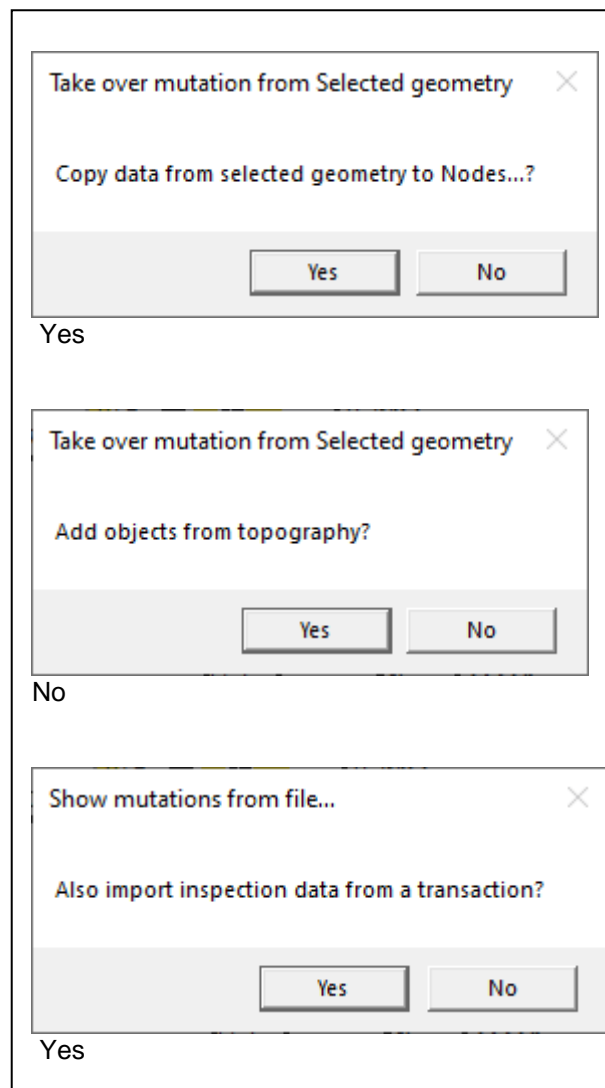
# Appendix D Example of how to convert data from geometry to the BRUTIS Model



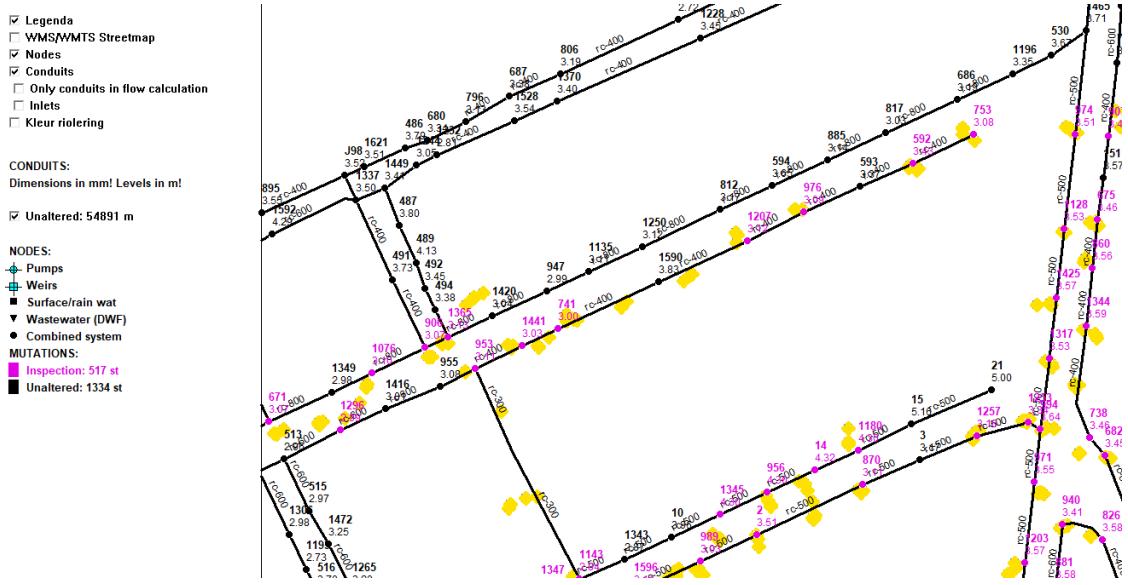
e. Click menu option: **Mutation -> Take over mutation from selected geometry -> Nodes...** , to extract the inspections from the selected geometry.


f. The program starts a dialog: whether you want to accept data from the selected geometry [Yes], to accept inspection data. Whether you want to add data [No] Do not add nodes from KML. And finally, whether you want to import the inspection data [Yes]. To import the inspection data.

g. The result is shown on the next page. The inspected nodes have a purple colour.



