



# InSite Seismic Processor: Import of TPC5 waveform data v 3.17



InSite is an integrated data acquisition, management, processing, visualization and interpretation software developed for seismological studies. InSite provides a solution for all seismology applications, ranging in scale from acoustic emissions in the laboratory, through microseismics around mining and petroleum fields, up to regional-scale earthquakes.

The following sections present a summary on how to import AE waveform data acquired in TPC5 format. You can also find further tutorials and demonstration videos in the 'Support' section of our website [appliedseismology.co.uk](http://appliedseismology.co.uk). Details on the configuration and use of the different visualisers can be found in 'InSite User Manual' and 'InSite Technical Appendices' within InSite's help menu or in the pdf version included in the installation folder (C:\Program Files\ASC\Manuals)

## 1. TPC5 waveform data

TPC5 is the file format used by Elsys instruments acquisition software, TranAX, to save waveform data. TPC5 is based on HDF5®, a file format composed of groups and datasets developed at the university of Illinois. The HDF5® specifications and libraries source codes are open and there are multiple tools for managing and reading HDF5® files. Information on the HDF5® format can be found at <https://www.hdfgroup.org/>. The Open source tool HDFView can be used for browsing and editing HDF® files.

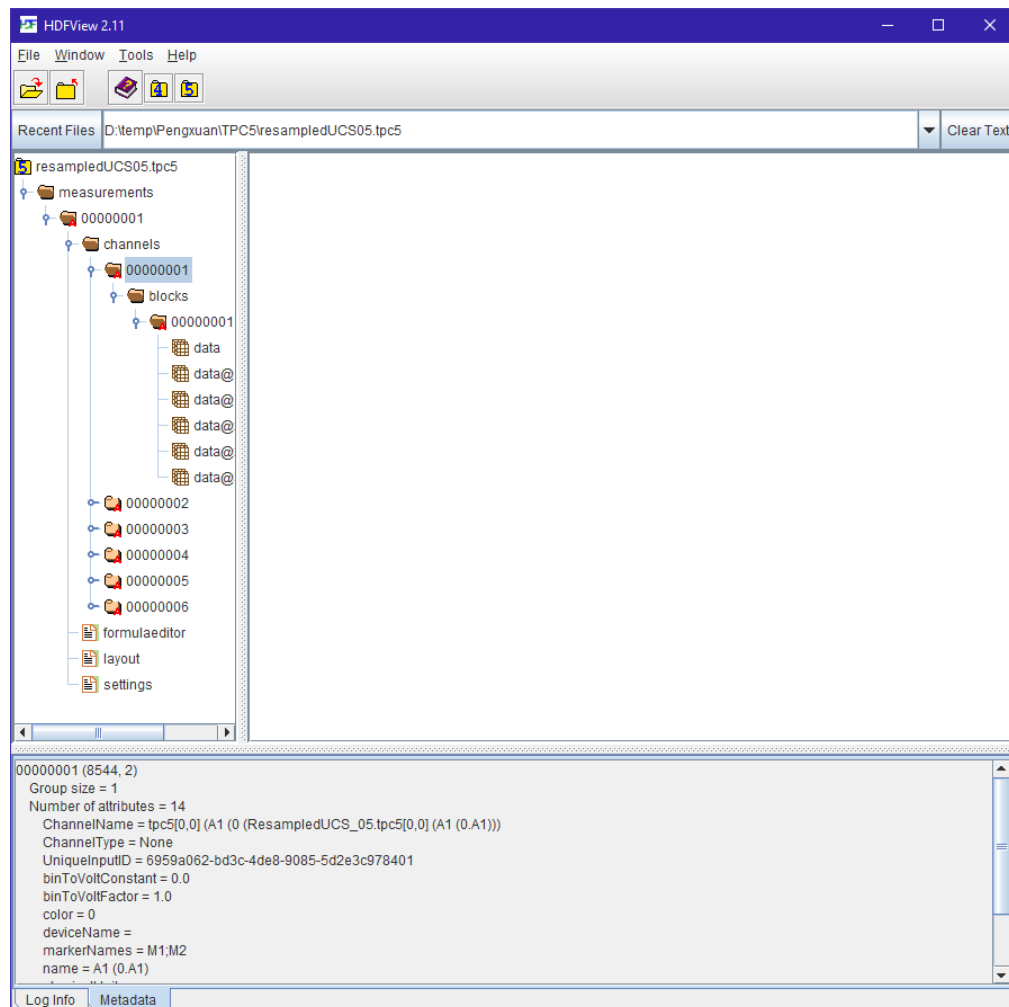


Figure 1: inspecting a TPC5 file using HDFView

## 2. Project Setup

The first step when working on a project in InSite is the import or creation of a sensor array with channel numbers matching those in the harvested or imported seismic waveform data files.

1. In InSite's 'Data Visualiser' click 'Project->Edit Default Arrays-> Receivers'. Alternatively, the same Dialog can be called clicking on



Figure 2: Array Input and Edit Button

in the main toolbar in Data Visualiser

2. the array can be imported from a ready-made .sen or .csv file following the format described in the User Manual by clicking Import from File. Alternatively, each sensor can be manually added by clicking Add and completing the properties menu.

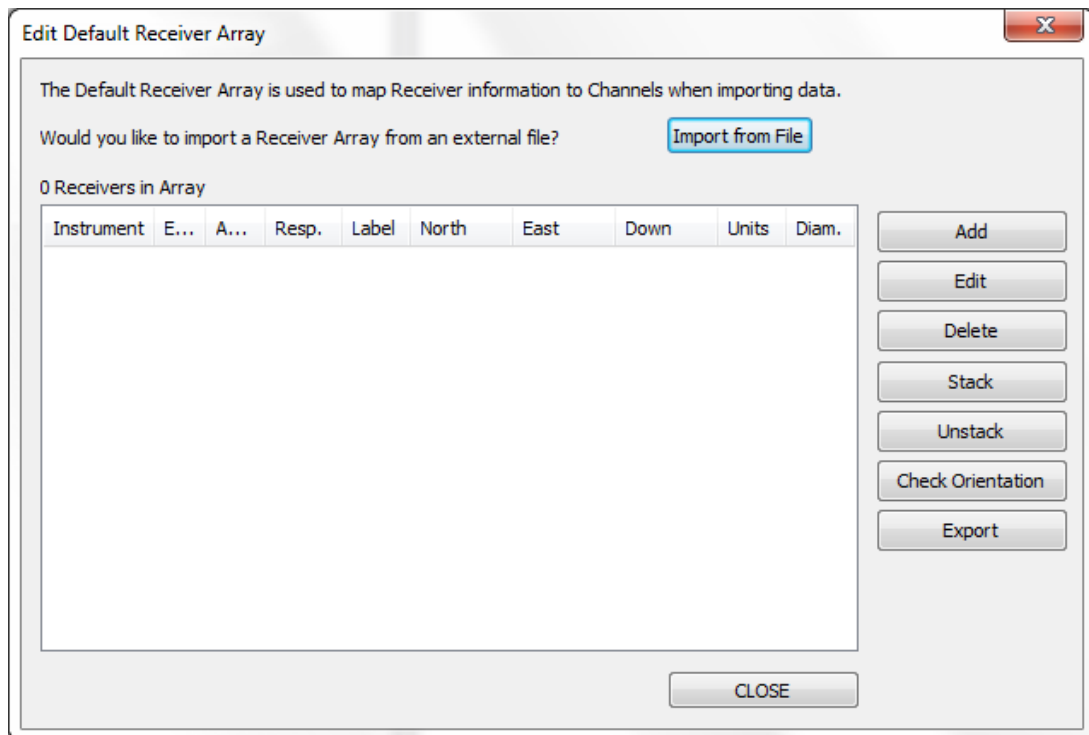


Figure 3: Array Input and Edit Dialog

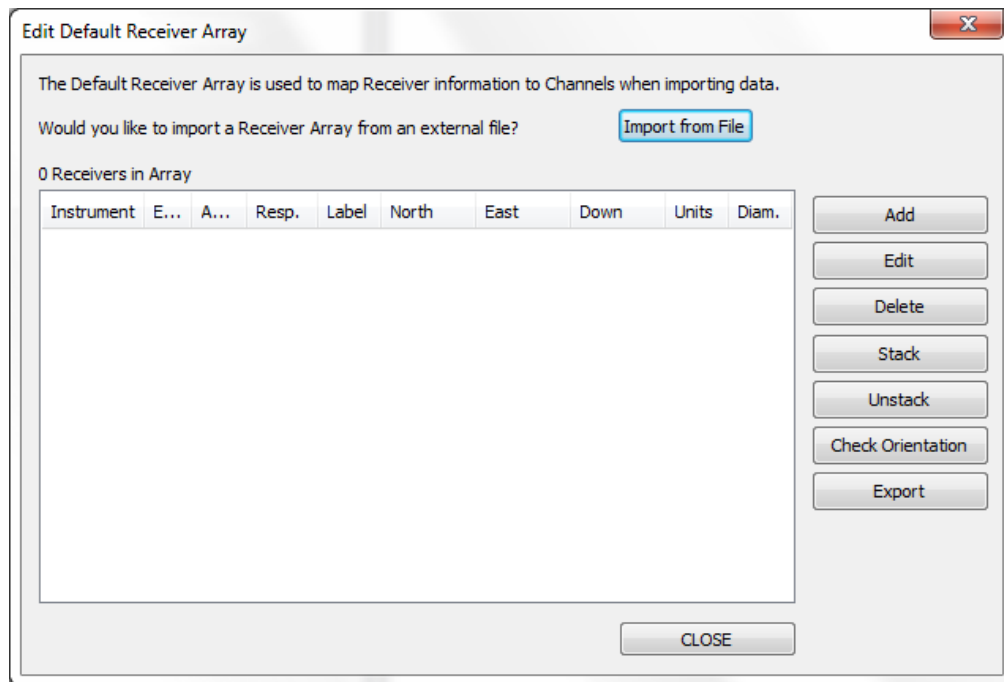


Figure 4: Array Input and Edit Dialog

### 3. Data Import

This processed is used to import triggered data or to import full streaming files into InSite.

1. On import of any waveform data, InSite will create an ESF file for each event, containing all the waveforms corresponding to the imported event. Therefore, the first step is creating an empty folder to store the ESF files.
2. From data visualiser, click on the 'Import and Manage Data' button. Alternatively click 'Project>Import and Manage Data...' from the menu bar.

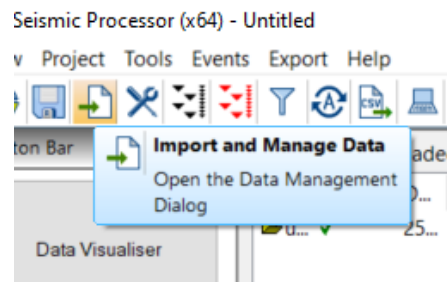


Figure 5: Import and Manage Data button in InSite's data Visualiser

3. The import dialog window will launch. Select the TPC5 data format form the drop-down list.

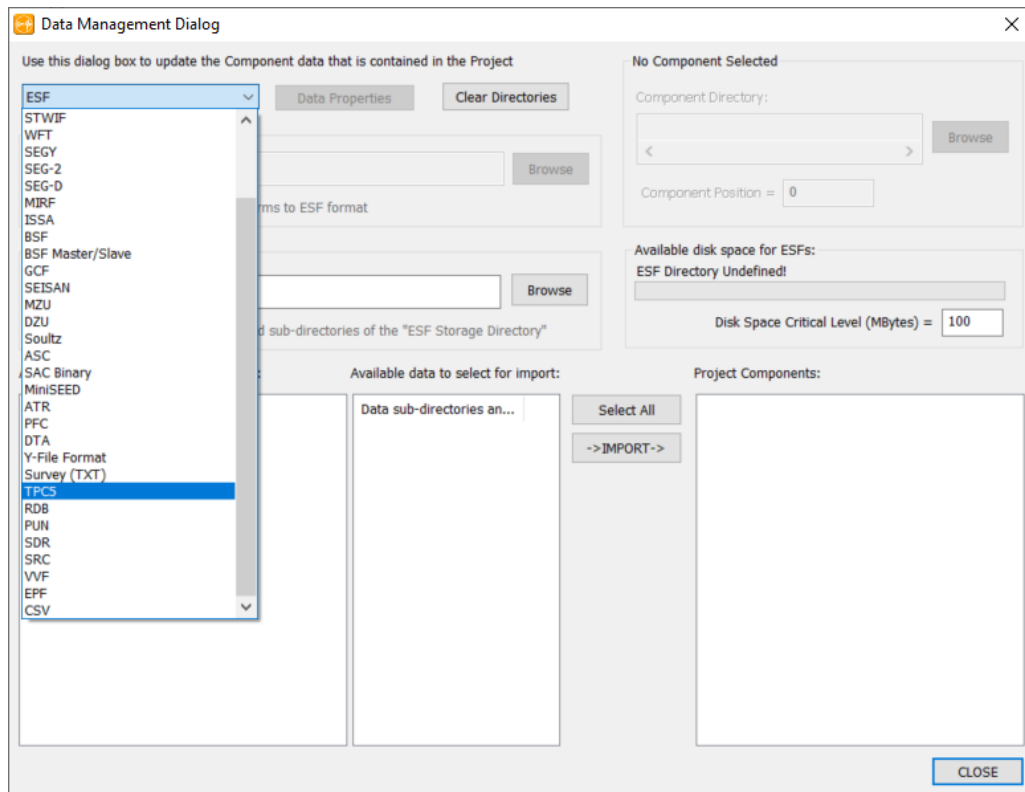


Figure 6: Selecting data format in InSite's 'Data management' dialog

4. Select the 'Import directory' containing the TCP5 waveform files and the 'ESF storage Directory' where Insite will store the created ESF waveform files.

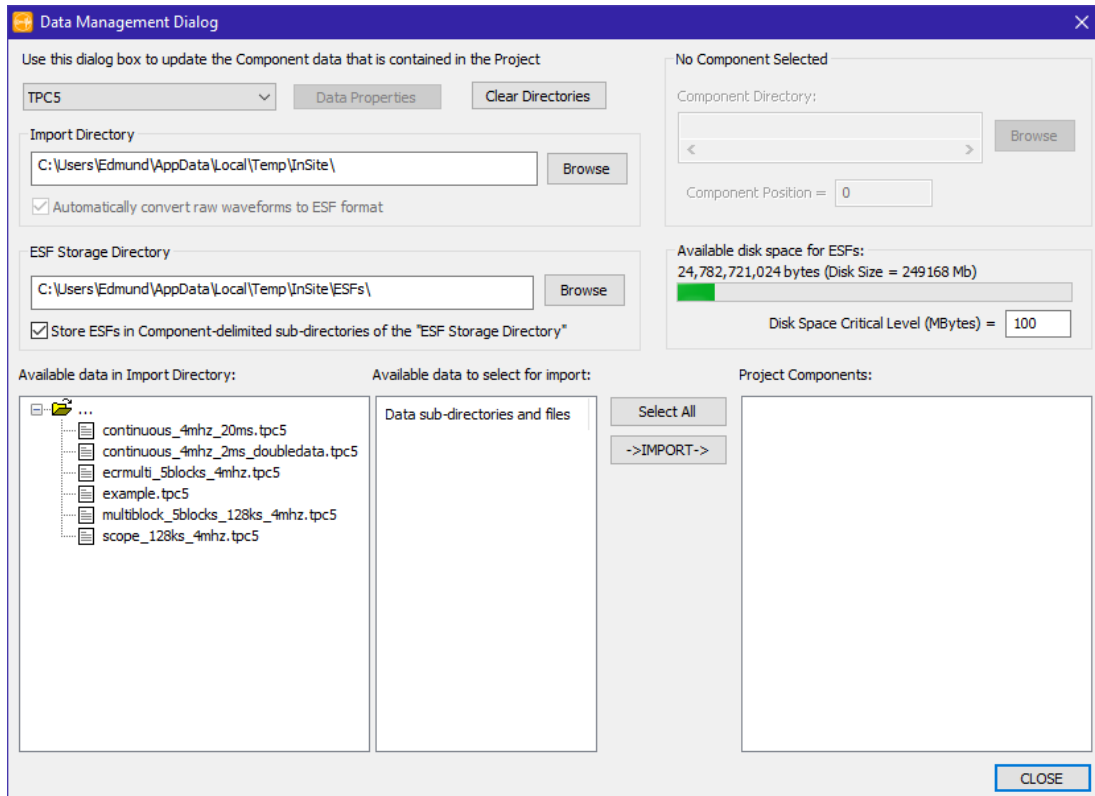


Figure 7:Configuring import and storage folders in InSite's 'Data management' dialog

5. InSite will assign each trace in the TCP5 file to a channel defined in the 'Receiver Array'. The trace number in the TCP5 header must match the channel number in InSite. If the channel numbers and the project is correctly set, you can now import all TPC5 files by selecting the folder icon in the 'Available data in Import Directory' pane and clicking the '->IMPORT->' button. A TCP5 file can contain multiple triggered events, all events will be grouped in a 'Component'. The imported 'Component' (group of events created by InSite based on import folder name) will show in the 'Project Components' pane
6. Once the process is completed, click 'Close' to return to the 'Data Visualiser' view of InSite. The data is imported and ready for visualisation and processing.

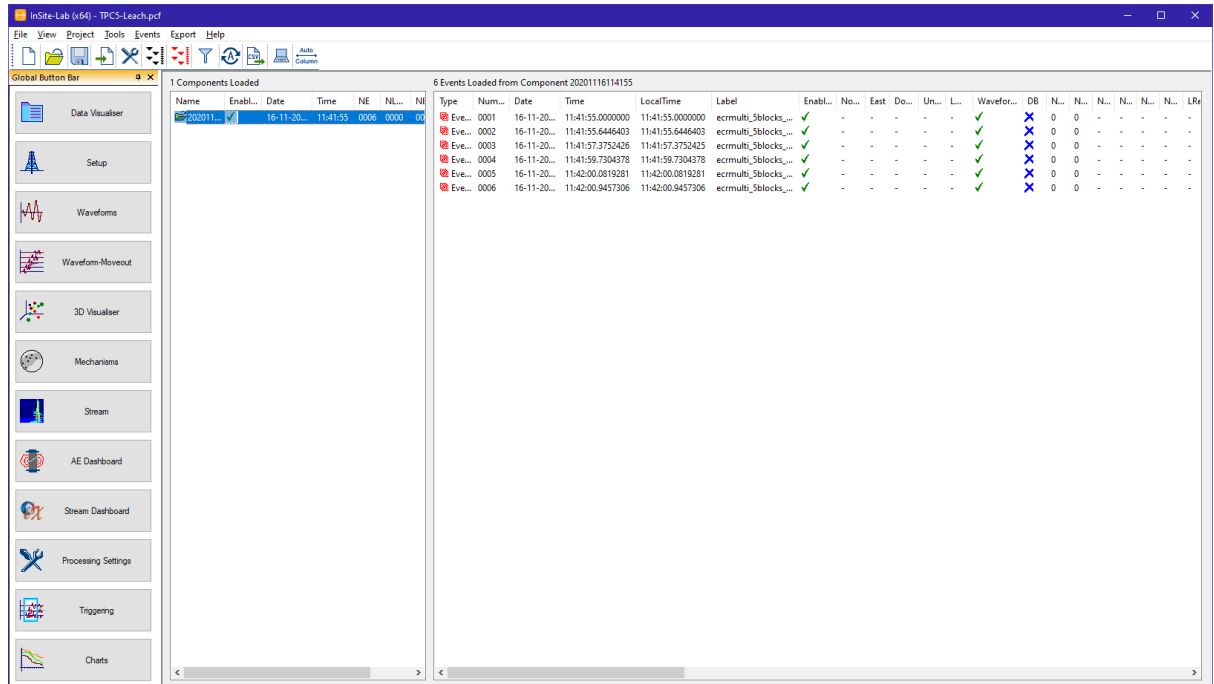


Figure 8: Completed import process in InSite's 'Data Visualiser'

## 4. Event harvesting

InSite Leach is the tool for extracting triggers or events from continuous waveform data streams. Full details on the configuration of the InSite Leach can be found in 'InSite User Manual'. To extract triggers or events from waveform streams recorded as TPC5 files the following steps must be followed:

1. In the Leach dialog select 'TPC5' from the 'File Format Type' drop-down list

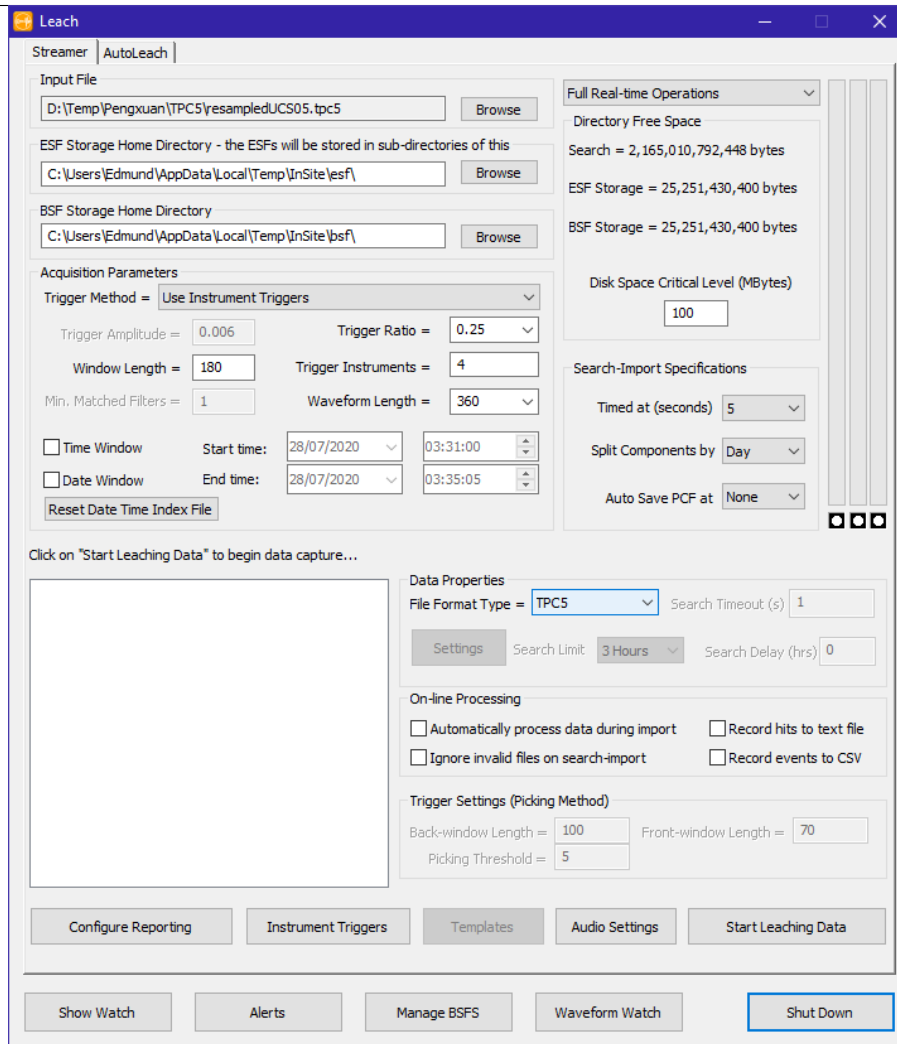


Figure 9: InSite's Leach dialog

2. Configure the import folder. In the 'Input file' click 'Browse' to point InSite to the storage folder for the raw TPC5 stream data

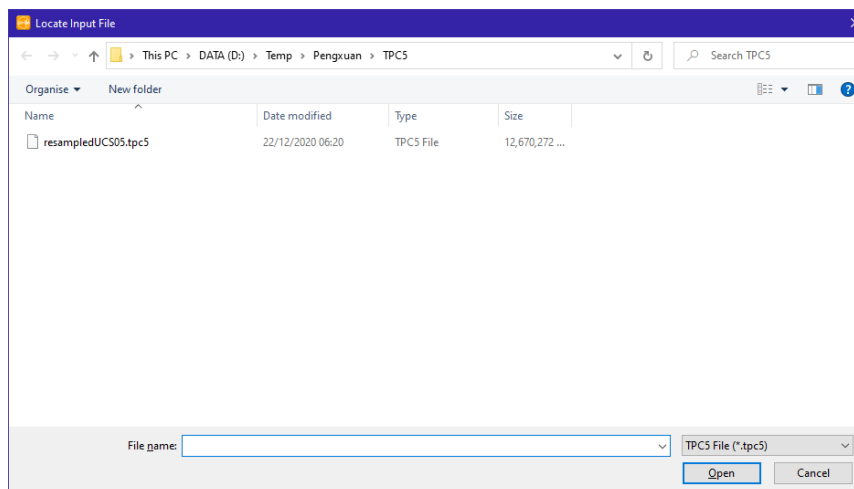


Figure 10: Browse window to select raw data search folder

3. Configure the storage folders. When working in 'Full Real-time Operations' mode, InSite will create

two files for each detected trigger:

- a. A waveform file containing waveform and processing (ESF)
- b. A raw waveform backup file (BSF)

These files will be stored in the defined folders and it is a prerequisite for operating the Leach. No files are stored when working in 'No Waveform storage' mode, and only BSF files are created in 'Autostore BSF only' mode.

4. Configure the extracted waveform. In the 'Acquisition parameters' set the following properties that configure the extracted event waveform:
  - a. Select the 'Trigger method' from the drop-down list. This controls the method used in the identification of triggers
  - b. Waveform Length. This is the size, in sample points, of the extracted section of stream that will be saved for each trigger. This must be long enough to include all the phases of interest and depends on the sampling rate, size of the array and distance to the monitored events.
  - c. Trigger ratio. The fraction of trace before the first detected arrival that will be saved in the triggered waveform. E.g. trigger ratio=0.25 means that the first arrival will be positioned at  $\frac{1}{4}$  of the total length of the trace.
  - d. Window length. The time (expressed in sample points) for which InSite will search for further arrivals after the identification of the first trigger.
  - e. Trigger instruments. The minimum number of instruments that must meet the trigger condition in order to identify the trigger as an event and extract the waveform
5. Click 'Start Leaching Data' to start the process. A list of the files in the raw data 'Search directory' will appear in the information panel.

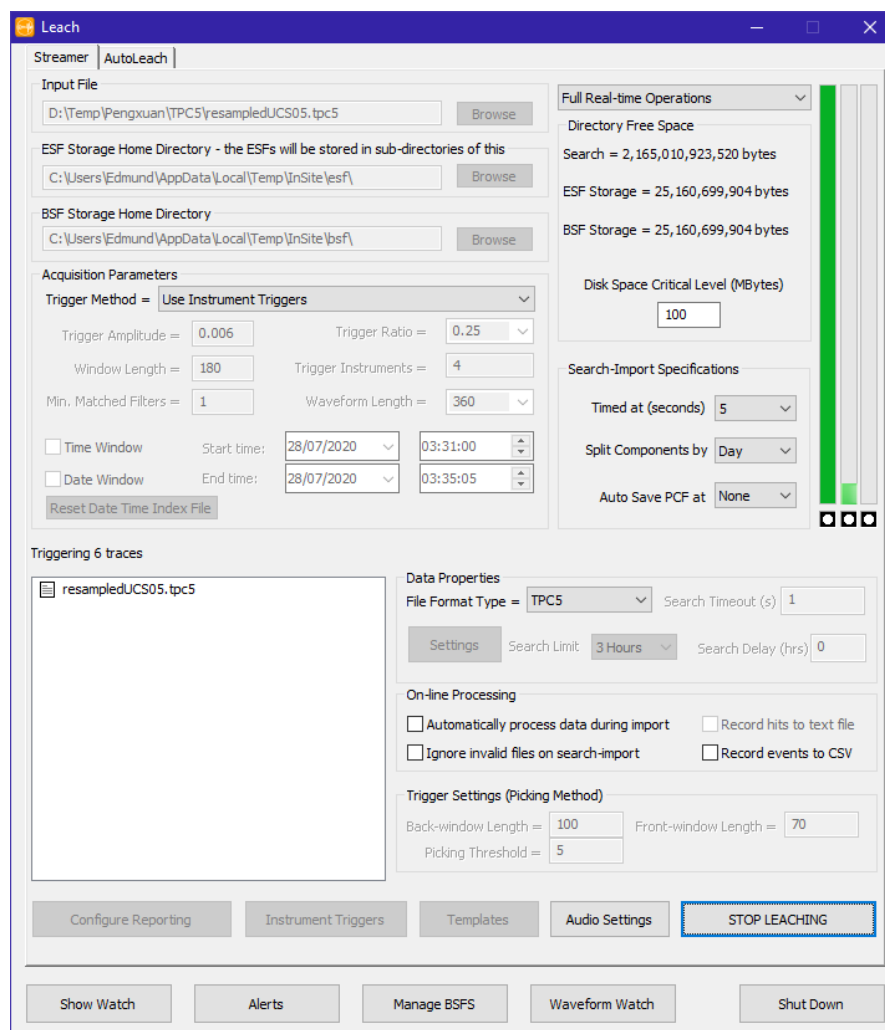


Figure 11: InSite's Leach dialog during data triggering



- A live feedback on the processes being carried out by 'InSite Leach' can be displayed by clicking 'Show Watch'

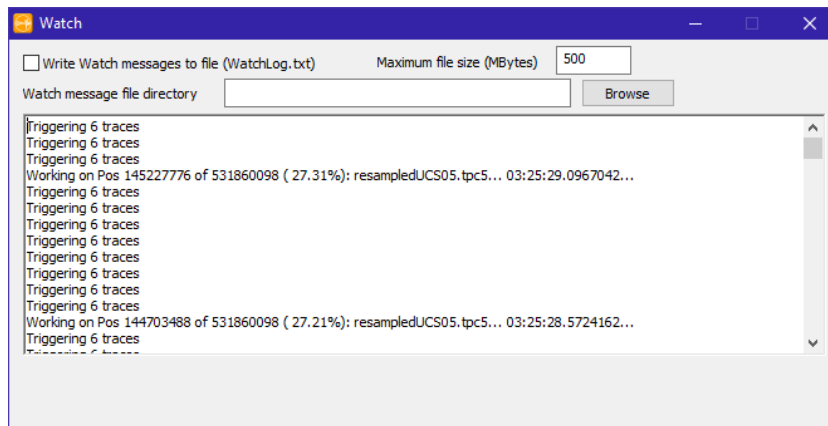


Figure 12: InSite's Leach Watch window displaying processes carried out during event harvesting

- Extracted triggers will be listed in the 'Data visualiser' during the process

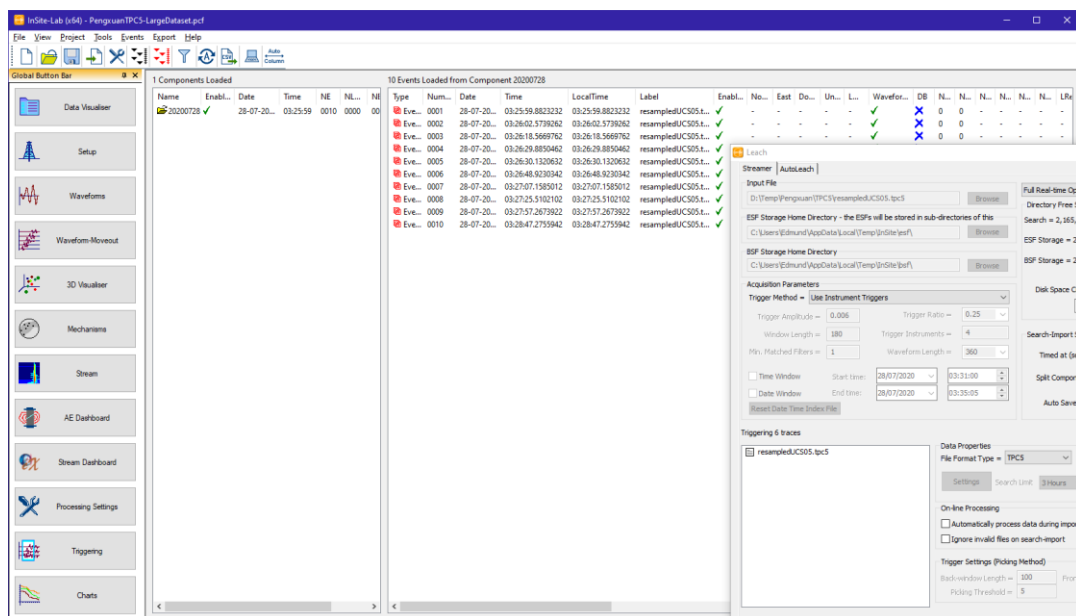


Figure 13: Extracted triggers in 'Data visualiser'

## 5. Stream visualiser

InSite's Stream Visualiser allows to view an entire Streamed data set in both the time and frequency domains, and to zoom into the data to study small changes in the data properties. The tool allows the import of data streams from different formats, including Elsys' TPC5 stream data.

