



InSite-Lite Seismic Processor: User Operations Manual

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Applied Seismology Consulting Ltd. is an ISO 9001:2015 certified company and operates a Quality Management System that provides quality assurance of our products and management procedures.

Acknowledgments

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InSite-Lite is the free version of ASC's InSite Seismic Processor. This version has limited functionality. Functions only available only for users of the full version of InSite show a '\$' symbol. Contact us at asc-info@appliedseismology.co.uk for information about how to upgrade to the full version.

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 install and work with an example project in InSite-Lite. The help menu in InSite Lite cover all the functions in InSite. You can also find further tutorials and demonstration videos in the 'Support' section of our website appliedseismology.co.uk.

1. Step 1 InSite-Lite Installation

After downloading the installation file, please follow the following steps:

- executing it will launch the dialog shown in Figure 1. Click Next to continue
- The second screen (Figure 2) in the installation dialog shows the terms and conditions of use of InSite-Lite. Scroll down to read the full terms and click 'I agree' to continue. By continuing with the installation, the user agrees with ASC's terms and conditions.
- The next screen shows the Privacy Policy (Figure 3). Click Next to continue with the installation. By clicking 'Next' the user accepts CopyMinder's Privacy Policy.
- The next step checks the installation of the prerequisite VC 2010 C++ (Figure 4). Click Next to proceed.
- Select the PC users with access to InSite-Lite (Figure 5). Click 'Next' to proceed.
- Choose the installation folder (Figure 6). By default, InSite-Lite is installed in 'C:\Program Files\ASC\InSite-Lite'. Click 'Install' to proceed.
- After Licence key installed a confirmation screen is reached (Figure 8). Click 'Next' to finalise installation.
- Once installation is completed a confirmation screen is shown (Figure 9). Click 'Finish' to exit the installation.

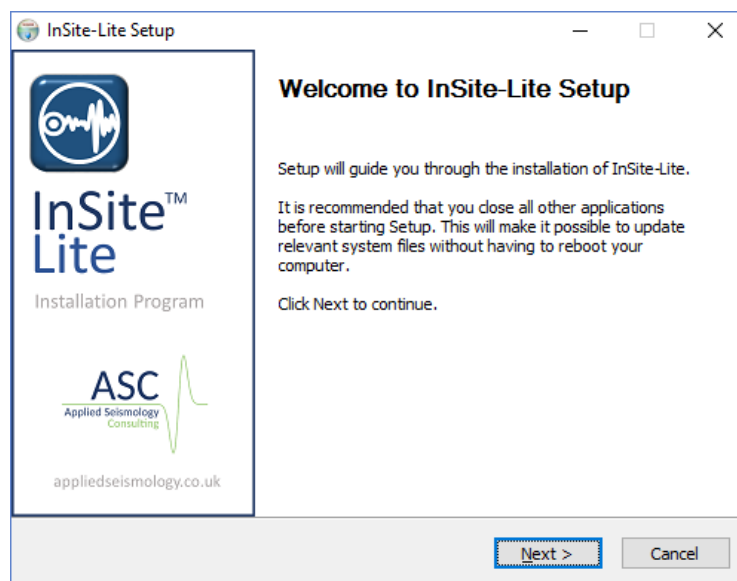


Figure 1: InSite-Lite setup program. Welcome screen

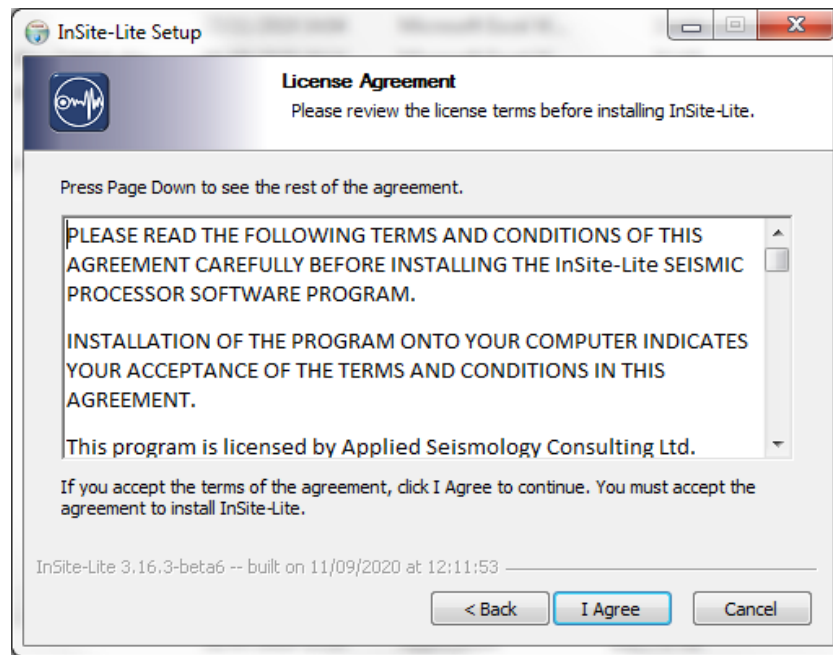


Figure 2: InSite-Lite setup program. Licence Agreement.