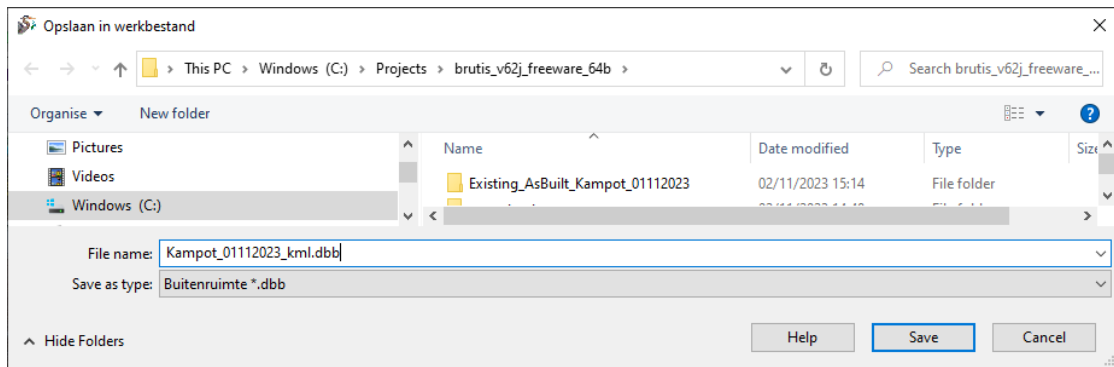
# Appendix D Example of how to convert data from geometry to the BRUTIS Model



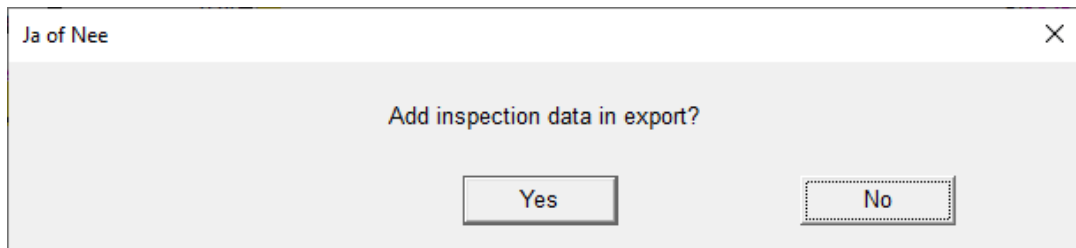
You can consult the inspection data by clicking on a node after the button: , after which the data of the node will be displayed. Below the data you will find the button: [Logbook], to display the inspection data. In the log window you can click on a status aspect to view photos.

h. Don't forget to save the merged data in a new work file.

## Appendix D Example of how to convert data from geometry to the BRUTIS Model



- i. And add the inspection data in the export to work file



- j. [Yes].

# Appendix D Example of how to convert data from geometry to the BRUTIS Model

## 8. Add inspection data from CSV

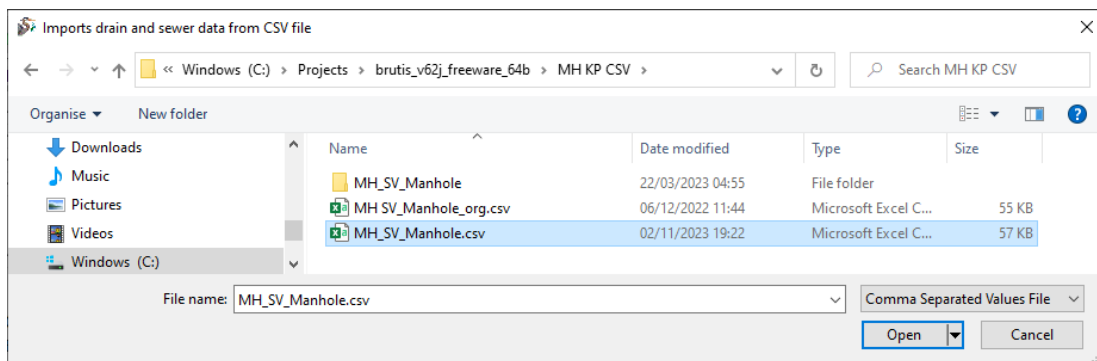
Before you import data from CSV, it is wise to view the data via MS Excel. To get an idea of what data is involved. In this case it contains rules recording the dimensions and bob levels of connected pipes and the quality of the well cover with photo file names.