The interface is launched from the 'Global Button Bar' by clicking 'Stream'

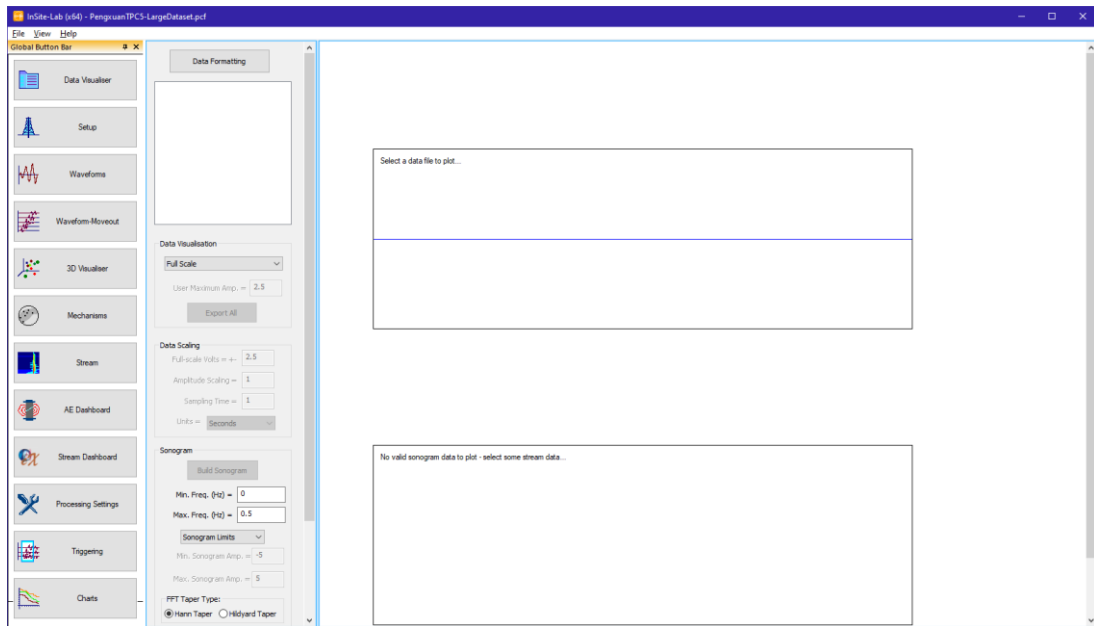


Figure 14: InSite's Stream visualiser dialog

Files are selected by launching 'Data formatting' dialog

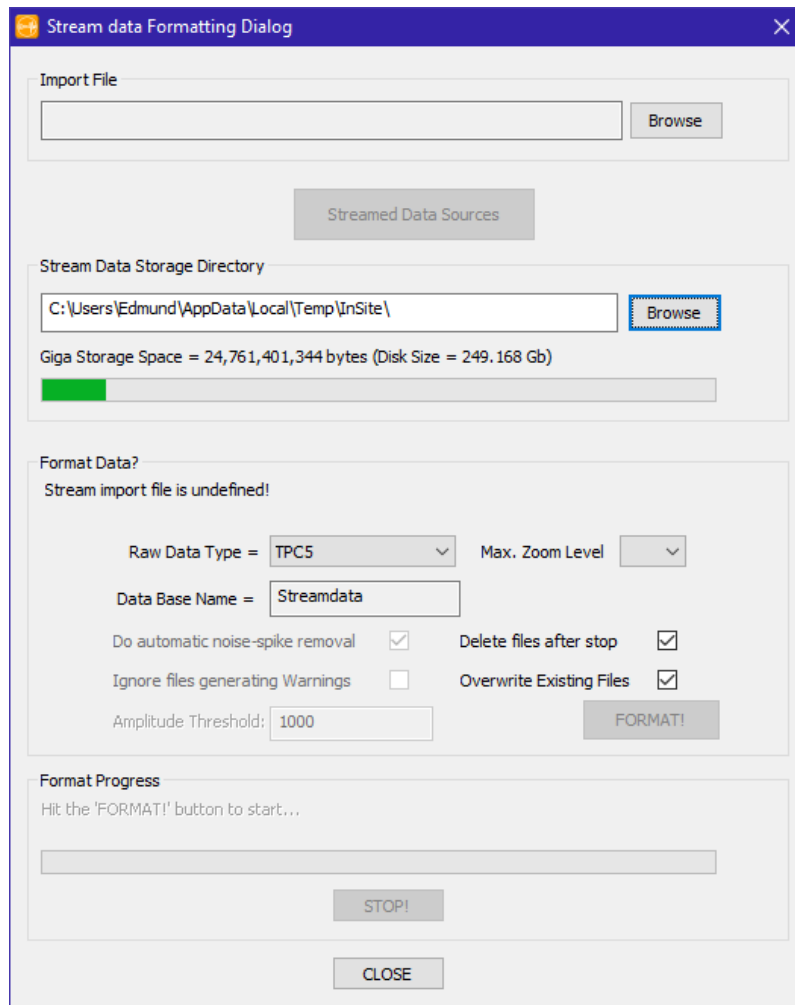


Figure 15: Configuration of data import into 'Stream Visualiser'

1. Select TPC5 in the 'Raw Data Type' drop-down list.
2. Select a basename for the steam image files inSite will create.
3. Browse to select the stream data File.
4. Select maximum zoom level
5. Click 'Format!' to start the import and creation of stream image files.

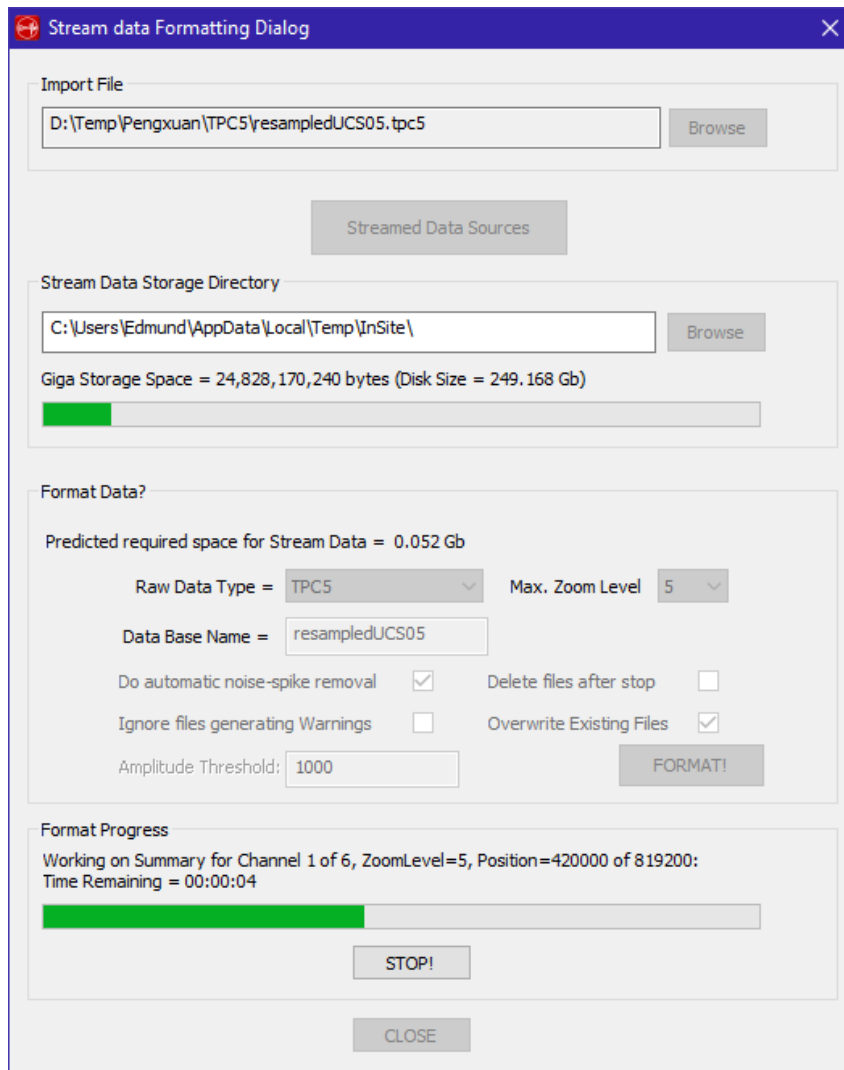


Figure 16: Import of stream data into 'Stream Visualiser'

6. At the end of the process, the full time domain stream will be displayed in the visualiser

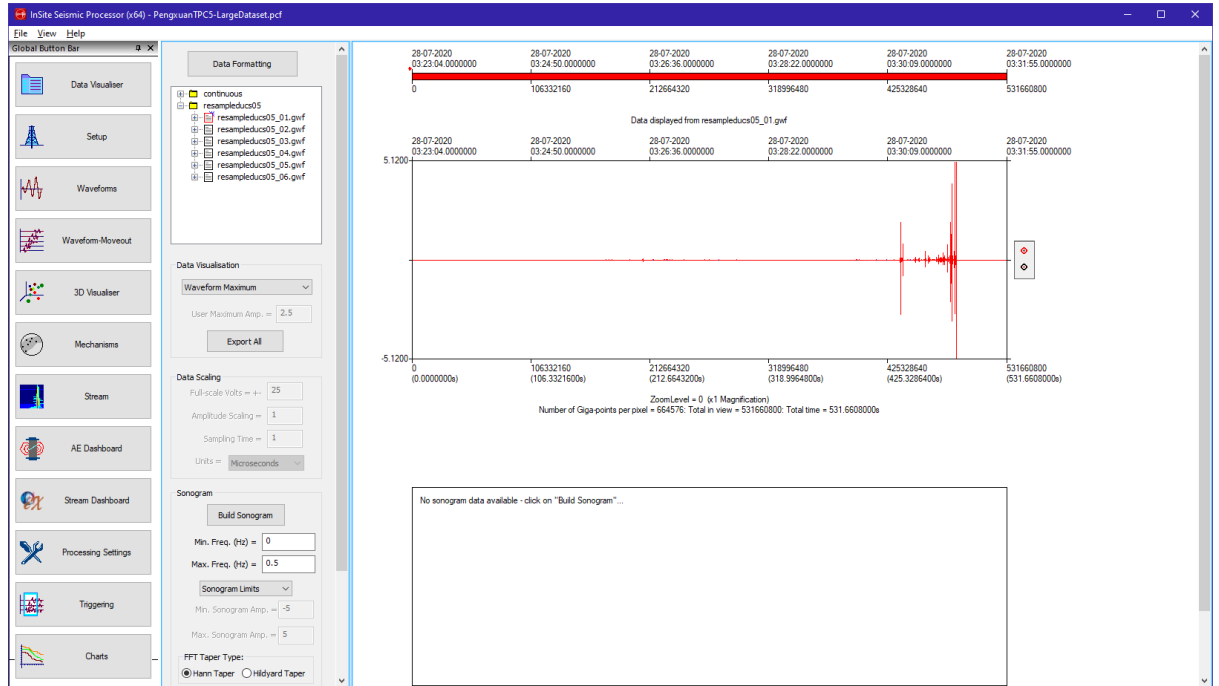


Figure 17: Imported data stream in 'Stream Visualiser'

- Click 'Build Sonogram' to display a frequency domain sonogram in the bottom panel of the visualiser.