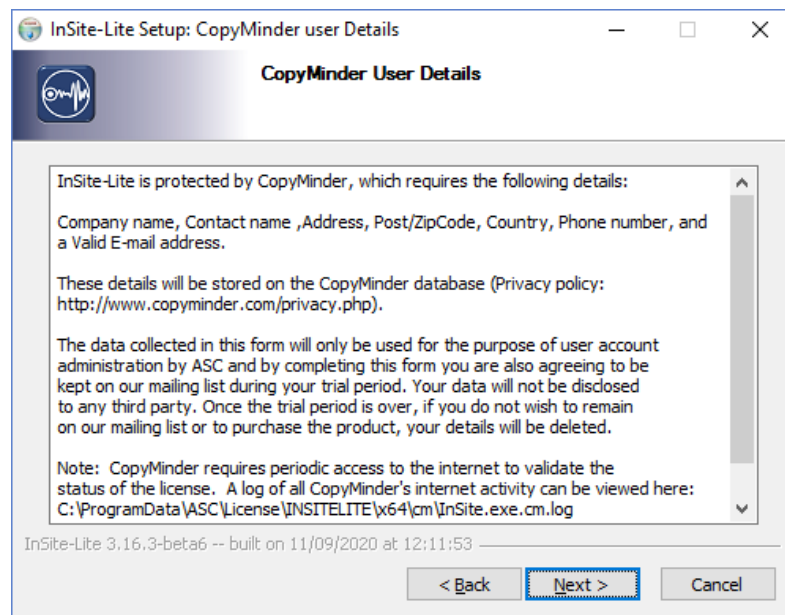


Figure 3: InSite-Lite setup program. CopyMinder Privacy Policy.

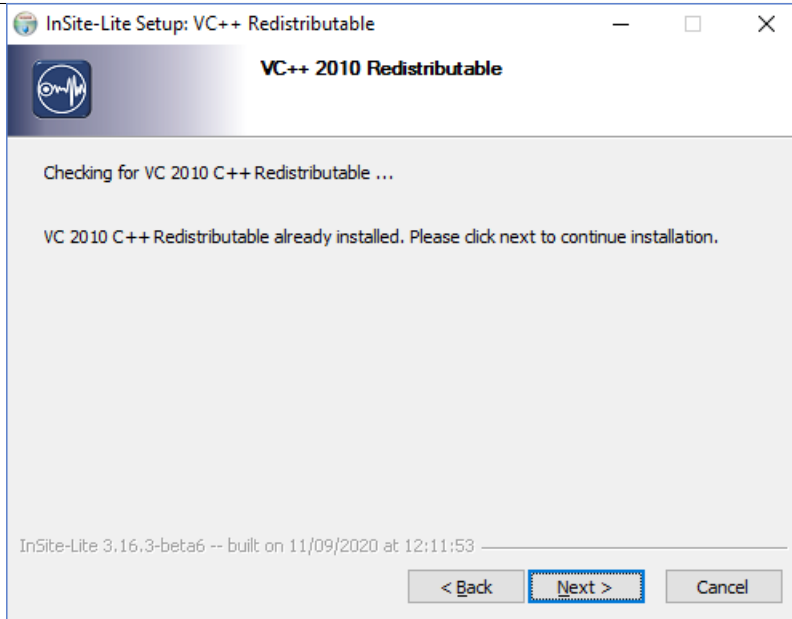


Figure 4: InSite-Lite setup program. Installation of VC 2010 C++ Redistributable pack.

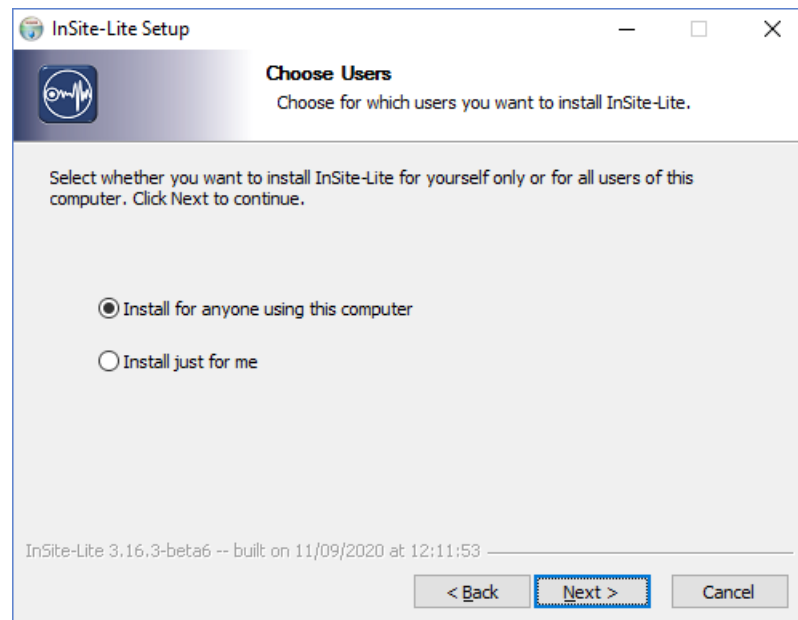


Figure 5: InSite-Lite setup program. User access configuration.

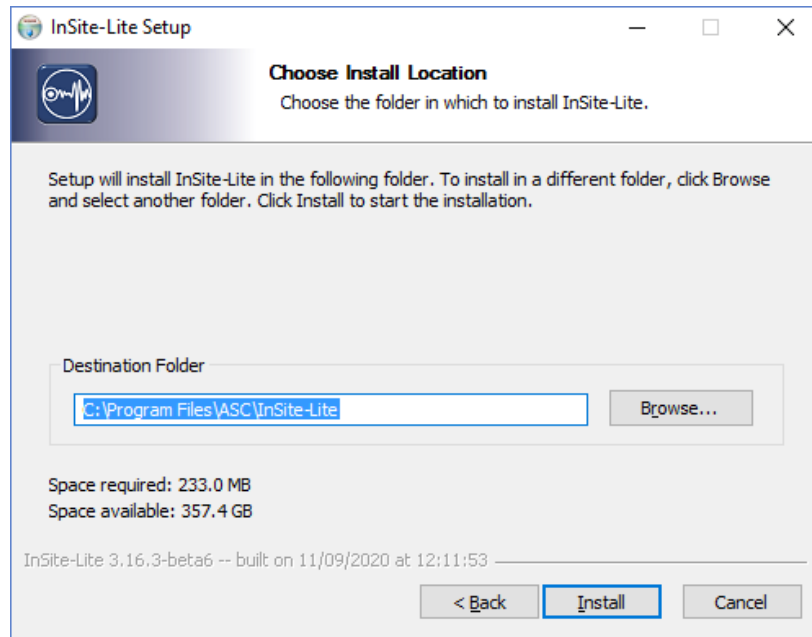


Figure 6: InSite-Lite setup program. Program installation folder.