ID	Geometry	Remarks	Top Level	Bottom Level	Pipe 1 Inv	Pipe 1 Dia	Pipe 2 Inv	Pipe 2 Dia	Pipe 3 Inv	Pipe 3 Dia	Pipe 4 Inv	Pipe 4 Dia	Water Lev	Sediment	Inspector	Condition	Photo 1	Photo 2
1	POINT Z (104.20875395 10.61101938 -4.153)														20221201	Good		
2	POINT Z (104.185674 3.22		1.70	1.82	0.6	1.80	0.6						2.41	0.4	20221201	Good	MH SV_20 MH SV_20221201_074041978.jpg	
3	POINT Z (104.185494 3.22		1.62	1.87	0.6	1.83	0.6						2.38	0.5	20221201	Minor dan	MH SV_20 MH SV_20221201_074648715.jpg	
4	POINT Z (104.18543018 10.60698690 -1.060)														20221201	Major Dan	MH SV_20 MH SV_20221201_075011385.jpg	
6	POINT Z (104.185260 3.09		1.4	1.65	0.6	1.60	0.6						2.23	0.4	20221201	Good	MH SV_20 MH SV_20221201_080501084.jpg	
7	POINT Z (104.185335 3.20		1.43	1.66	0.6	1.64	0.6						2.23	0.3	20221201	Good	MH SV_20 MH SV_20221201_080951307.jpg	
8	POINT Z (104.185187 3.12		1.30	1.68	0.6	1.65	0.6						2.23	0.6	20221201	Good	MH SV_20 MH SV_20221201_081341628.jpg	
9	POINT Z (104.185088 3.11		1.51	1.75	0.8	1.4	0.6	1.44	0.6				2.13	0.3	20221201	Good	MH SV_20 MH SV_20221201_082152598.jpg	
10	POINT Z (104.185021 3.16		1.53	1.77	0.8	1.72	0.8						2.09	0.4	20221201	Minor dan	MH SV_20 MH SV_20221201_082821970.jpg	
11	POINT Z (104.184869 3.15		1.6	1.71	0.8	1.75	0.8						2.14	0.3	20221201	Good	MH SV_20 MH SV_20221201_084224434.jpg	
12	POINT Z (104.184865 3.06		1.35	1.70	0.8	1.75	0.8						2.09	0.4	20221201	Good	MH SV_20 MH SV_20221201_084657155.jpg	
13	POINT Z (104.184823 3.08		1.4	1.55	0.8	1.53	0.8						2.15	0.30	20221201	Good	MH SV_20 MH SV_20221201_085096607.jpg	
14	POINT Z (104.188599 3.4		2.47	2.42	0.6	2.4	0.6						2.70	0.2	20221201	Good	MH SV_20 MH SV_20221201_121302633.jpg	
15	POINT Z (104.188115 3.33		2.06	2.30	0.6	2.33	0.6	2.34	0.6				2.84	0.3	20221201	Good	MH SV_20 MH SV_20221201_124237431.jpg	
16	POINT Z (104.187797 3.25		2.13	2.08	0.6	2.04	0.60						2.84	0.4	20221201	Good	MH SV_20 MH SV_20221201_124617534.jpg	
17	POINT Z (104.1847712 10.60642041 -12.450)														20221201	Good	MH SV_20 MH SV_20221201_124905765.jpg	
18	POINT Z (104.187202 3.40		2.16	2.35	0.6	2.30	0.6						2.68	0.3	20221201	Good	MH SV_20 MH SV_20221201_125213714.jpg	
19	POINT Z (104.186952 3.18		2.01	2.23	0.6	2.20	0.6						2.63	0.2	20221201	Good	MH SV_20 MH SV_20221201_125600211.jpg	
20	POINT Z (104.186664 3.22		2.20	2.35	0.6	2.38	0.6						2.78	0.3	20221201	Minor dan	MH SV_20 MH SV_20221201_125938598.jpg	
21	POINT Z (104.186398 3.30		2.36	2.33		6 2.3	0.6						2.81	0.3	20221201	Good	MH SV_20 MH SV_20221201_130443938.jpg	
22	POINT Z (104.186147 3.15		2.00	2.05	0.6	2.07	0.6						2.56	0.4	20221201	Good	MH SV_20 MH SV_20221201_131255995.jpg	
23	POINT Z (104.18604387 10.60566569 -2.407)														20221201	Minor dan	MH SV_20221201_131524769.jpg	
24	POINT Z (104.18570993 10.60573590 -5.937)														20221201	Good	MH SV_20 MH SV_20221201_131757376.jpg	
25	POINT Z (104.18545390 10.60565946 -4.289)														20221201	Major Dan	MH SV_20 MH SV_20221201_131918043.jpg	
26	POINT Z (104.185296 3.34		1.92	2.2	0.8	2.05	0.8						0 1.1		20221201	Good	MH SV_20 MH SV_20221201_132335410.jpg	
27	POINT Z (104.185083 3.56		2.19	2.25	0.8	2.2	0.8						2.94	0.5	20221201	Good	MH SV_20 MH SV_20221201_132751869.jpg	
28	POINT Z (104.184857 3.50		2.00	2.17	0.8	2.15	0.8						0 0.8		20221201	Good	MH SV_20 MH SV_20221201_133231263.jpg	
29	POINT Z (104.184641 3.55		1.9	2.22	0.8	2.2	0.8						2.80	0.5	20221201	Minor dan	MH SV_20 MH SV_20221201_133937665.jpg	
30	POINT Z (104.184447 3.50		2.04	2.18	0.8	2.15	0.8						2.94	0.8	20221201	Minor dan	MH SV_20 MH SV_20221201_134356188.jpg	
31	POINT Z (104.184224 3.51		1.95	2.31	0.8	2.30	0.8						2.86	0.4	20221201	Good	MH SV_20 MH SV_20221201_134905440.jpg	