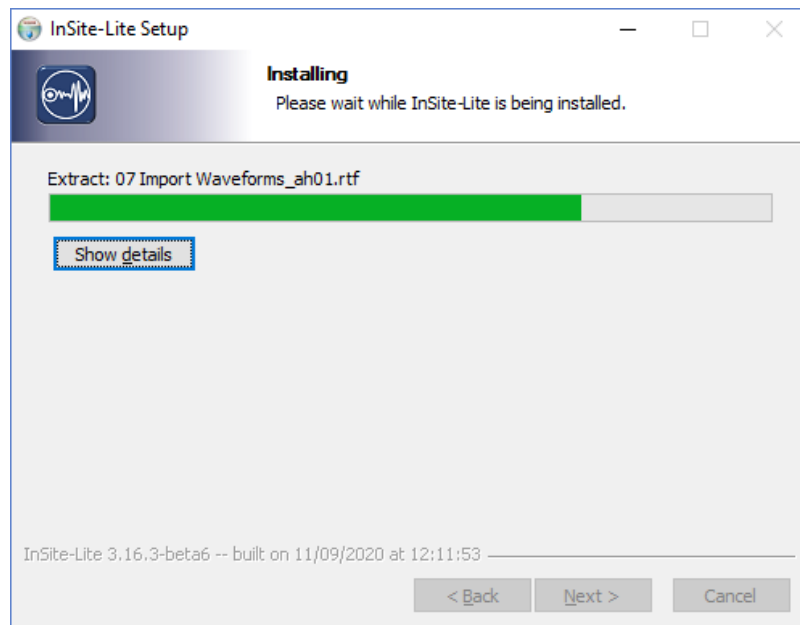


Figure 7: InSite-Lite setup program. Progress update.

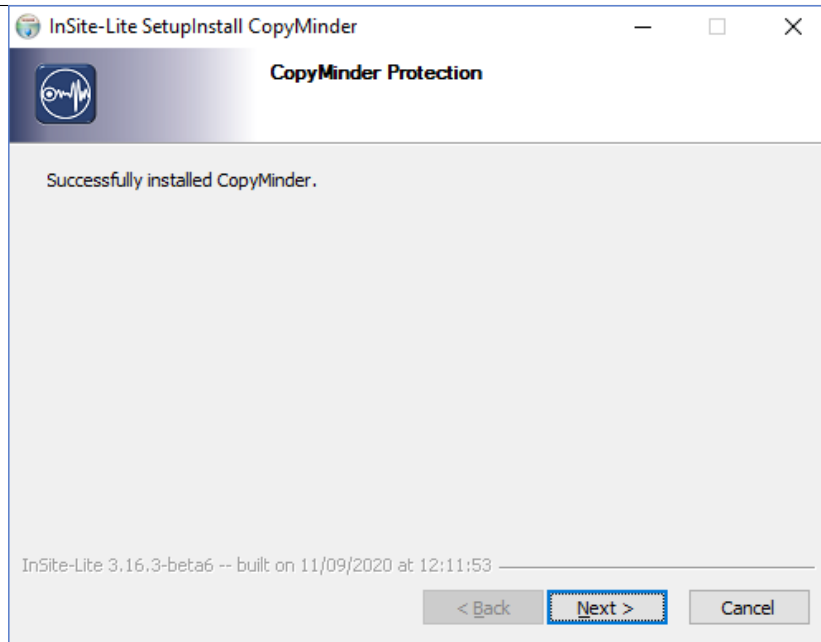


Figure 8: InSite-Lite setup program. Installation of program key.

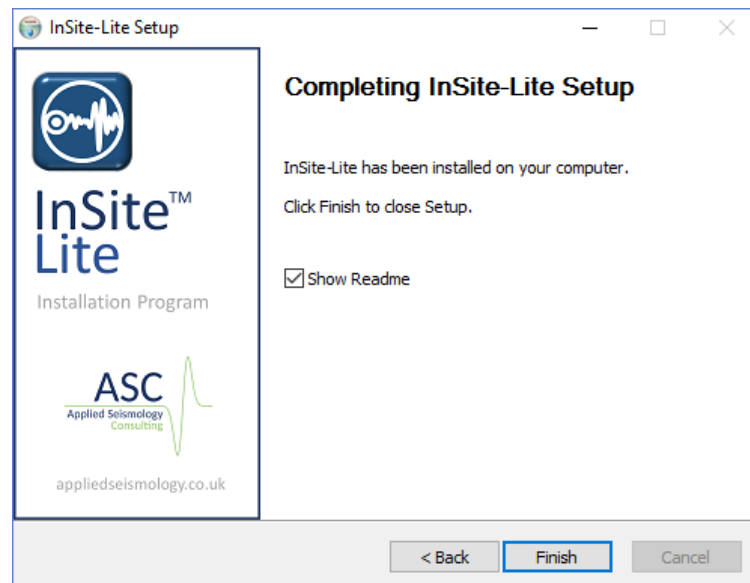


Figure 9: InSite-Lite setup program. Installation completed.

On first execution of InSite-Lite, the software licence key will be activated. Please ensure the PC is connected to the Internet. To activate the licence, proceed through the following steps:

- On first execution, a dialog is launched to select the type of licence (Figure 10). Select 'Configure as a trial' if you do not have a licence code. This option will activate the licence for a trial period of 90 days.
- Only, if you have been provided with a licence code, select 'Configure as a standalone program' (Figure 11) and enter the licence code.
- A window will confirm the selection (Figure 12). Click 'OK' to proceed with licence registration.
- Enter user's details to register and activate the licence (Figure 13). Click 'OK' to submit your details.
- A verification email is sent to registered user (Figure 14). Click on the link to verify your registration.
- Once user's details are verified, a confirmation page will confirm licence activation (Figure 15)

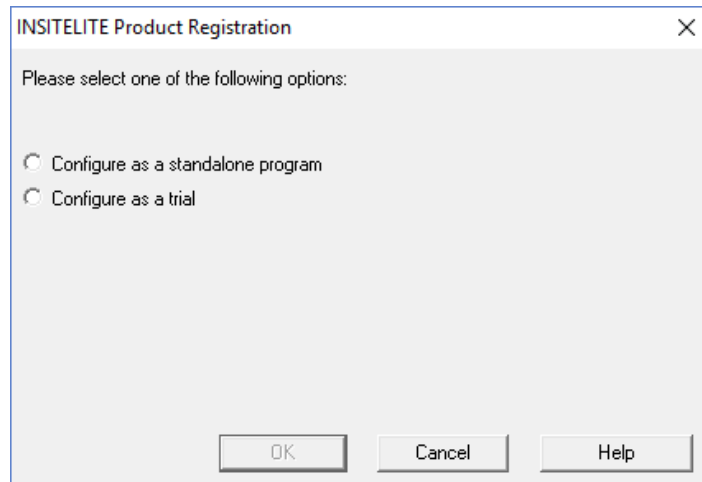


Figure 10: InSite-Lite. First execution.

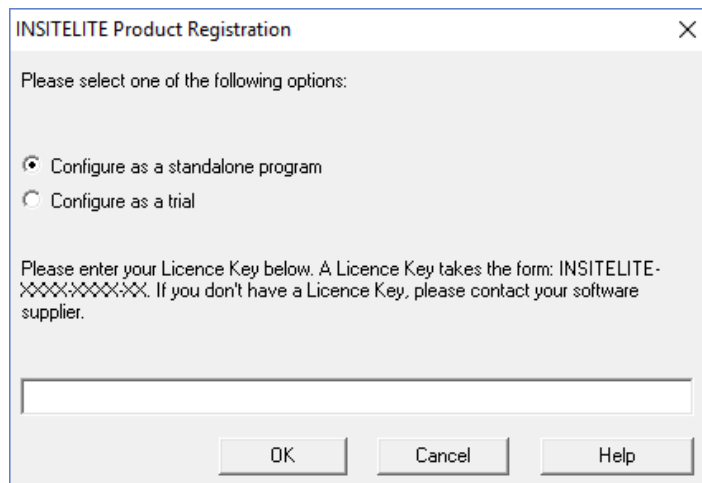


Figure 11: InSite-Lite. First execution option.

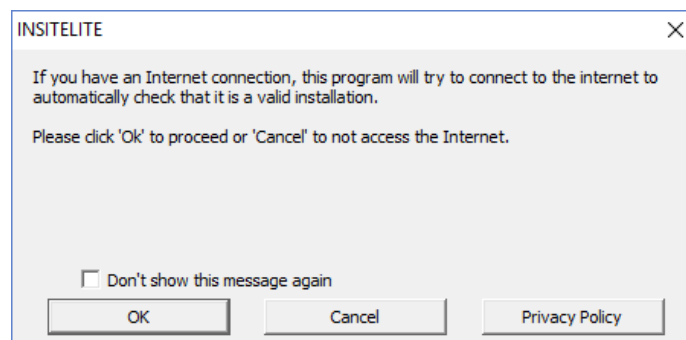


Figure 12: InSite-Lite. First execution information.

Product Registration

To complete the registration of this product, please fill out the form below. Items marked with a * are compulsory.

Only information regarding the registration of this product will be sent over the Internet. This information will be securely stored by Microcosm and will not be distributed to anybody other than the Software Developer and Microcosm.

If you would like to see Microcosm's security policy then please click the button below

Company Name *

Contact Name *

House Name/Number *

Street Name *

Town/City *

County/State

Post/Zip Code *

Country *

Telephone No.

Email Address *

OK Cancel Privacy Policy

Figure 13: InSite-Lite. User registration for activation.

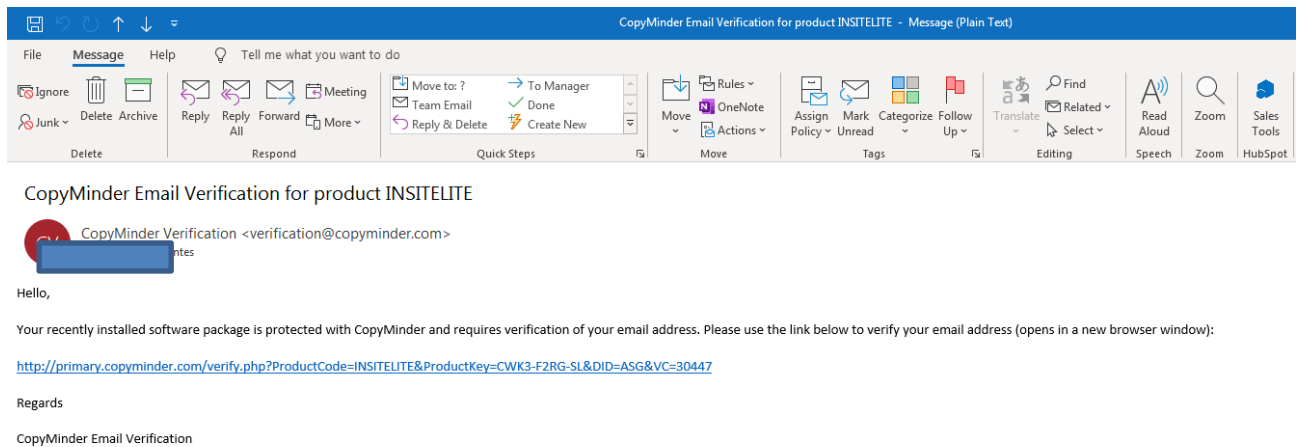


Figure 14: InSite-Lite. User verification email.