You can import a huge amount of data via CSV and SHP and link it to existing data. Much more than at KML.

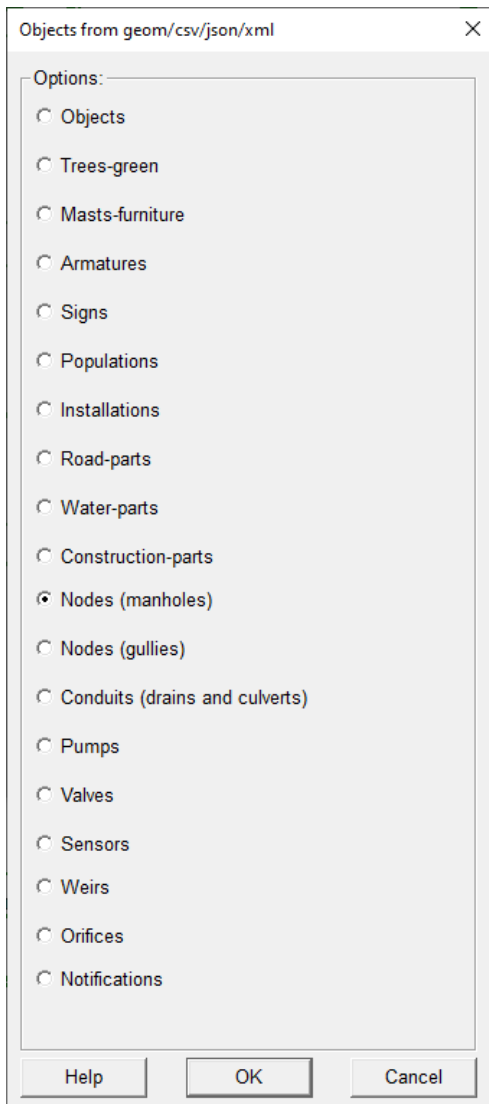
If you do not want to copy coordinates from the CSV, it is also important to give start option: **nomove the value 1**, via menu option: **Tools -> Start options**. To disable the replacement of coordinates from import data.

- a. Import the CSV data, via menu option: **Import -> CSV Object data -> Start**.