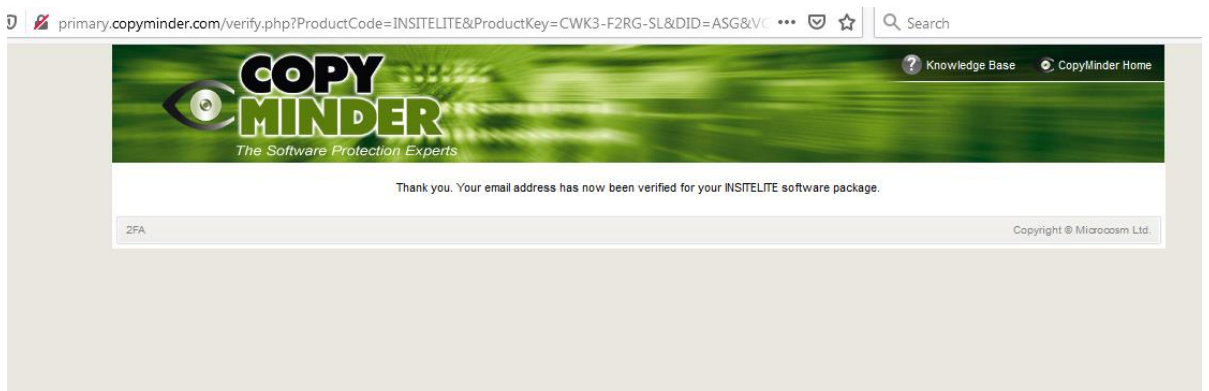


Figure 15: InSite-Lite. Licence activation confirmation.

2. Step 2 Project Setup

Installation of InSite-Lite includes an example project to familiarise with the use of the software. Please copy and paste the tutorial folder in the installation path, `C:\Program Files\ASC\Insite-Lite\Quick Start Tutorial`, to a folder where you can read and write. Please follow through this tutorial in the following order using the data and PCF (project file) file provided.

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.

In this example, the .pcf file is already set with the correct sensor array and this step can be skip. The following details are for information only and working on a fresh project.

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



Figure 16: 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 (examples included in the folder `C:\Program Files\ASC\Insite-Lite\Examples`) following the format described in later sections by clicking `Import from File`. Alternatively, each sensor can be manually added by clicking `Add` and completing the properties menu.
-

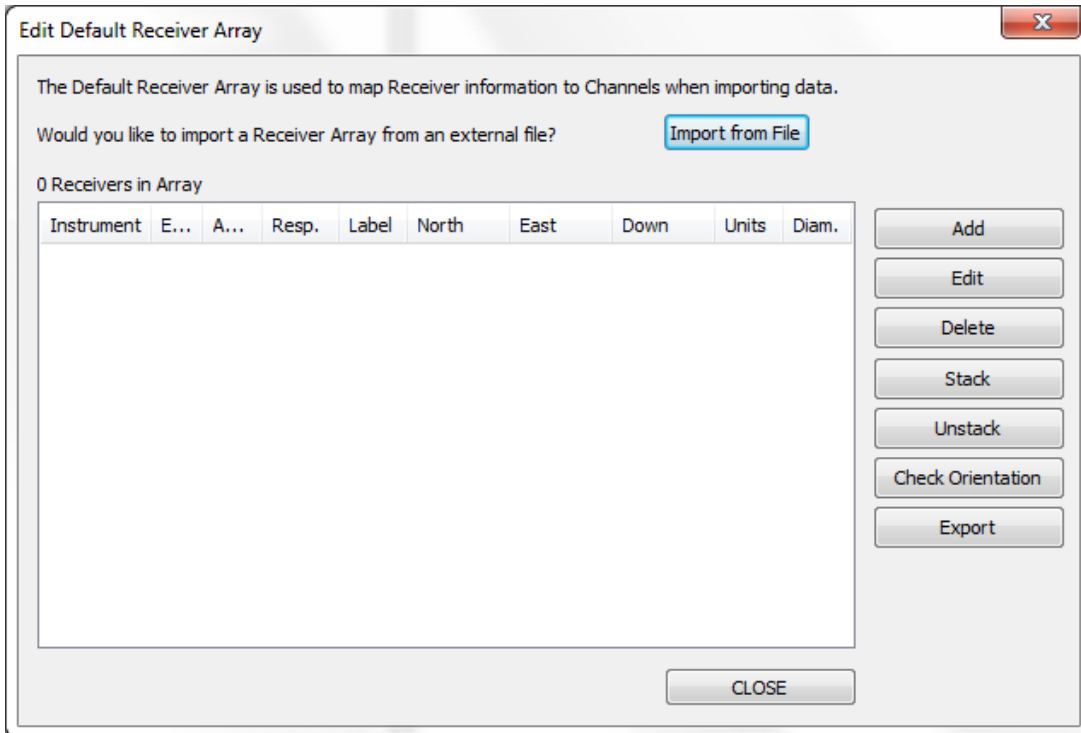


Figure 17: Array Input and Edit Dialog

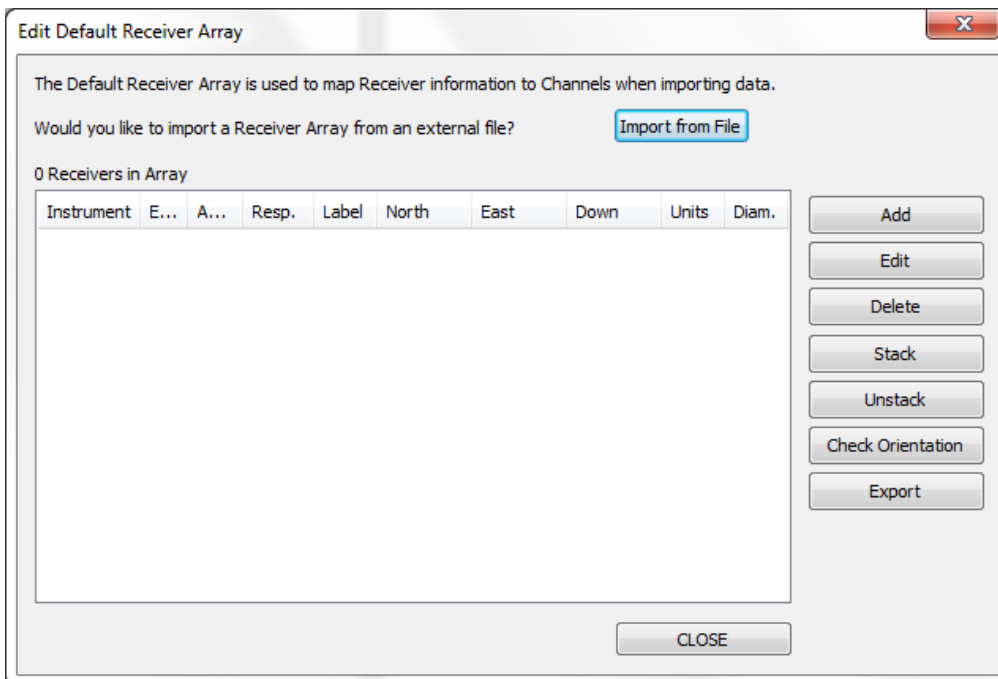


Figure 18: Array Input and Edit Dialog

3. Step 3 Data Import

InSite-Lite can import a variety of data formats.

In this step, we just import triggered SEGY format data. Notice that the tutorial SEGY data are triggered event data.

1. Create an empty folder ESF under the same directory as the SEGY folder.
2. Click 'Project -> Import and Manage Data...' Make sure the Import Directory and the ESF Storage Directory are set correct (see figure below)
3. Select the root of the file tree and click ->Import->, all .sgy files will be imported to InSite and stored as ESF files in the specified ESF folder.

Note: there are 50 events imported into InSite-Lite

4. Right-click on any one event and select `View Waveforms`. You will notice that some first arrivals were already picked. The free version of InSite-Lite does not have automatic first arrival picking. In the next step, we will manually pick or re-pick the first arrivals and locate events using homogeneous model.
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4. Step 4 Microseismic Waveform Processing

Once we have setup the monitoring array and imported waveforms, we are ready to process microseismic events.

InSite provides 3 ways of processing:

- Automatic processing or batch processing: the procedures are defined in the auto-processor by users (available in the full version of InSite).
- Online processing: process the data while triggering. In online processing, procedures are not specified by users and determined by the type of data automatically (available in the full version of InSite).
- Manual processing: each step of processing is conducted by users. In this step, we will introduce the automatic processing and manual processing.

Adjusting processing parameters:

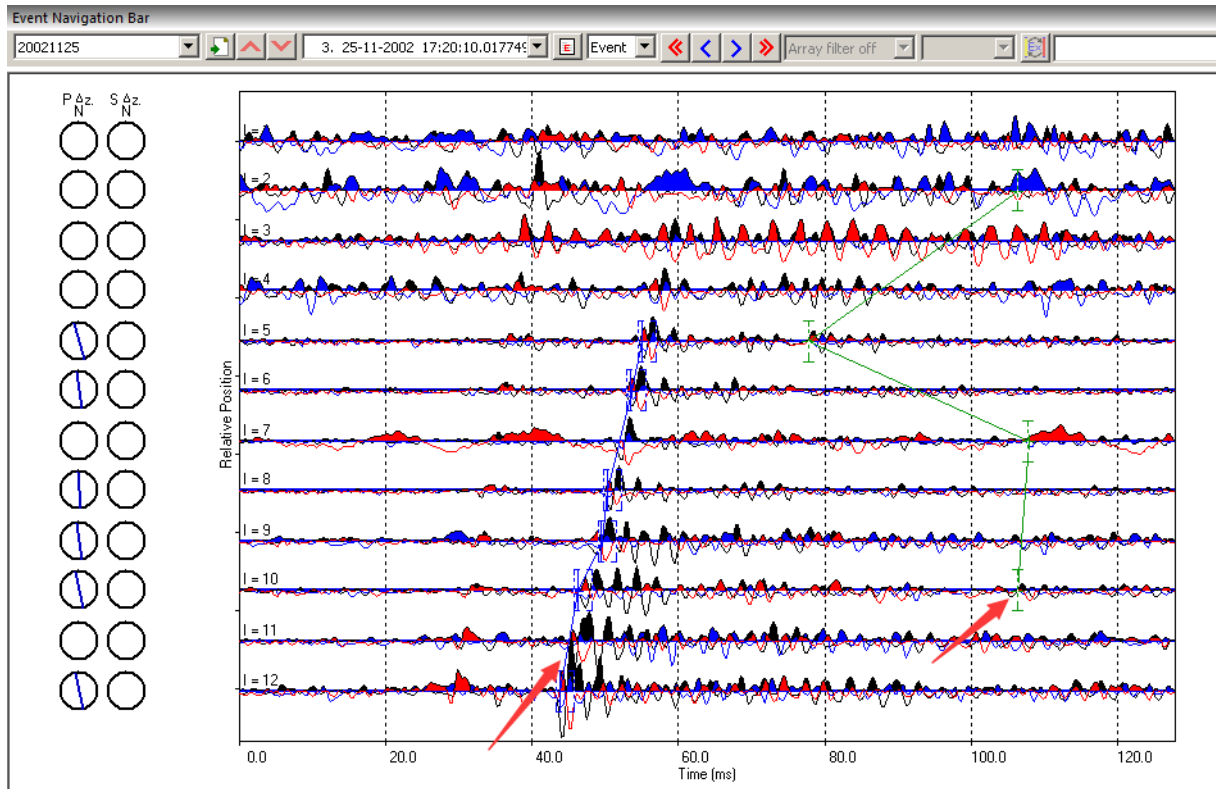
- Right-click on one event that was not located successfully. In the example shown below, event 5 is not located.