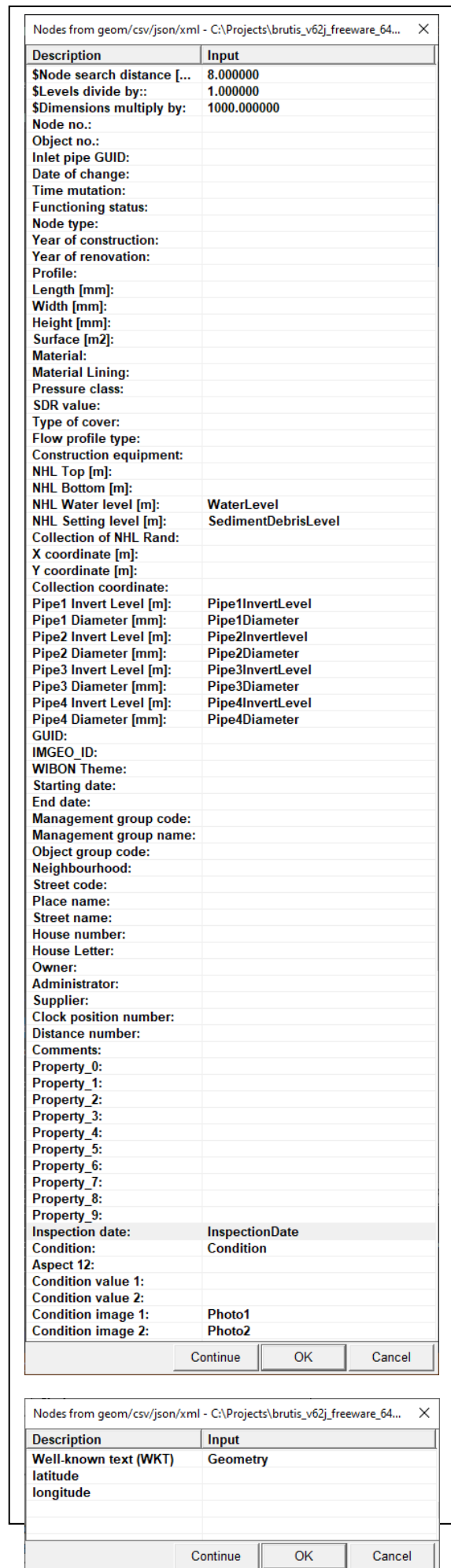


- b. Select the file and click [Open]
- c. If the column headings are unknown, the program will ask for the data type in the next window.

# Appendix D Example of how to convert data from geometry to the BRUTIS Model

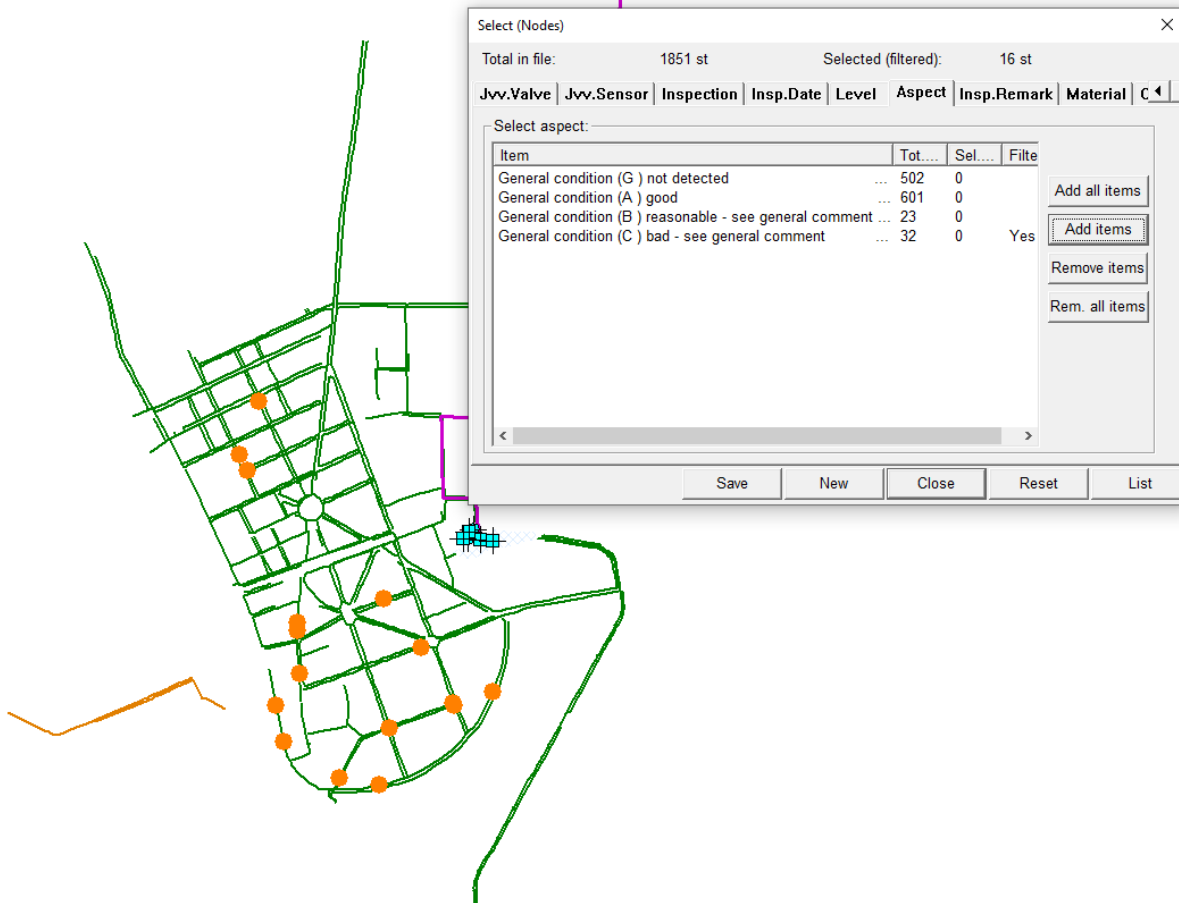
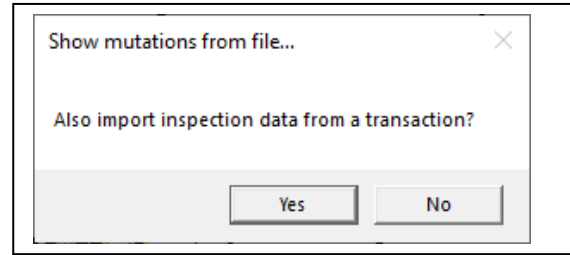



- d. Click on the nodes checkbox to indicate that it concerns node data. And then click the [OK] button.
- e. The window will then appear in which you can indicate how the data from the CSV file should be processed. And what the **matchdis** parameter is to link the node data to the existing nodes.
- f. Almost at the bottom you will find the Well-known test (WKT) field, behind which you register the "geometry" column from the CSV file.
- g. Click: [OK], as soon as, as many BRUTIS data fields as possible have been provided with the columns from the SHP-File.
- h. Click: [Yes], to save the choices in the integration file. The integration file is saved with the SHP-File, ready to automatically populate the integration window next time. Or to use for an automated conversion of data.



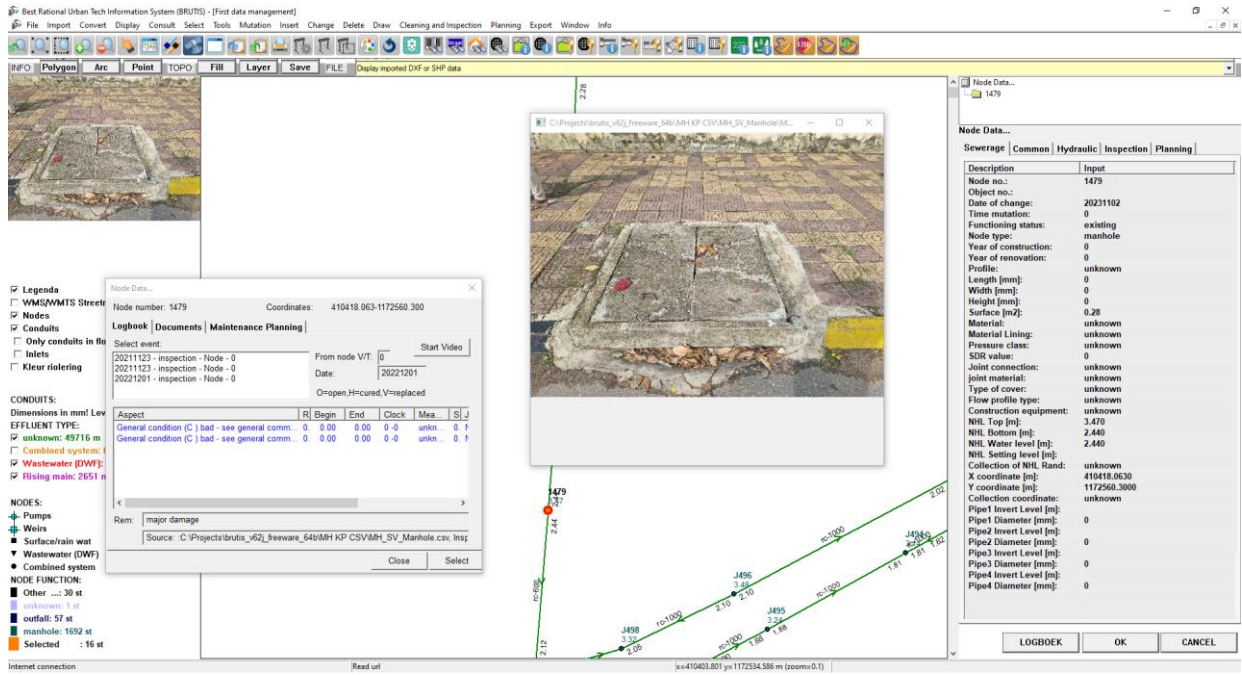
## Appendix D Example of how to convert data from geometry to the BRUTIS Model