103 Events Loaded from Component 2002112517

Type	Num...	Date	Time	LocalTime	Label	Enabl...	North	East	Down	Un...	LMag	Wavefor...	DB	N...	N...	N...	N...	N...	N...
Eve...	0001	25-11-20...	17:19:58.0094990	17:19:58.0094990	f_004508.rcd	✓	-	-	-	-	-	✓	✗	27	24	-	-	-	-
Eve...	0002	25-11-20...	17:20:00.0809990	17:20:00.0809990	f_004508.rcd	✓	-6.0537	-102.756	12678.9	1.00	0.0570	✓	✗	33	33	15	8	8	-
Eve...	0003	25-11-20...	17:20:07.1939990	17:20:07.1939990	f_004510.rcd	✓	-	-	-	-	-	✓	✗	33	21	-	-	-	-
Eve...	0004	25-11-20...	17:20:10.0022491	17:20:10.0022491	f_004511.rcd	✓	12.608	175.141	13126.3	1.00	0.0116	✓	✗	30	30	11	6	3	-
Eve...	0005	25-11-20...	17:20:11.5137490	17:20:11.5137490	f_004511.rcd	✓	-	-	-	-	-	✓	✗	36	15	-	-	-	-
Eve...	0006	25-11-20...	17:20:12.3402490	17:20:12.3402490	f_004511.rcd	✓	-	-	-	-	-	✓	✗	27	27	-	-	-	-
Eve...	0007	25-11-20...	17:20:32.0795000	17:20:32.0795000	f_004516.rcd	✓	-	-	-	-	-	✓	✗	33	24	-	-	-	-
Eve...	0008	25-11-20...	17:20:57.5332500	17:20:57.5332500	f_004522.rcd	✓	-	-	-	-	-	✓	✗	33	27	-	-	-	-
Eve...	0009	25-11-20...	17:20:58.0860000	17:20:58.0860000	f_004522.rcd	✓	-59.331	-91.081	12650.0	1.00	-0.0...	✓	✗	36	33	16	8	3	-
Eve...	0010	25-11-20...	17:20:59.7432500	17:20:59.7432500	f_004523.rcd	✓	-	-	-	-	-	✓	✗	33	18	-	-	-	-
Eve...	0011	25-11-20...	17:20:59.9360000	17:20:59.9360000	f_004523.rcd	✓	-30.906	-157.970	12706.5	1.00	0.203	✓	✗	36	21	18	11	7	-

Figure 19: Some events are not located in the triggering and online processing step

- The reason is that the auto-picking algorithm failed to pick the P-wave arrival. See the figure below.



To adjust the first arrivals, users can manually add a new pick or could either right-click with the mouse on the arrival and drag it to the desired position.

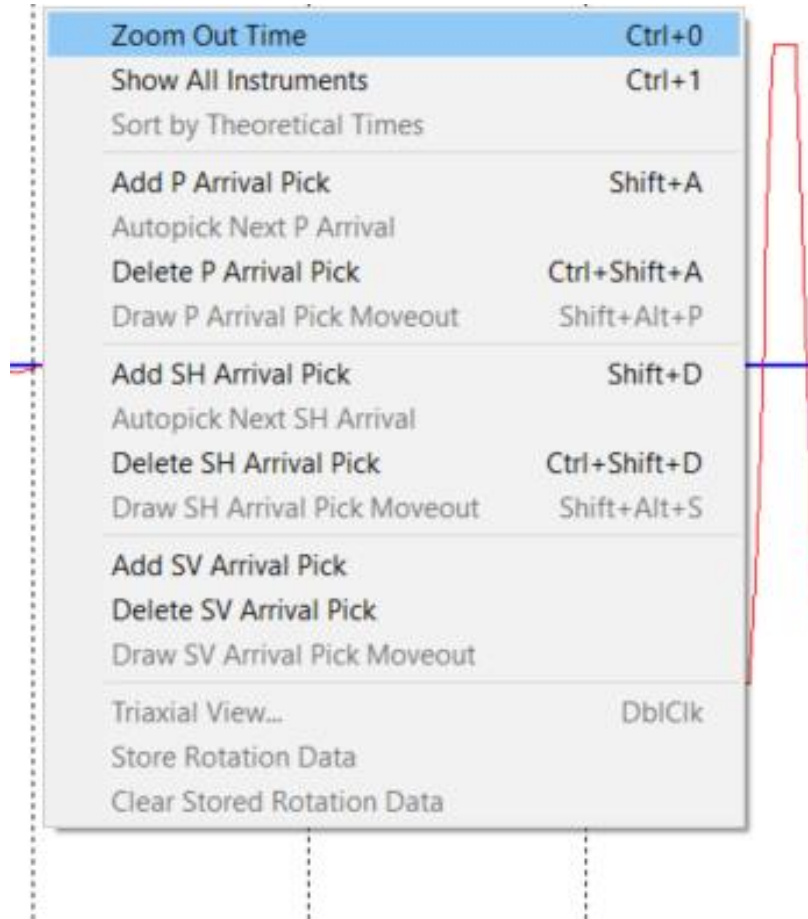


Figure 21: Manual pick

- Click the location button to relocate the event. This event is thus relocated manually. You may want to repeat this procedure for all other events. Tips: you can repick all first arrivals only without click the locate button. The full version of InSite includes an autoprocessor to batch processing all events.
- Other parameters can also be adjusted. For example, the source vector time window, auto-picking parameters, or parameters in locator. Please note that auto-picking is only available in the full version of InSite
- This step gives you some flavour about how tedious the processing can be. Advanced locating method such as source scan has been developed to automate this process to a certain degree. However, at the end of the day it is the sole responsibility of the processor to ensure the quality and the reliability of the processing outcome.

5. Step 5 3D Visualiser

InSite provides comprehensive 3D visualisation to assist interpretation of fracture propagation. See Location Visualiser for details. In this tutorial we will explore two functions including displaying events by different colour and size scales and play events as a function of time.

Display events by different colour and size scales

- Enter the 3D visualiser and click **Properties**. In the tab of **Events**, display the event by **sphere** symbol type, and colour scale by **time** and size scale by **signal-to-noise ratio** (see figure below). Now you will be able to tell when and where a good quality event is located. For automatic processing, this is a good trick to emphasize good quality events to reveal major failure zones.

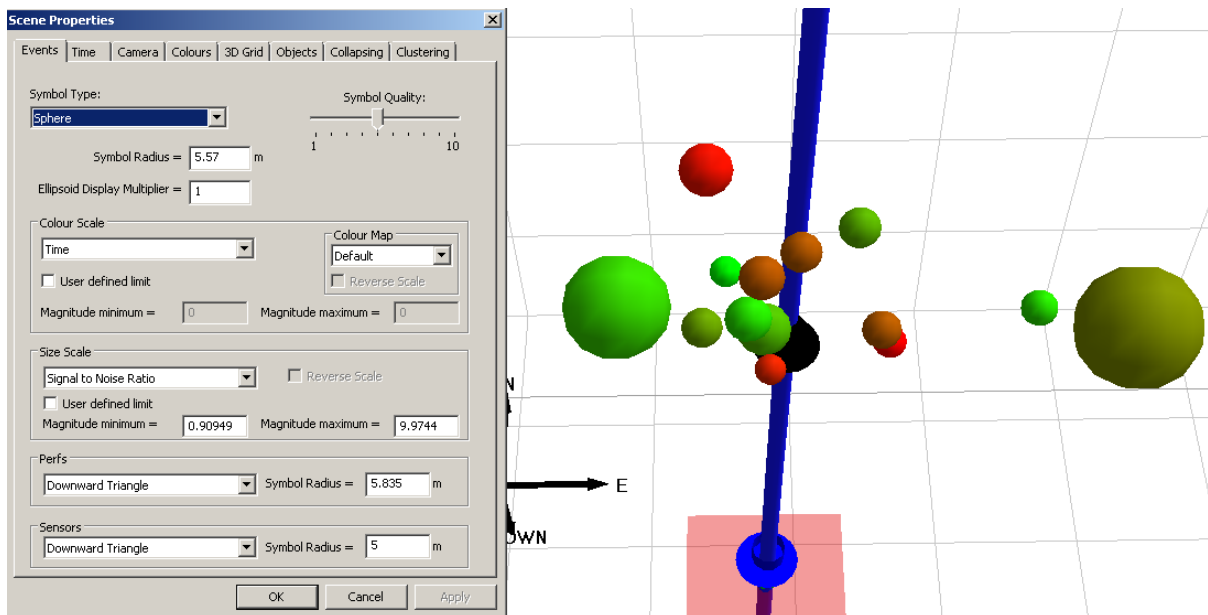


Figure 22: 3D visualiser

- Now switch to the **Time** tab and set the parameters following the figure below. Click **OK**.

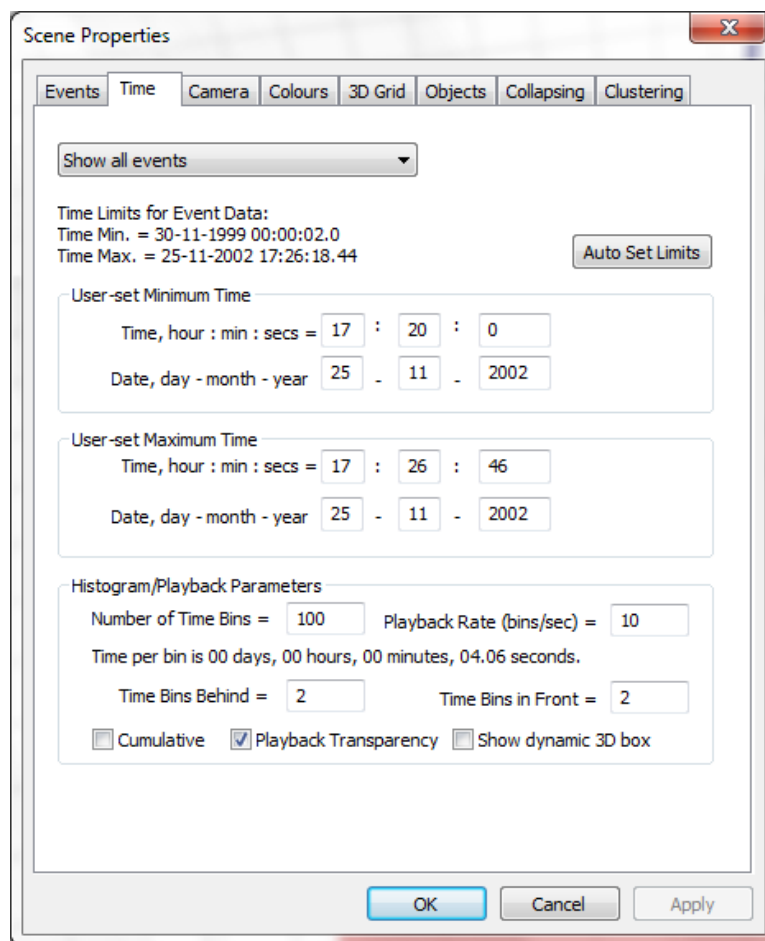


Figure 23: Set parameters to play events by time

- Click `Play Events` button to start. The events will appear on screen as a function of time. The historical events will be displayed in transparent mode and the active events are in solid mode. This is a very useful tool to understand the time and space patterns of the microseismicity.

6. Step 6 Data and results Export

The full version of InSite includes functions for exporting quantitative information such as waveform and event catalogue for further data processing. InSite-Lite is limited to the export of seismic catalogues. Seismic catalogues can be exported with different level of details. Make sure you are in `Data Visualiser`; the drop-down menu from `Export` shows different ways of exporting catalogue information. See the `Export` sub-menu for details.

- `Export CSV Event Data File` is the most common function. It exports parameters such as time, location, magnitude etc for each event. Please export a file and review the content in it. You can open CSV file by EXCEL.
- `Export CSV Instrument Data File` has more details than Event Data file. Each pair of source and receiver is stored in one row and the additional information include picked and theoretical arrival time, ray polarization, etc.