- i. If inspection data is found the program ask's if the data should be imported. Click [Yes].
- j. You can see the results below. Via the menu option: **Select -> Via filter -> nodes**, you start a window with which you can select the quality of nodes via the tab: **Aspect**.

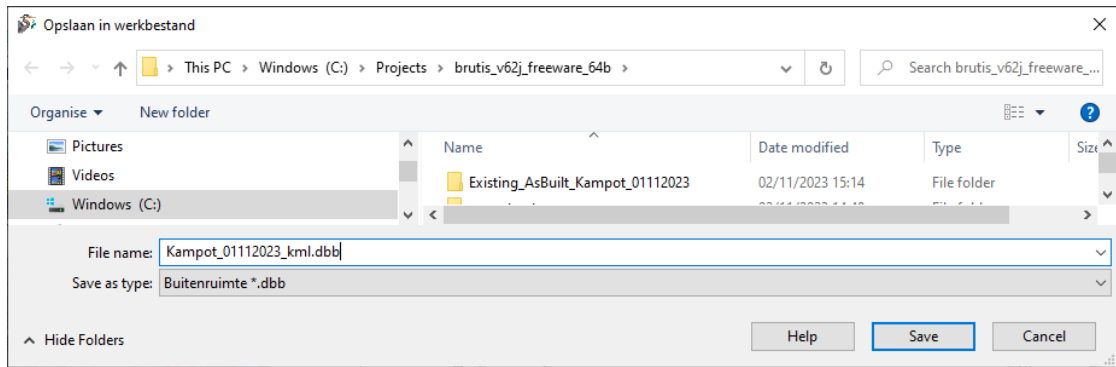


You can consult the inspection data by clicking on a node after the button: , after which the data of the node will be displayed. Below the data you will find the button: [Logbook], to display the inspection data. In the log window you can click on a status aspect to view photos.

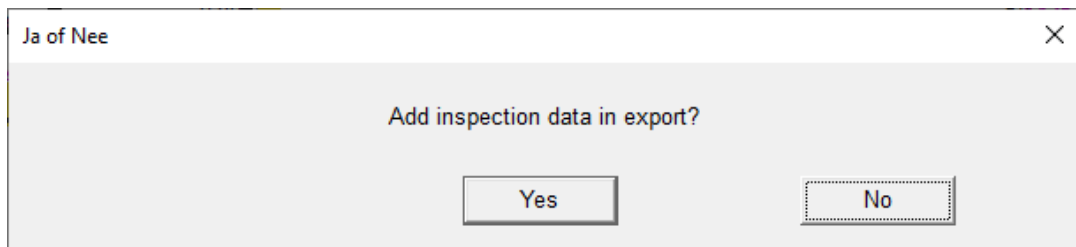
# Appendix D Example of how to convert data from geometry to the BRUTIS Model



k. Don't forget to save the merged data in a new work file.



l. And add the inspection data in the export to work file



m. [Yes].

## Appendix E BRUTIS Database

When no tables found BRUTIS creates automatically the next urban drainage management tables: