

**Blast
Design&Optimization
Platform**

User Manual
V 2.0



o-pitblast

User Manual

O-PITBLAST, LDA
Rua de Belém 467, 4350-071 – Porto, Portugal
T: +351 224 096 803 | E: info@o-pitblast.com | www.o-pitblast.com



O-Pitblast, Lda.

O-Pitblast, Lda
Rua de Belém 467, 4350-071
Porto, Portugal

Phone: +351 224 096 803
E-mail: info@o-pitblast.com
Website: www.o-pitblast.com

Customer Support

O-Pitblast is represented by qualified technicians with full mobility. For more information, contact the O-Pitblast departments.

General info: info@o-pitblast.com
Technical Support: support@o-pitblast.com
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1. Introduction

O-Pitblast® 2017 V2.0, is a PC Windows-based application software designed for the planning, control and optimization of rock blasting operations. Developed by O-Pitblast®, is an application that pretends to fulfill all the need of blast engineers in order to optimize, control, reduce costs and increase safety in their blasts.

This platform allows the user to import terrain features, like topography and rock characteristics, and design the best blast for each operation. This is possible due to the artificial intelligence module that identifies potential safety risks and KPI's capable to generate savings. Besides all the operation modules, it has a management section that permits the recording of blast data, generation of blast plans and reports, KPI control graphics, track & trace technology, user control and multiple-projects management.

This software is user friendly and this manual will guide the user throughout all the basic features needed to learn and control it.

2. System Requirements (Recommended)

Operating System	Windows 7 or later
Productivity Tools	Adobe PDF
Processor Type	Core i5 Processor or higher
Memory	8 GB RAM or higher
Graphics Card	512 MB Video Memory or higher
Free Hard Drive Space	5 GB
Minimum Resolution	1152x768

3. Installing O-Pitblast® Platform

To install the O-Pitblast® Platform, start windows and double click on the O-Pitblast® Platform executable (.msi) icon (Fig. 1) and follow the onscreen instruction of the Setup program.

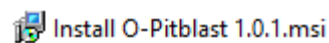


Fig. 1 - O-Pitblast Installation icon

After the welcome window appears (Fig. 3), click **Next** and select the **Typical** installation method. Previously you must agree with the **EULA** (End-user license agreement) and select **INSTALL** to execute the installation of the software (Fig. 5).

A desktop icon (Fig. 2) is created and you must click on it to execute O-Pitblast® Platform.

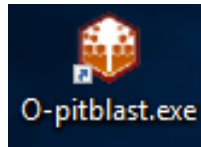


Fig. 2 - O-Pitblast Desktop icon

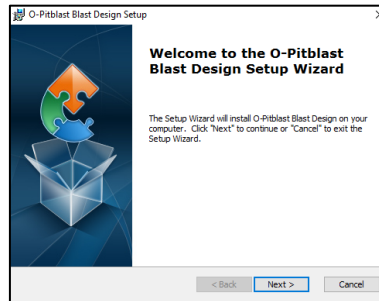


Fig. 3 - O-Pitblast Welcome Window

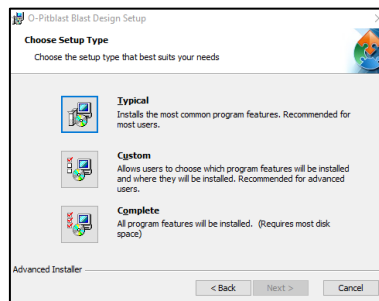


Fig. 4 O-Pitblast Installation Type

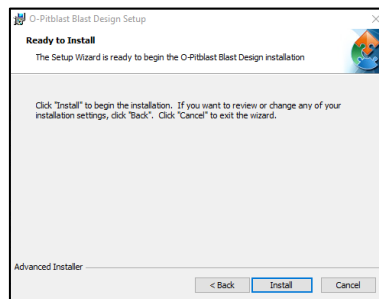


Fig. 5 - O-Pitblast Ready to Install

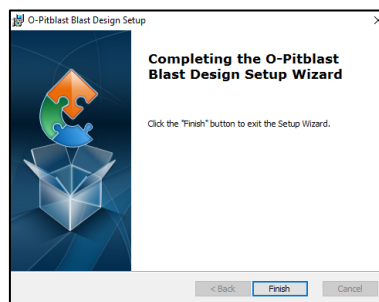


Fig. 6 - O-Pitblast Installation Finished

4. Updates

O-Pitblast® update installation is automatic. If an update is available, and the user is connected to internet a pop-up window will appear advising to proceed with the installation of the update.



5. Registering O-Pitblast® Platform

When clicking in the O-Pitblast desktop icon a loading screen (Fig. 7) and an authentication window (Fig. 8) will be available for the user registration. Your login credentials must be given by O-Pitblast Technical Support (support@o-pitblast.com). Introduce your user credentials and confirm.



Fig. 7 - O-Pitblast Loading Screen

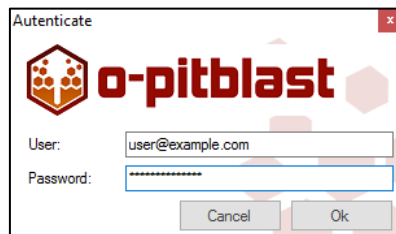


Fig. 8 - O-Pitblast User Login Window



O-Pitblast® Manual



6. O-Pitblast® Overview

O-Pitblast® interface is showed in Fig. 9 and it is composed by 5 sectors:

- A. Main Control Bar
- B. Toolbox
- C. Work environment
- D. View Pane
- E. Status Bar

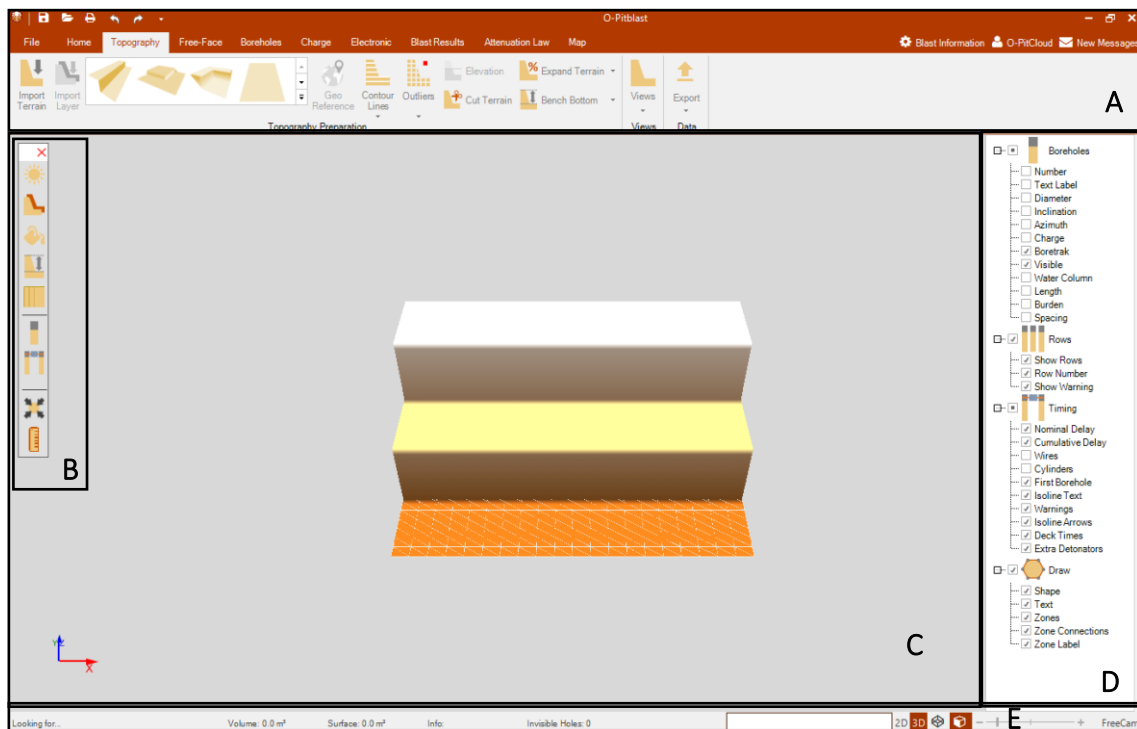


Fig. 9 - O-Pitblast Overview

6.1. Main Control Bar

The main control bar controls all the functionalities of the Software on it is possible to save a project, open existents projects, share files, and edit an entire plan.

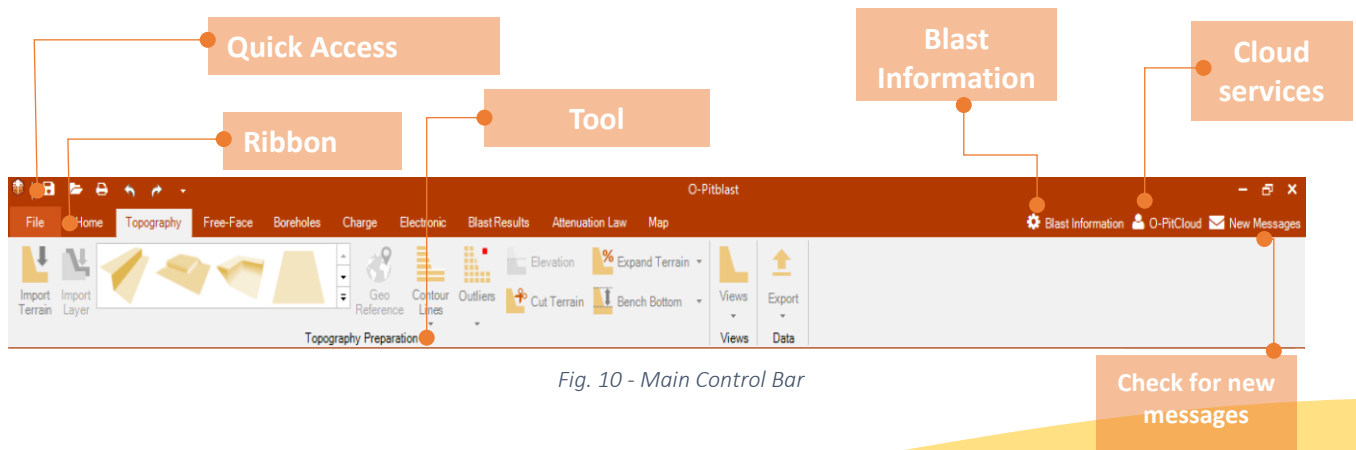


Fig. 10 - Main Control Bar



6.2. Quick access bar

Here the user has several options:

- Save the actual file;
- Open a new file;
- Print report;
- Undo;
- Re-do;
- Open tool box, check for updates and news, tutorials and download the manual (Fig. 12).

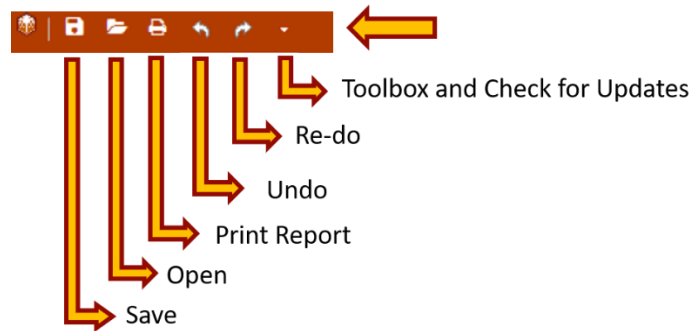


Fig. 11 - Quick access bar

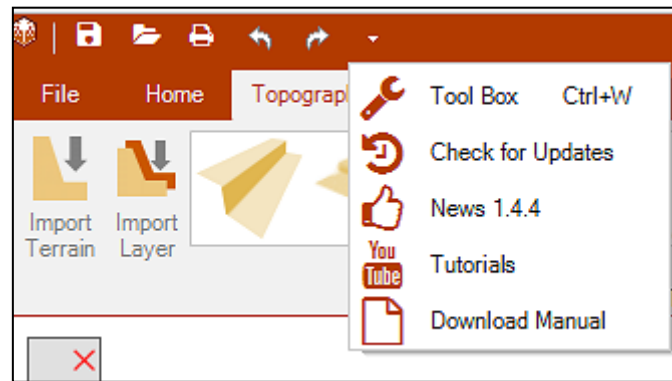


Fig. 12 - Option inside of quick access bar

6.3. Files Tab

On the files tab (Fig. 13) the user can manage the files and project options.

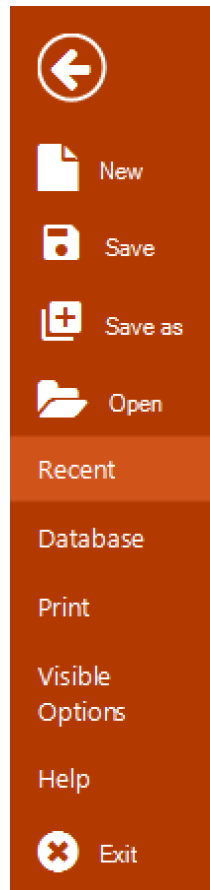


Fig. 13 - Files Tab

6.3.1. Create a New project

By clicking on the **New** project, the user opens a new instance of O-Pitblast Software.

6.3.2. Save and Save As the current project

O-Pitblast allows the user to save each project by generating a file with *.opit extension (Fig. 14).

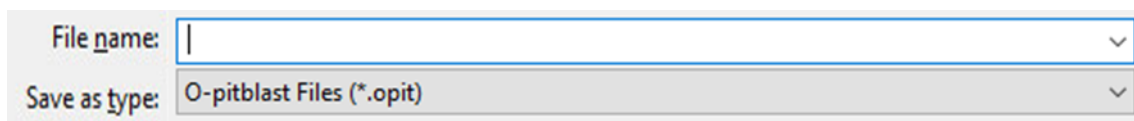


Fig. 14 - Save *.opit File

The **Save** option will save the project by updating an existent one, in the other hand, the **Save As** option will generate a new file.

6.3.3. Open an existent file

To open an existent file, the user can click twice on the saved file icon (Fig. 13) on the Windows File Explorer.



Fig. 15 - O-Pitblast icon

Another option is through the **Files Tab**, by selecting the **Open** service.

6.3.4. Open a recent file

O-Pitblast stores up to 20 files on the recent tab (Fig. 16). The user can select the file and it will open automatically.

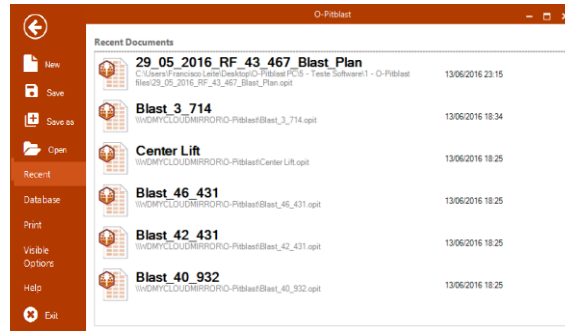


Fig. 16 - Recent Files

6.3.5. Database

The database allows the storage of explosives types and explosives accessories.

6.3.5.1. Creating Detonators

To create a new detonator, the user must click in the add button **+**, add the **Name/Description** of the element, the **Type** (Dual Detonator, Surface Connector or In-Hole Detonator), the **Surface Delay (ms)**, the **In-Hole Delay (ms)**, the **Scatter (%)**, the **Price**, the **Length (m)**, the **Color** and the **Discount (%)**. To delete an element, it is necessary click on the delete button **X** and, if the user needs to change some characteristics of any detonator, there is the update button **↻**. The user can also import their product information by clicking on the import button **↓**.

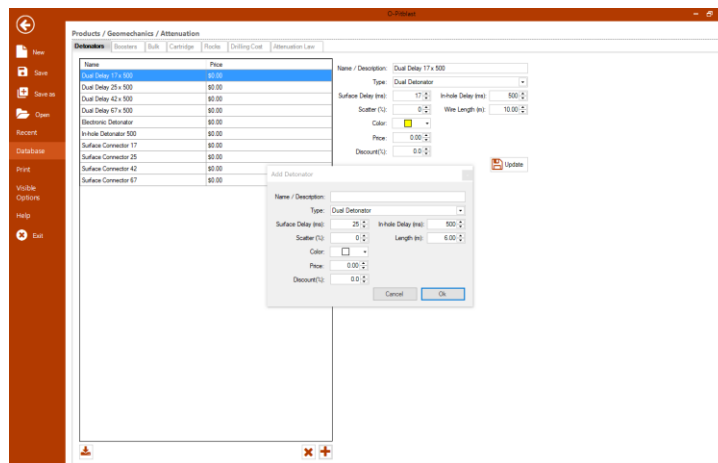


Fig. 17 - Detonators Database (Adding detonator)



6.3.5.2. Creating Boosters

To create a new booster, the user must click in the add button **+**, add the **Name/Description** of the element, the **Length (mm)**, the **Diameter (mm)**, the **Weight (g)**, **Price** and **Discount (%)**. To delete an element, it is necessary click on the delete button **×** and, if the user needs to change some characteristics of any booster, there is the update button **↻**. The user can also import their product information by clicking on the import button **↓**.

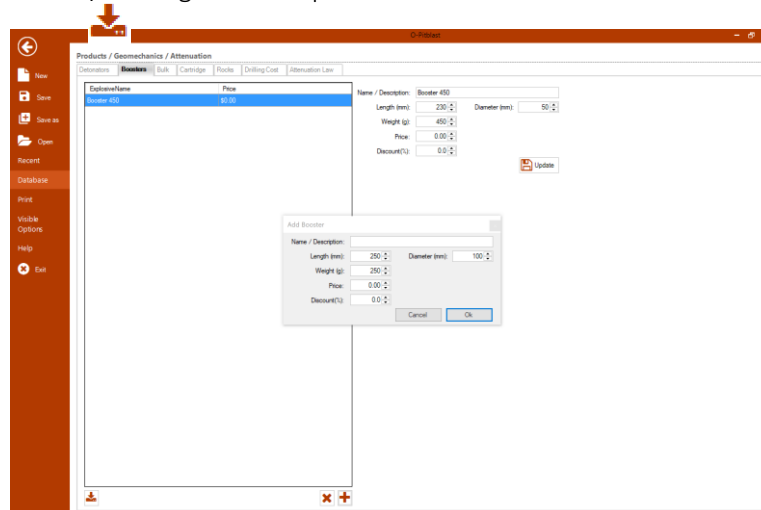


Fig. 18 - Booster Database (Adding booster)

6.3.5.3. Creating Bulk Explosives

To create a new Bulk explosive, the user must click in the add button **+**, add the **Name/Description** of the element, **RWS**, the **Density (g/cm³)**, the **Price** and the **Discount (%)**. To delete an element, it is necessary click on the delete button **×** and, if the user needs to change some characteristics of any bulk explosive, there is the update button **↻**. The user can also import their product information by clicking on the import button **↓**.

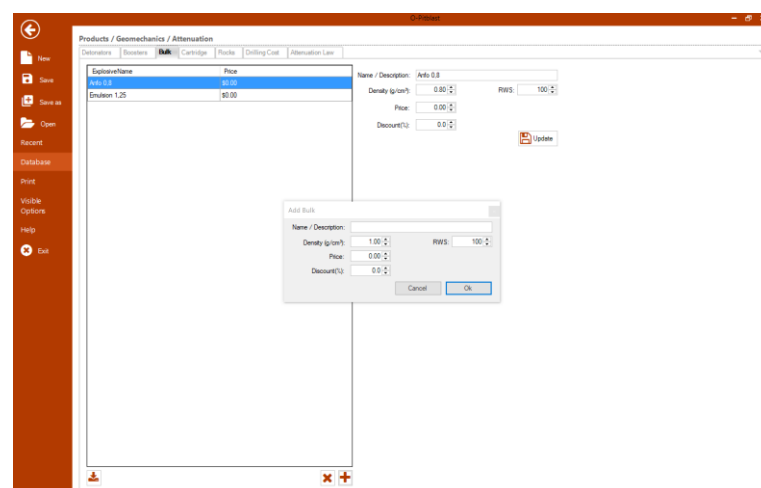


Fig. 19 - Bulk Database (Adding bulk explosives)



6.3.5.4. Creating Cartridge Explosives

To create a new Cartridge explosive, the user must click in the add button **+**, add the **Name/Description** of the element, the **Length (mm)**, the **Diameter (mm)**, **Weight (g)**, **RWS**, the **Density (g/cm³)**, the **Price** and the **Discount**. The user can also choose if he wants per Kg or per Unit by clicking on those options. To delete an element, it is necessary click on the delete button **X** and, if the user needs to change some characteristics of any bulk explosive, there is the update button **U**. The user can also import their product information by clicking on the import button **I**.

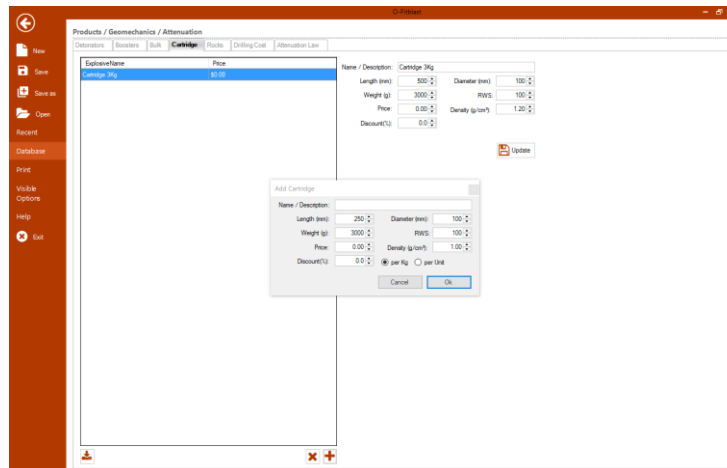


Fig. 20- Cartridge Database (Adding cartridge explosives)

6.3.5.5. Creating Rocks

To create a new Rock, the user must click in the add button **+**, add the **Name/Description** of the element, the **Rock density (g/cm³)**, the **Unc. Compressive Strength (Mpa)**, the **Young's Modulus (Gpa)** and the **Rock Factor**. To delete an element, it is necessary click on the delete button **X** and, if the user needs to change some characteristics of any bulk explosive, there is the update button **U**. The user can also import their rock properties information by clicking on the import button **I**.

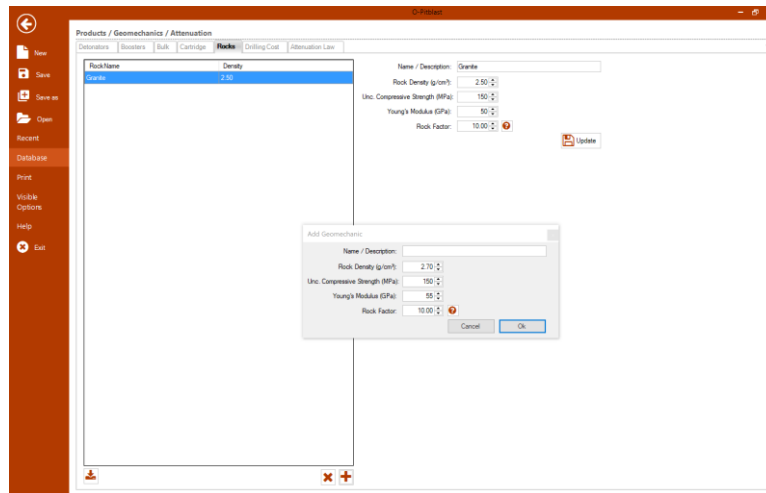


Fig. 21 - Rock Database (Adding rock types)

6.3.5.6. Creating Drilling Costs

To create a new Drilling Cost, the user must click in the add button **+**, add the **Description** of the element, the **Diameter (mm)** and the **Price**. To delete an element, it is necessary click on the delete button **x** and, if the user needs to change some characteristics of any bulk explosive, there is the update button **U**.

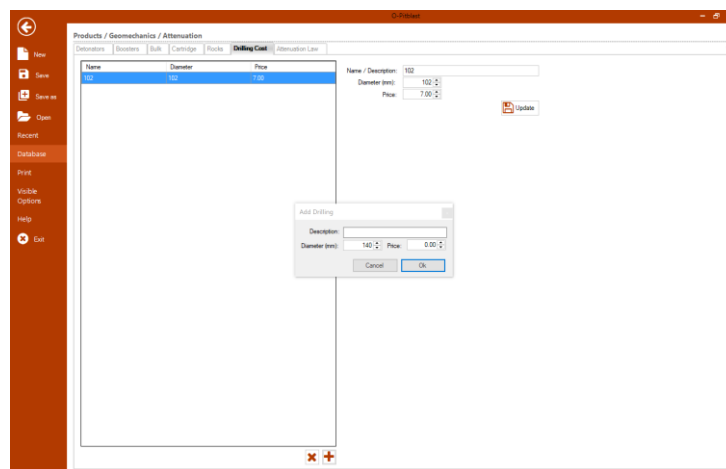


Fig. 22 – Drilling Cost Database (Adding drilling costs)

6.3.5.7. Creating Attenuation Law

To create a new Attenuation Law, the user must click in the add button **+**, add the **Name/Description** of the element and the K , α and β factors. To delete an element, it is necessary click on the delete button **x** and, if the user needs to change some characteristics of any bulk explosive, there is the update button **U**.

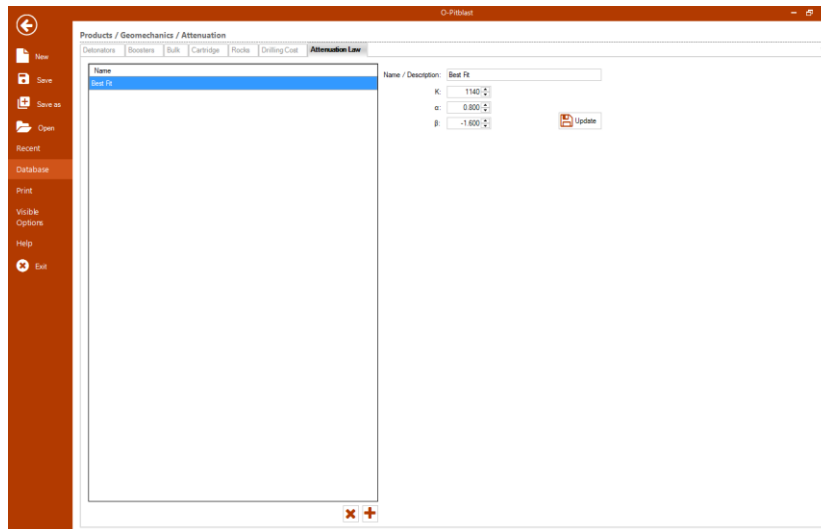


Fig. 23 – Attenuation Law Database (Adding attenuation law)

6.3.6. Print the Blast Plan

In the Blast Plan **Print** Tab, the user can preview the blast plan pages. Is possible to edit the final model by checking and un-checking each available option.

6.3.6.1. Preview fill PDF

When the user is in “Print”, it has on the bottom left size the option “Preview Full PDF”. This allows the user to see the report before he prints it.



Fig. 24 - Preview PDF button

6.3.6.2. Configure PDF

In this button the user can configure the report. It can change the **color**, **size** and **connector label size**.

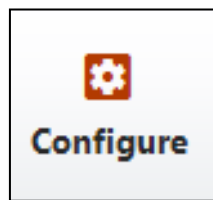


Fig. 25 - Configure report button

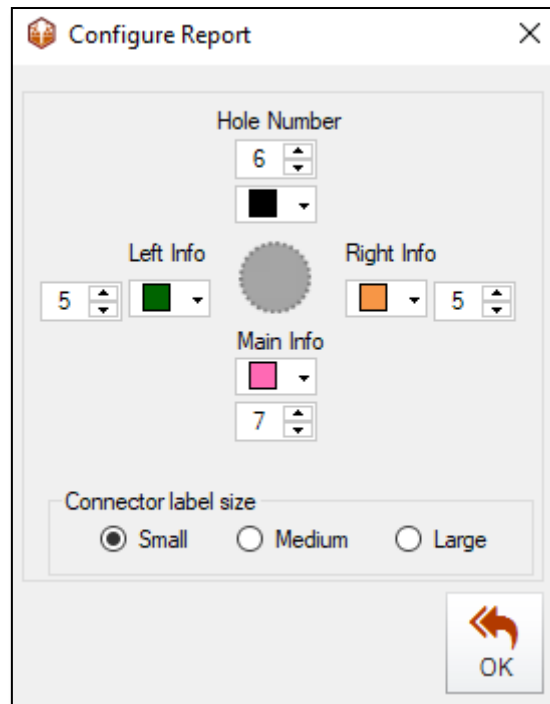


Fig. 26 - Configure Report tab

6.3.6.3. Page Options

On the **Page Options** section is possible to select the preview information, page size and insert a company logo (Fig. 27).

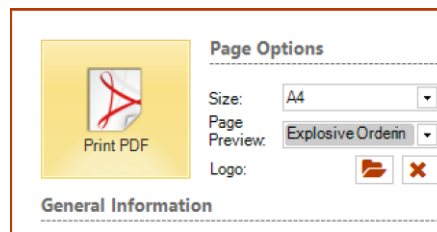


Fig. 27 - Printing Blast Plan - Page Options

6.3.6.4. General Information

The **General Information** section (Fig. 28) allows the selection of **Explosive Ordering**, **Accessories Ordering**, **Blast Resume**, **Comments**, **Charge Rule Design**, **Rows**, **Driller's Report**, (Fig. 29), **Borehole Information** (Fig. 30), **Profile First Row**, **Cost**, **Rows**, **Detonator Profile**, **Fit Booster to BB** and **Detonators List**, **Map Details** (Fig. 31), and **Driller's log** (with D.I option – only showing information on the report of holes with deviation data).



General Information

Explosive Ordering Comments
 Accessories Ordering Charge Rule Desig
 Blast Resume Borehole Information
 Profile First Ro 1 pp Cost
 Rows Real Fit Booster to BB.
 Detonator Profile Detonators List
 Driller's report D.I. Map Details ?
 Fragmentation Driller's log

Fig. 28 – Printing Blast Plan - General Information

o-pitblast Blast Plan
Blast ID: 29_05_2016_RF_43_467_Blast_Plan

Project information

Site Name: _____ Date: _____ Shotfirer: _____
 Country: _____ Location: _____ D&B Resp.: _____

Explosive Ordering

Explosive Product	Density	Type	Quantity
Anfo 0.8	0,80 g/cm ³	Bulk	1863,2 kg
Cartridge 3kg	1,20 g/cm ³	Cartridge	1378,0 kg
Total			3241,2 Kg

Accessories Ordering

Product	Type	Quantity
Surface Connector 17	SurfaceConnector	33
Surface Connector 25	SurfaceConnector	2
In-hole Detonator 500	InholeDelay	36
Booster 450 g	Booster	18

Blast Resume

Bench Height	17,41 m	Volume	8366,7 m ³	Powder Factor	0,350 kg/m ³
Total of Holes	36	Tonnes	25020,1 t	Powder Factor	0,130 kg/t
Drilled Meters	680,11 m	Specific Drilling	0,073 m/m ³		

Comments

Charge Rule Design

1: 80% Cartridge

2: Booster 450g + ANFO

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Fig. 29 - Blast Plan- General Information

o-pitblast Blast Plan
Blast ID: 29_05_2016_RF_43_467_Blast_Plan

Borehole information

No.	Depth (m)	Stemming (m)	Subsiding (m)	Angle (°)	Asimuth (°)	Diameter (mm)	Bulk Explosive (kg)	Cartridge Explosive (kg)	Total Explosive (kg)	Charge Design	In-hole Delay (ms)	
1	18,552	3,000	1,500	0,0	0,0	102	101,7	0,0	101,7	2	500	
2	18,647	3,000	1,500	0,0	0,0	102	102,8	0,0	102,8	2	500	
3	18,650	3,000	1,500	0,0	0,0	102	102,0	0,0	102,0	2	500	
4	18,680	3,000	1,500	0,0	0,0	102	103,5	0,0	103,5	2	500	
5	18,882	3,000	1,500	0,0	0,0	102	105,8	0,0	105,8	2	500	
6	18,946	3,000	1,500	0,0	0,0	102	104,2	0,0	104,2	2	500	
7	18,800	3,000	1,500	0,0	0,0	102	103,8	0,0	103,8	2	500	
8	18,933	3,000	1,500	0,0	0,0	102	104,2	0,0	104,2	2	500	
9	18,935	3,000	1,500	0,0	0,0	102	104,0	0,0	104,0	2	500	
10	18,992	3,000	1,500	0,0	0,0	102	102,6	0,0	102,6	2	500	
11	18,721	3,000	1,500	0,0	0,0	102	102,7	0,0	102,7	2	500	
12	19,094	3,000	1,500	0,0	0,0	102	104,8	0,0	104,8	2	500	
13	18,728	3,000	1,500	0,0	0,0	102	102,7	0,0	102,7	2	500	
14	18,793	3,000	1,500	0,0	0,0	102	103,2	0,0	103,2	2	500	
15	18,920	3,000	1,500	0,0	0,0	102	104,1	0,0	104,1	2	500	
16	18,102	3,000	1,500	0,0	0,0	102	103,3	0,0	103,3	2	500	
17	18,920	3,000	1,500	0,0	0,0	102	104,4	0,0	104,4	2	500	
18	18,091	3,000	1,500	0,0	0,0	102	103,3	0,0	103,3	2	500	
19	18,704	3,000	1,500	0,0	0,0	102	0,0	0,0	75,4	75,4	1	500
20	18,724	3,000	1,500	0,0	0,0	102	0,0	0,0	75,5	75,5	1	500
21	18,696	3,000	1,500	0,0	0,0	102	0,0	0,0	76,1	76,1	1	500
22	18,723	3,000	1,500	0,0	0,0	102	0,0	0,0	75,5	75,5	1	500
23	18,678	3,000	1,500	0,0	0,0	102	0,0	0,0	76,1	76,1	1	500
24	18,920	3,000	1,500	0,0	0,0	102	0,0	0,0	76,4	76,4	1	500
25	18,088	3,000	1,500	0,0	0,0	102	0,0	0,0	77,7	77,7	1	500
26	18,867	3,000	1,500	0,0	0,0	102	0,0	0,0	76,7	76,7	1	500
27	18,970	3,000	1,500	0,0	0,0	102	0,0	0,0	81,5	81,5	1	500
28	18,681	3,000	1,500	0,0	0,0	102	0,0	0,0	75,3	75,3	1	500
29	18,711	3,000	1,500	0,0	0,0	102	0,0	0,0	75,4	75,4	1	500
30	19,094	3,000	1,500	0,0	0,0	102	0,0	0,0	77,0	77,0	1	500
31	18,716	3,000	1,500	0,0	0,0	102	0,0	0,0	75,4	75,4	1	500
32	18,780	3,000	1,500	0,0	0,0	102	0,0	0,0	75,7	75,7	1	500
33	18,920	3,000	1,500	0,0	0,0	102	0,0	0,0	76,4	76,4	1	500
34	19,006	3,000	1,500	0,0	0,0	102	0,0	0,0	76,8	76,8	1	500
35	19,044	3,000	1,500	0,0	0,0	102	0,0	0,0	77,0	77,0	1	500

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Fig. 30 - Boreholes Info



It's important to refer that the user needs to take a picture of the map (see Map Module) to get that information in the report.

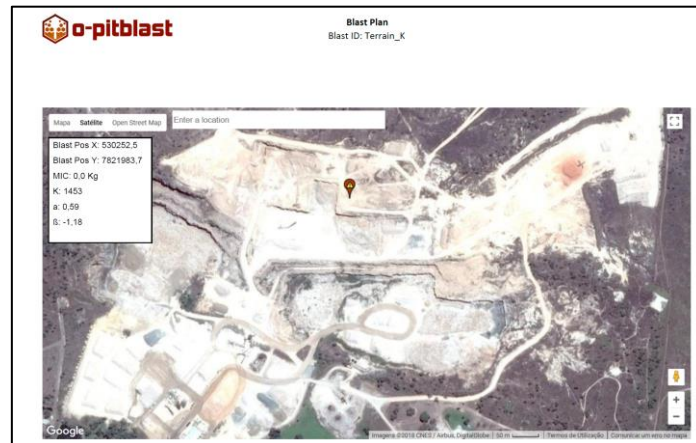


Fig. 31 - Map info

6.3.6.5. Plans Information

O-Pitblast generates four types of plans, Drill Plan (Fig. 33), Tie-Up Plan (Fig. 34), Offset Plan (Fig. 35) and Charge Plan that can be managed in the section of Fig. 32.



Fig. 32 - Printing Plan – Plans

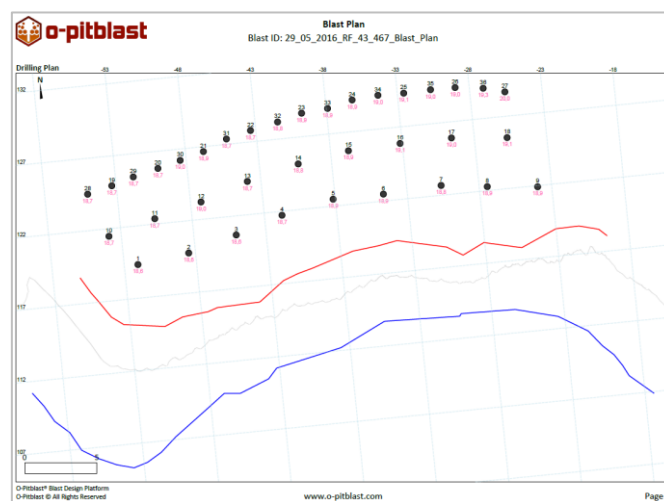


Fig. 33 - Drill Plan

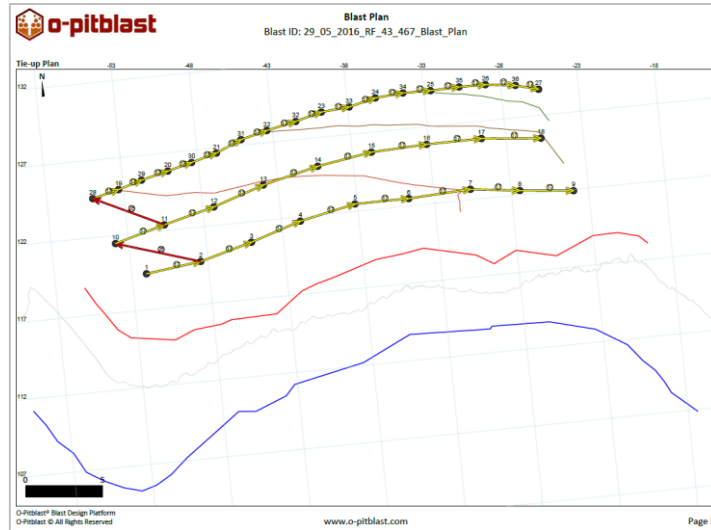


Fig. 34 – Tie-Up Plan

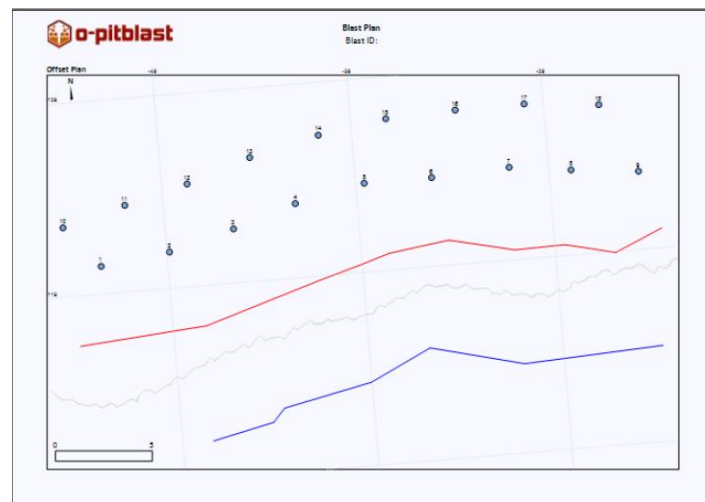


Fig. 35 - Offset Plan

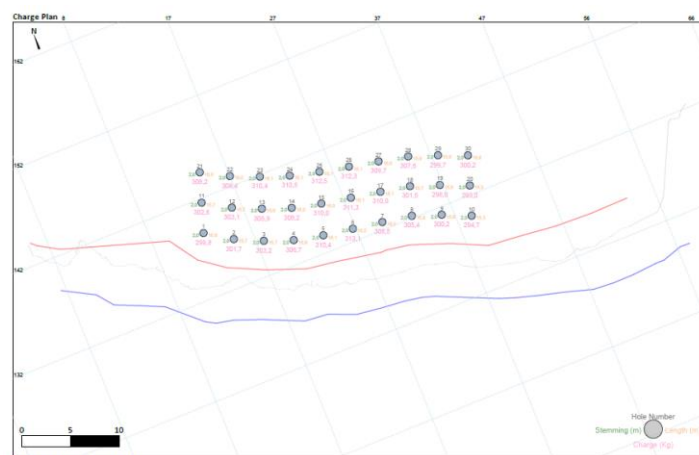


Fig. 36 - Charge Plan



6.3.6.6. Plans Options

The Plans Options section permits the selection of some element to be present on plans: **Azimuth and Angle**, **Contour Lines**, **Crest and Toe**, **Grid** (selection of default values), **Time Isolines**, **Connector Label**, **Scale**, **Grid**, **Best Fit**, **Show Detonators Time**, **Use Label** (instead of number of hole), **Crest and Toe**, **Show Hole ID**, **Extra Detonators Time**, **Stemming/Length on Charge**, **Comments**, **Legend and Driller’s Report Length** (shows the longitude on driller’s report). The **Best Fit** option generates the best adjustment of the holes, crest and toe in the printed paper and it. If the user deselects this option, the user can adjust your plan by angle.

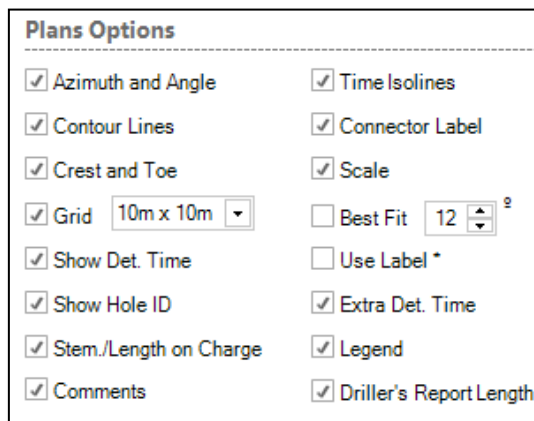


Fig. 37 - Printing Plan - Plans Options

6.3.6.7. Save Configuration

The user can save the configuration that he wants in all report from there. Just need to create a configuration and save it to future refer. It also can delete a configuration.



Fig. 38 - Save Configuration. Buttons from left to right: load configuration, delete configuration and save a new configuration.

6.3.7. Options

Here the user has access to general options to change **currency** (Fig. 39), **unit system** - Fig. 40 - (the change it only be applied when you restart O-Pitblast), **terrain detail** - Fig. 41 - (up to a maximum of 500000 points) and **auto save** - Fig. 42 - (that allows to automatically save the user work in .opit files - in a defined interval).

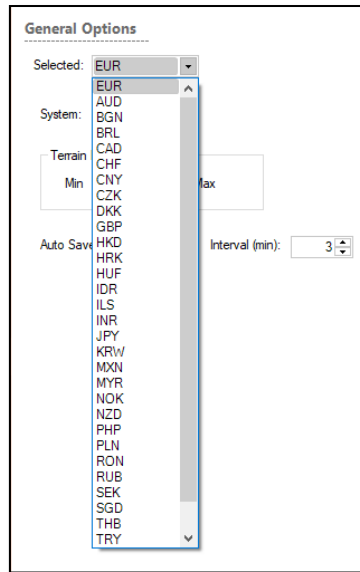


Fig. 39 - Change currency



Fig. 40 - Change to metric/imperial system



Fig. 41 - Change terrain detail



Fig. 42 - Auto Save option

6.3.8. Visible options

The visible options allow the user to mark the option that he wants to see in the ribbon. The user can mark and unmark the **Topography** label, **Free-Face** label, **Borehole** label, **Charge** label, **Non-Electronic** label, **Electronic** label, **Home** label, **Attenuation Law** label, **Blast Results** label and **Map** label.

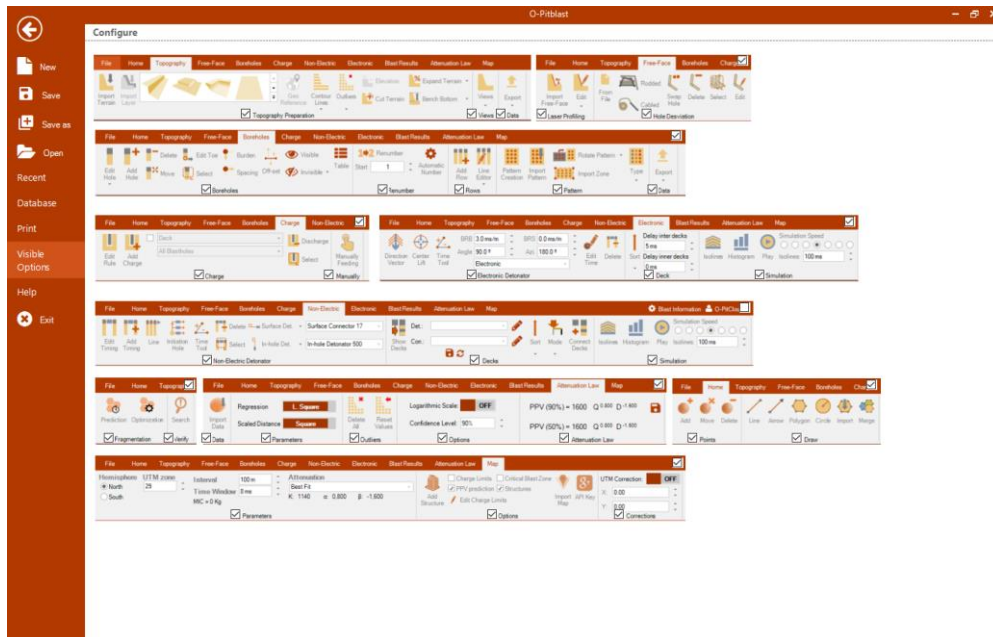


Fig. 43 – Visible options tab

6.3.9. Help

Through the **Help** tab, the O-Pitblast user will have access to **O-Pitblast Website**, to a platform to **Contact O-Pitblast team**, several **Movie Tutorials** and other interest connections.

Support

www.o-pitblast.com

Visit our website for the latest news.

Contact Us

Let us know if you need help or how we can make O-Pitblast even better.

Credentials

Send your credentials to your email.

Movie Tutorials

Watch getting started online movie tutorials.

Ask for help

Send your question for the support.

Facebook

Follow us on Facebook to stay on top of all the news.

Fig. 44 - Help Tab

6.3.9.1. Ask for help

This option (Fig. 45) allows the user to open a new ticket where the O-Pitblast file is send to the server with the error reported. Also, the user can add a **tittle** (referring the question/problem), **comments** explaining the problem/question and also **pictures** (on the plus sign).

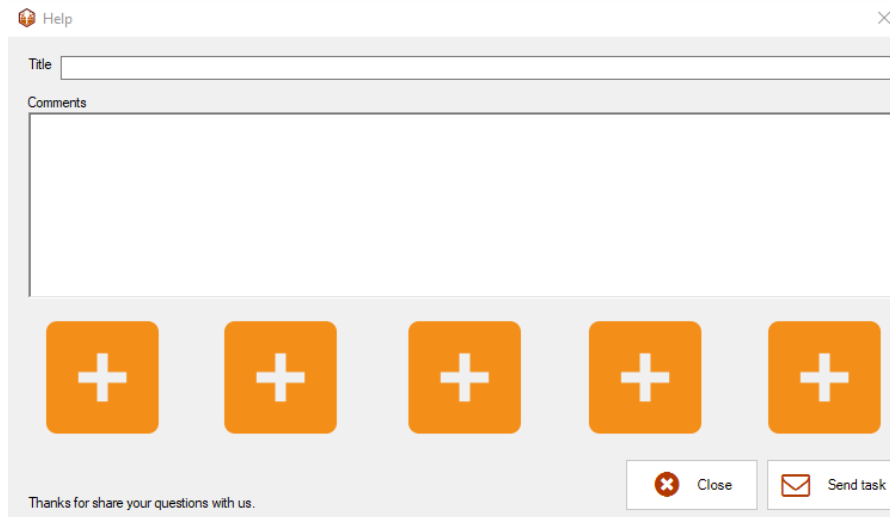


Fig. 45 - Ask for help tab

6.3.10.Exit

By clicking in the **Exit** tab, O-Pitblast will shut down.

6.4. Tool Box

Tool box centralize all the useful means to control the visual effects of the working environment. It is divided in 7 sub-categories with an extra **Centralize** button to center the terrain in the user screen and an extra **Ruler** button that will help the user to make measurements on the terrain and check the angles. To all these sub-categories, the actions will only be applied after clicking in the confirmation button **Ok**.

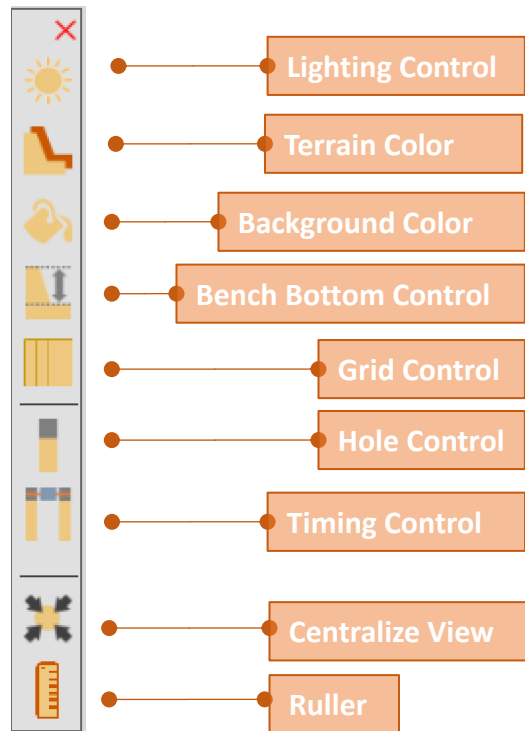


Fig. 46 - Tool Box Window

6.4.1. Lighting Control - ☀

In the **Lighting Control Window** (Fig. 47), the user is able to control the light **Intensity** as also as the incident lighting vector direction (**X** and **Y**).

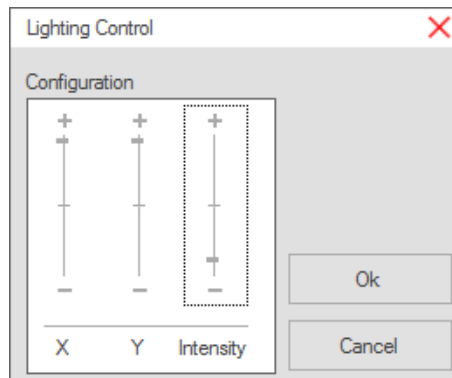


Fig. 47 - Lighting Control Window

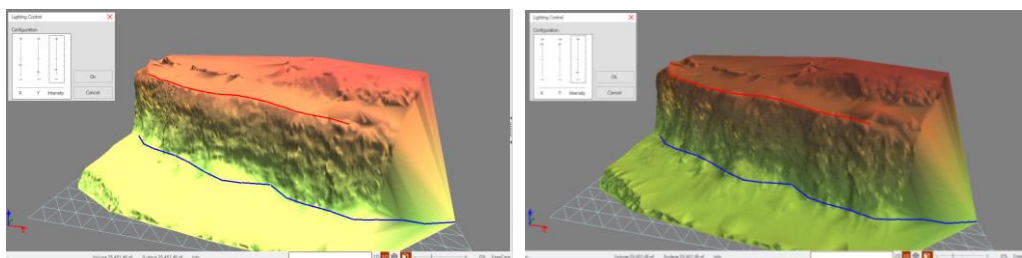


Fig. 48 - Lighting Control



6.4.2. Terrain Color - 📌

To change the terrain visualization characteristics, in the **Terrain Color Window** (Fig. 49), the user can modify:

- Main terrain Color or Layer color
- Triangulation type (**Solid** or **Wire**)
- Scan points
- Transparency

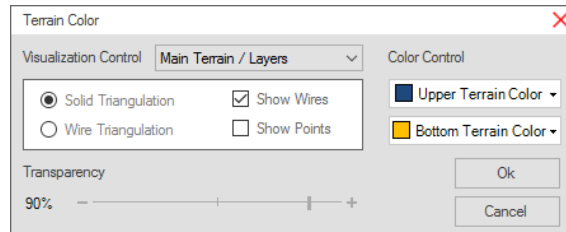


Fig. 49 - Terrain Color Window

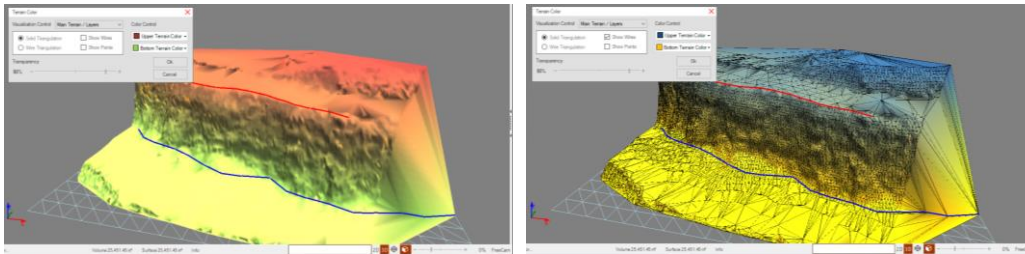


Fig. 50 - Terrain Color Edition

6.4.3. Background Color - 📌

The **Background Color Windows** (Fig. 51) allows the user the change the Background color

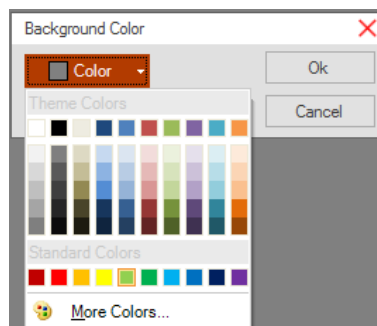


Fig. 51 - Background Color Window

6.4.4. Bench Bottom Control - 📌

In the **Bench Bottom Control Window** (Fig. 52), the user can adjust the bench bottom level, inclination, azimuth, color and triangulation type (solid or wire).

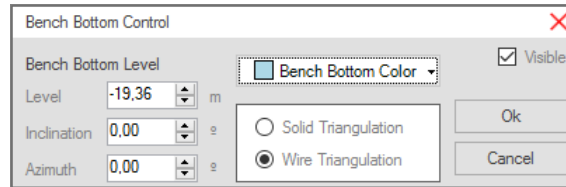


Fig. 52 - Bench Bottom Control Window

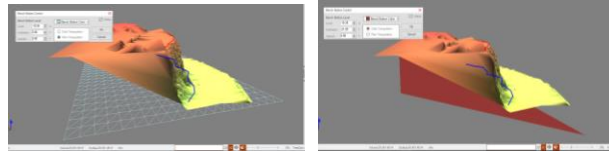


Fig. 53 - Bench Bottom Edition

6.4.5. Grid Control

The **Grid Control** allows the user the change the **grid** (meters), **color** or if is **visible** or not.

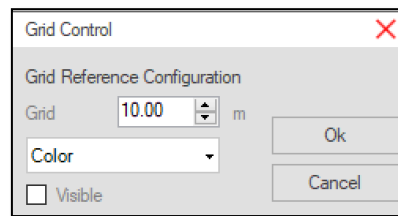


Fig. 54 - Grid control

6.4.6. Hole Control - ■

The **Hole Control Window** (Fig. 55) controls the hole visualization characteristics such as type color, diameter scale.

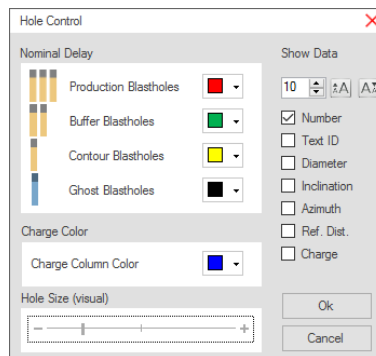


Fig. 55 - Hole Control Window

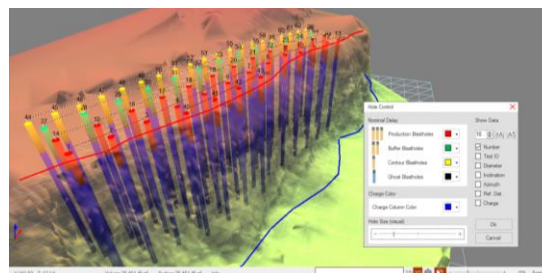


Fig. 56 - Holes visualization control



6.4.7. Timing Control -

In the Timing Control Window (Fig. 57), the user can establish the visualization of the nominal times of connectors or/and cumulative blast delays of each hole. Besides that, is possible to control de size of connector cylinders and text sizes.

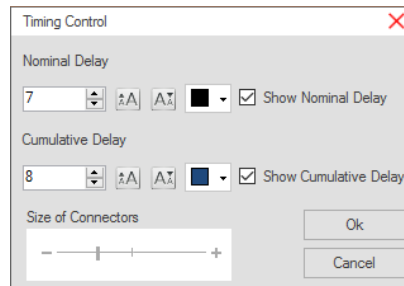


Fig. 57 - Timing Control Window

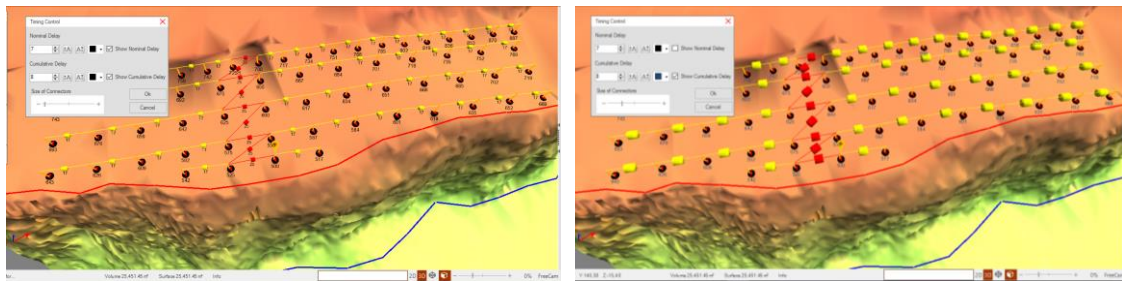


Fig. 58 - Editing Connectors

6.4.8. Ruler

In the **Ruler** options the user can measure any part of the terrain, such as length of borehole or the burden between two holes. Just click on the ruler option and click in a point on the terrain. Then drag the mouse until the other point (the two points of measure).

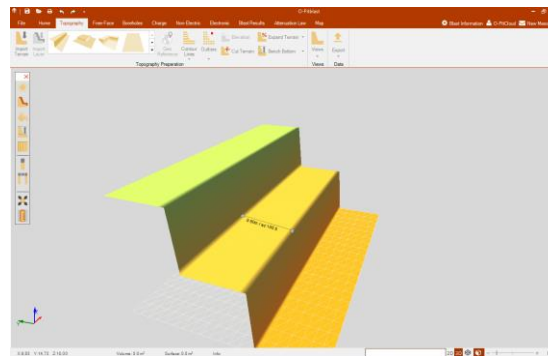


Fig. 59 – Ruler tool (measurement view)

One left-click on the measurement and it will appear the angles.

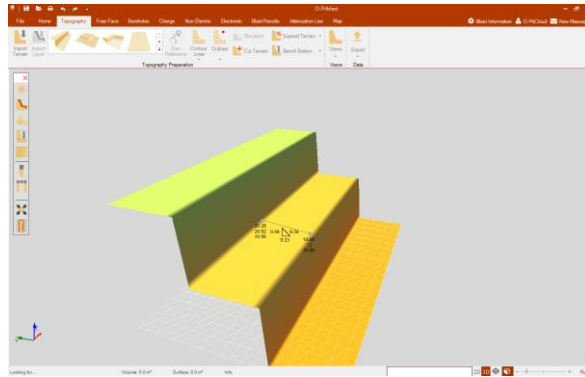


Fig. 60 - Ruler tool (angles view)

And finally, two left-clicks and it will pop up a window to create a new label to that measurement.



Fig. 61 - Label window

6.5. Work Environment

The work environment is the area where the project terrain will be shown which the user can edit, change and add planning elements. It has three views (2D, 3D: parallel (orthogonal) view and perspective).



Fig. 62 – From the left to the right: 2D view, 3D view, orthogonal view and perspective view.

6.6. View Pane

The view pane allows the user to select several view options.

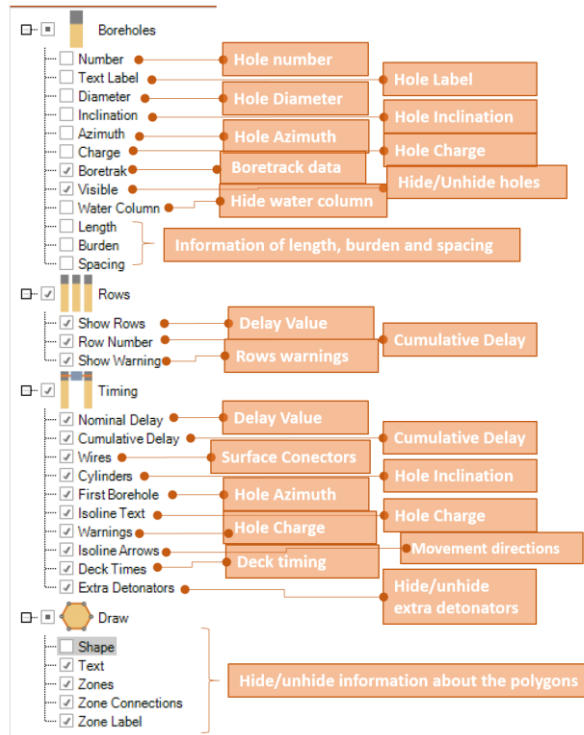


Fig. 63 - View Pane

6.7. Operation Control Tab

In the **Operation Control Tab** (Fig. 64) the user can observe information like:

- Mouse coordinates
- Terrain volume
- Terrain area
- Hided holes
- Status info
- Status bar
- View perspectives
- Control zoom
- Stage info

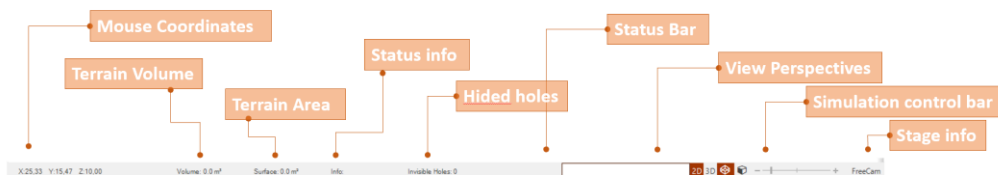


Fig. 64 - Operation Control Tab



6.8. Borehole Radial Menu -

The **Borehole Radial Menu** pretends to be an easy and useful tool to use key functions. This radial menu appears when pressing the mouse with the right-click button in one hole. Fig. 65 displays the main functions available in this menu.

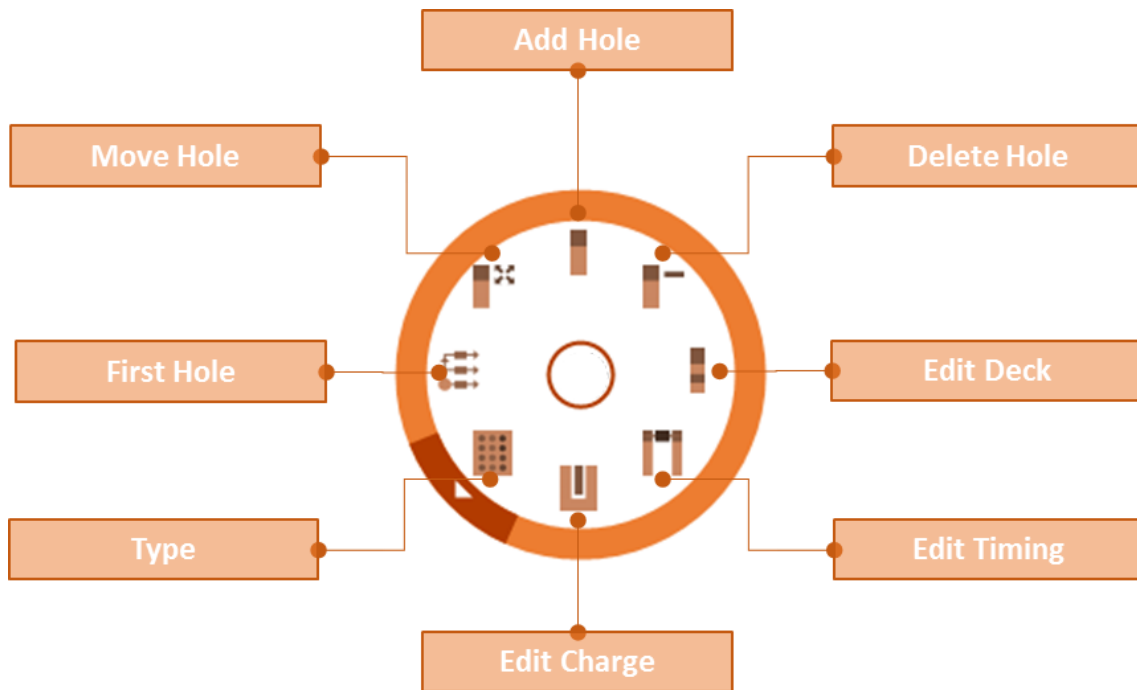






Fig. 65 - Borehole Radial Menu

7. Home






Home module includes tools that allows to add points, polygons, circles, arrows, etc.



Fig. 66 – Home module

Icon	Description	
	Add point	Add a new point and use it to creat lines, arrows, etc.
	Move point	Update the position of a point
	Delete point	Delete all points
	Line	Add a new line



	Arrow	Add a new arrow
	Polygon	Create a new polygon
	Circle	Add a new circle
	Import	Import several polygons from an external file
	Merge	Merge zones and create new ones

7.1. Add, move and delete points

The user can add a new point by clicking on the **Add** symbol and by pressing the left button of the mouse on the terrain.

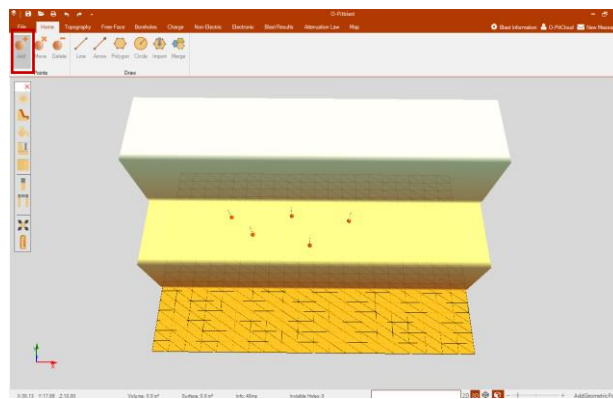
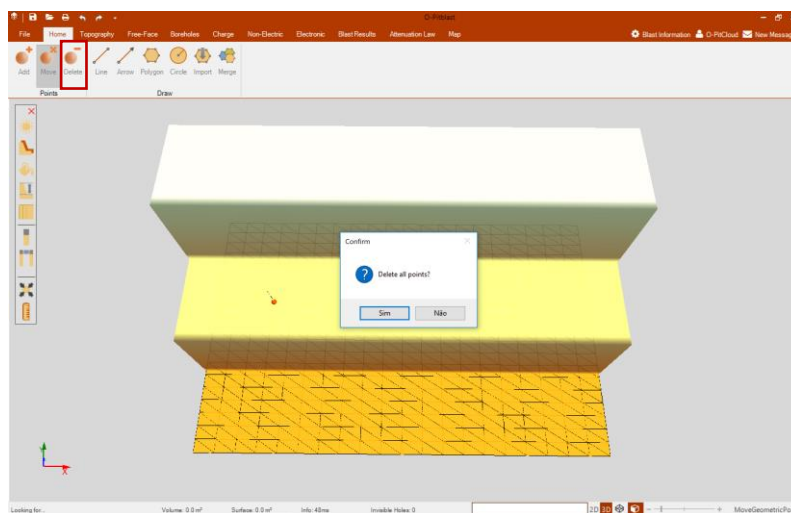


Fig. 67 – Add new points

The user can move a point by clicking on the **Move** button by left-clicking on a point and drag it to another place.

Finally, the user can delete all points by clicking on the **Delete** button.





7.1.1. Add, move and delete one point

The user can do the same things just to one point with the singular menu. This menu appears when pressing the mouse with the right-click button in one point. The picture bellow displays the main functions available in this menu.

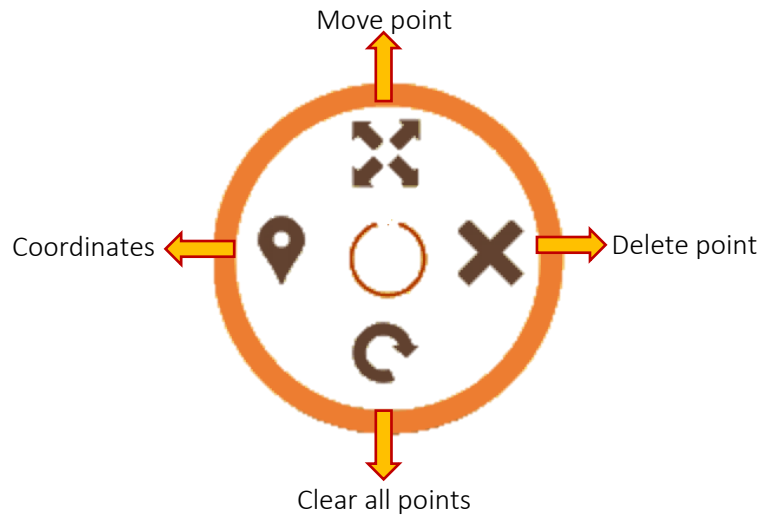


Fig. 68 – Menu of a singular point

The **Coordinates** option opens a window that allows the user to input the coordinates that he wants.

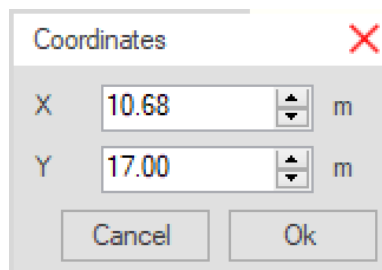


Fig. 69 -Coordinates window

7.2. Create lines, rows and polygon

The user can create a new line and a new row by clicking on the **Line** button and click in any place of the terrain and drag the mouse (without drop) to another point.

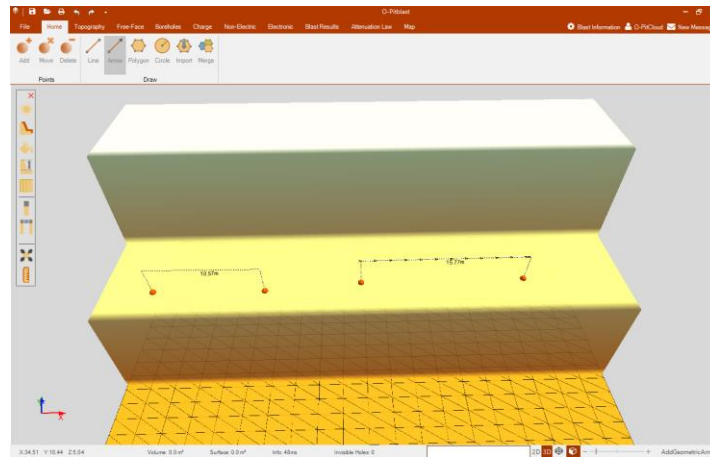


Fig. 70 – Create a new line

To create polygon the user must left-click on the mouse in the terrain and draw the polygon that he wants.

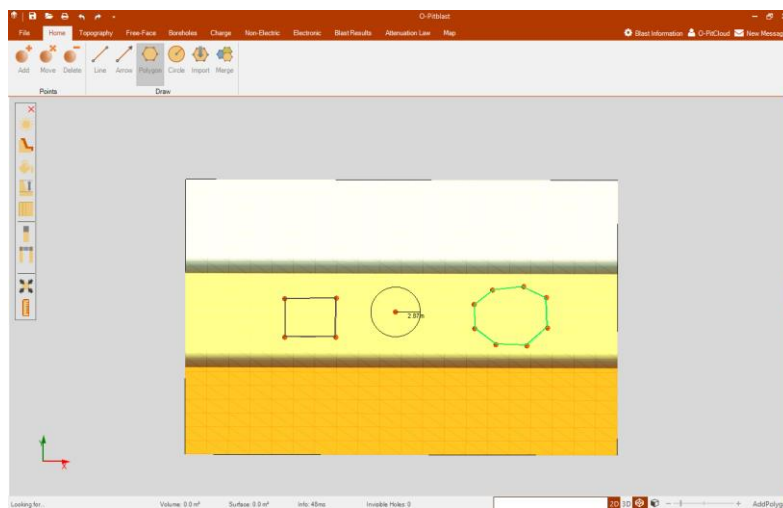


Fig. 71 – Create a new polygon

Also, inside of the polygon icon the user has the option **use crest** (Fig. 72). If there is a crest defined the user can use this option. This button will use the crest point to help the user to easily create a new polygon.

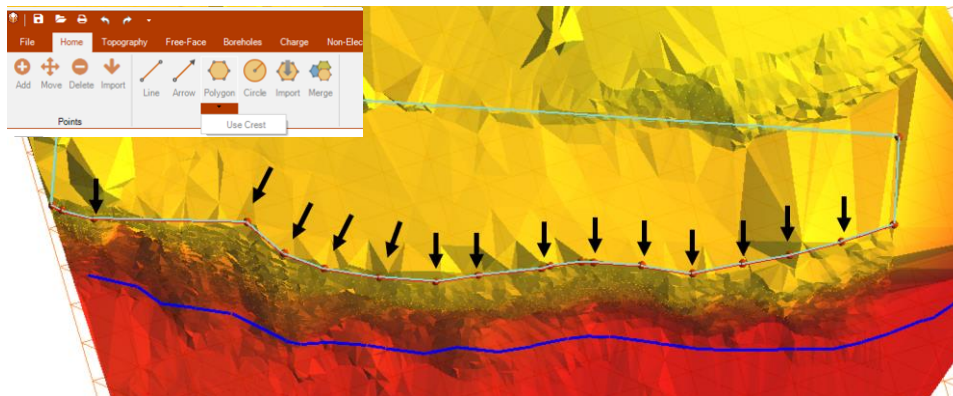


Fig. 72 - Use crest option



7.2.1. Import polygon

To import a polygon the user can click on the button **Import** and upload .dxf .xml .csv files. Also, the user has the option to change the coordinate system of the data (see **Topic 43**).

7.2.2. Merge

The user can merge different polygons to create a new one. First, he clicks on the button **Merge** and it will pop up a window (Fig. 73) to choose the zone that the user wants to merge. Then he can delete the selected zones by checking the box that said **Delete selected zones**.

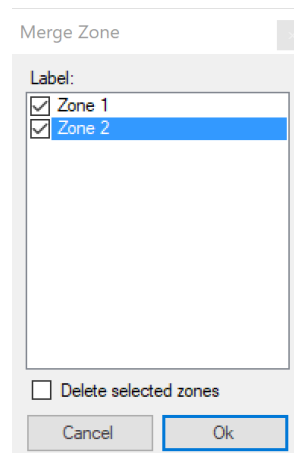


Fig. 73 – Merge zones window

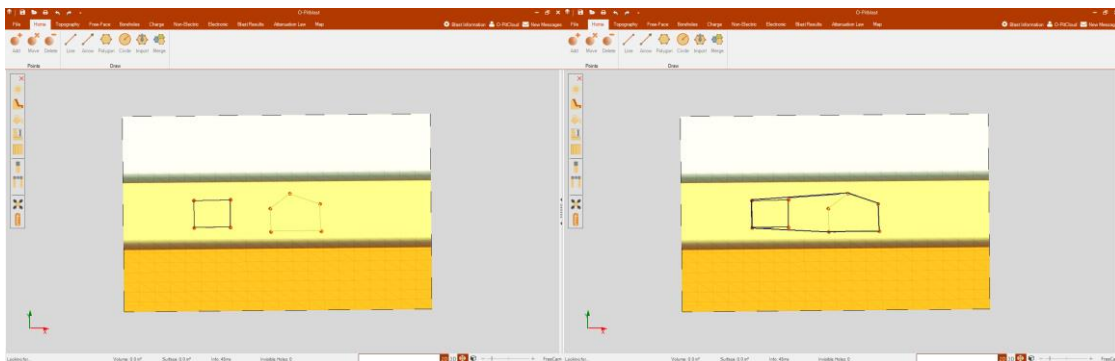


Fig. 74 –Left (A): Two separated polygons; Right (B): Merged zone

7.3. Zone Menu

This module also has another menu, that appears when a polygon is created and the user right-clicks inside of the polygon zone. In the picture below we'll see the main options.

Clicking on the **Delete** and **Delete Points** button the user will erase the polygon/points of the polygon. By clicking on the **Add Hole** button will create a pattern (10.7.1) inside of the polygon area. Clicking on **Edit Label** will create a label – the user must insert a name/description for that label. The **Change Polygon Color** button will allow the user to change the polygon color. The button **Export Zones Points** will generate a .csv file with coordinate system of the points of the polygon. The **Show Volume** button will tell the user the volume of the terrain inside of the



polygon. Finally, the button **Edit timing** (Fig. 76) will let the user to add a translation delay (ms) in the timing of the boreholes (when using electronic detonators).

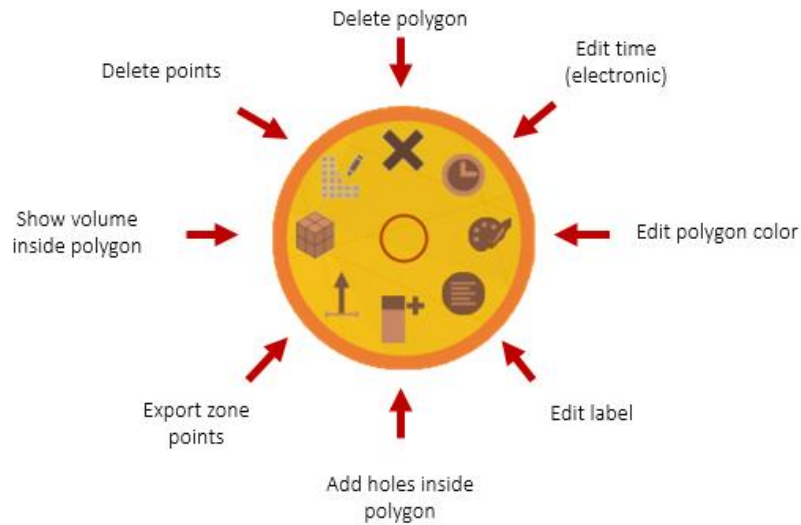


Fig. 75 – Zone Menu

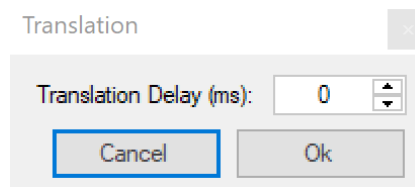


Fig. 76 – Add Timing Window

8. Topography

Topography module includes all the important tools for terrain importation and edition.



Fig. 77 – Topography module

8.1. Topography preparation

Icon	Description
	Import Terrain Import terrain from file (.xyz, .xls, .str, .csv)
	Import Layer Import Layer from file. A Layer can be a terrain element, orebody stratum or any geometrical shape.
	Geo-Reference Geo-Reference a terrain tool. This tool allows the geo-reference a terrain or free face scan, having field reference points.



	Outliers	Outliers detection tool. Some terrains or Laser scans have outliers' points such as out of range pick-ups or dust refraction point. This algorithm eliminates those noises to the minimum level.
	Terrain	Terrain outlier elimination tool.
	Crest/Toe	Crest/Tool outlier elimination tool.
	Terrain Styles	This tool allows the user to create or use a pre-stipulated topography.
	Elevation	Elevation edition tool. This tool allows the manual edition of the terrain, selectin an area and changing its elevation
	Cut Terrain	Cut terrain tool. This tool permits the cutting of a determinate terrain in order to define a precise work area.
	Expand Terrain	Expand terrain tool. With this tool the user can expand a determinate work terrain.
	Bench Bottom	Bench Bottom control. Bench bottom definition tool
	Views	This tool allows the user to see some crucial points of the terrain like the free-face and isolines.
	Export	The user can export their data about the terrain and contour (.csv files).
	Bench Bottom	The user can change the bench bottom elevation, inclination and azimuth.
	Countour Lines	The user can see the terrain isolines and define the interval (meters) and if want them visible or invisible.
	Edit Cloud	The user can eliminate cloud points from the terrain.
	Eliminate Triangles	The user can eliminate triangulation triangles from the terrain.
	Select	The user can select the type of rock associated to that terrain.

8.1.1. Importing terrain -

By clicking in the import terrain icon, a selection window will appear in order to select the terrain file (Fig. 78).

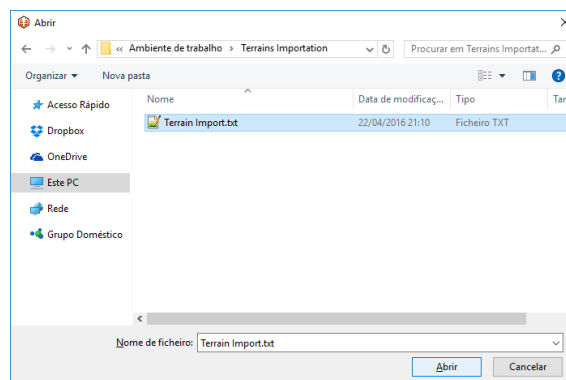


Fig. 78 - Import terrain window



The user must attribute the X, Y and Z values to North coordinates, East coordinates and elevation coordinates, respectively (Fig. 79) and click **Import coordinates** (Fig. 80).

Column0	Column1	Column2	Column3	Column4
	X	Y	Z	
32000	74175.090	-49364.880	X	
32000	74174.480	-49367.500	Y	
32000	74176.910	-49366.140	Z	
32000	75718.140	-49234.280		1178.330
32000	75718.900	-49234.460		1178.320
32000	75719.990	-49225.740		1191.680
32000	74435.730	-49217.300		1200.780
32000	74441.080	-49214.220		1200.960
32000	74428.000	-49203.790		1200.890
32000	72755.806	-49491.192		1103.149
32000	72756.040	-49498.290		1103.000
32000	72755.840	-49491.170		1103.150
32000	72760.910	-49494.170		1103.240
32000	72751.987	-49498.283		1102.926
32000	72752.844	-49496.692		1102.960
32000	72744.240	-49490.550		1118.570

Use separator Add as extra points

Fig. 79 - Correlating XYZ values with North, East and Elevation

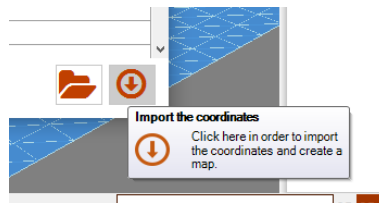


Fig. 80 - Importing terrain

Column0	Column1	Column2	Column3	Column4
	X	Y	Z	
32000	74175.090	-49364.880	1192.190	
32000	74174.480	-49367.500	1194.280	
32000	74176.910	-49366.140	1193.330	
32000	75718.140	-49234.280	1178.330	
32000	75718.900	-49234.460	1178.320	
32000				
32000	74435.730	-49217.300	1200.780	
32000	74441.080	-49214.220	1200.960	
32000	74428.000	-49203.790	1200.890	
32000	72755.806	-49491.192	1103.149	
32000	72756.040	-49498.290	1103.000	
32000	72755.840	-49491.170	1103.150	
32000	72760.910	-49494.170	1103.240	
32000	72751.987	-49498.283	1102.926	
32000	72752.844	-49496.692	1102.960	
32000	72744.240	-49490.550	1118.570	

Use separator Add as extra points

Fig. 81 - Loading Terrain

8.1.2. Coordinate system

With this option the user has the possibility to change the X, Y, and Z from one coordinate system to other.

First, the user must choose the X, Y and Z of raw data (Fig. 79). Then clicks on the coordinate system () icon on the import terrain system window.



After that it will pop up a window (Fig. 82) where the user has to choose from/to which coordinate system that he wants.

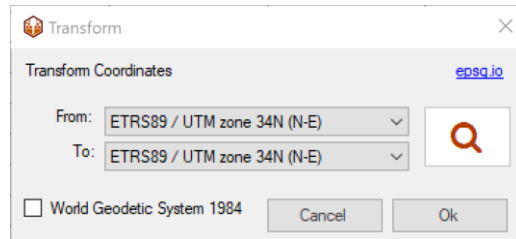


Fig. 82 - Choose from/to coordinate system window

Then the handler chooses magnifier glass (Fig. 83) to search for new coordinate systems.

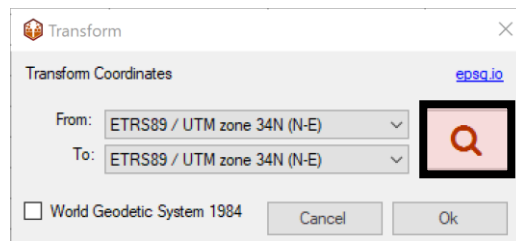


Fig. 83 - Search new coordinate system

This will open a new window (Fig. 84) here the user can search for the new coordinate system through:

- ETRS;
- Name;
- UTM ZONE.

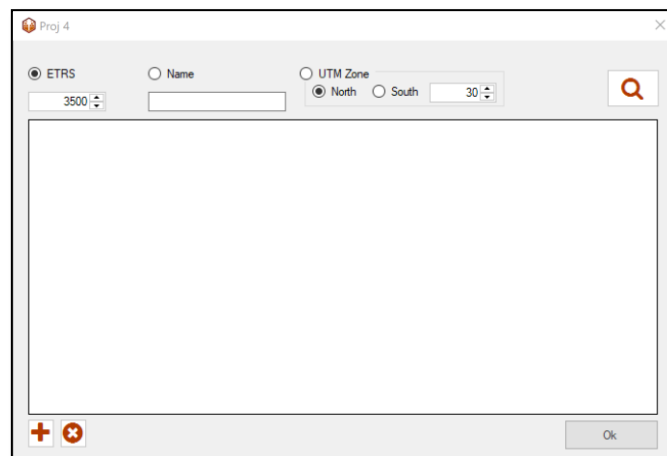


Fig. 84 – New coordinate system window

After inputting a parameter in the search method chosen (ETRS, Name or UTM Zone) the user clicks again in the magnifier glass on top right to get the results (Fig. 85).

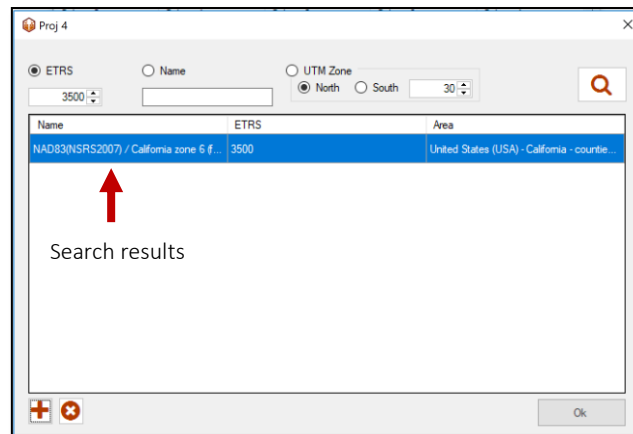


Fig. 85 - Search results

To **add** the pretend system to the main window the user must click on the plus sign (**+**) and it will appear a message confirming the action “**Data added successfully**”.

Otherwise, if the user pretends to **delete** the coordinates that he previously saved it must click on the cross (**×**). This option will open all database previously added and the user can choose which ones he wants to eliminate.

Finally, the user just chooses **from** and **to** (Fig. 86) which coordinate system he wants to change and clicks in **OK** button.

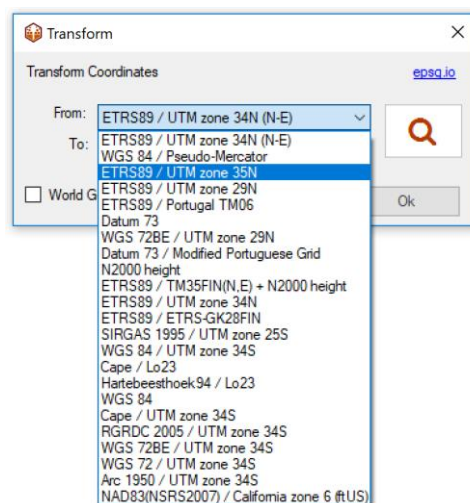


Fig. 86 - Coordinate system present in the database

8.1.3. Import Layer

In this option the user can import a terrain as a layer (it works as a normal importation). After that it can treat the new layer has a new bench bottom adjusting the pattern until the layer (Fig. 87) or, for example, change layer color (Fig. 88).

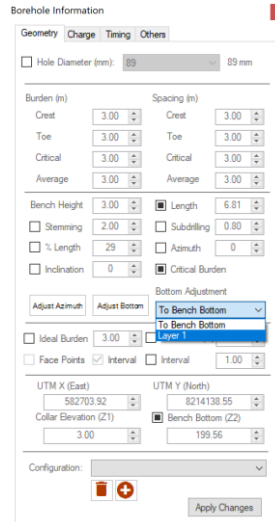


Fig. 87 - Adjust hole until layer

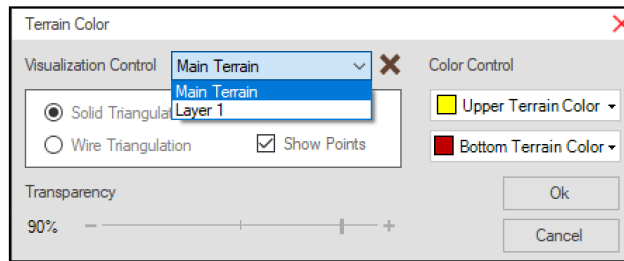


Fig. 88 - Change layer color

8.1.4. Terrain Style -

At this step the user can create or use one of the terrains that are available on the software. When the user clicks on **Create Style** it will appear a new window (Fig. 89) with some parameters like **Longitude**, **Toe (m)**, **Altitude (m)**, **Angle (°)** and **Azimuth (°)** to fill in to create a new style.

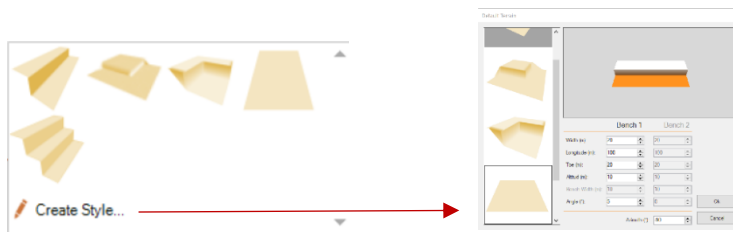


Fig. 89 – Topography's available and Create Style Button

8.1.5. Countour lines

The user can hide/unhide the contour lines of the terrain and choose the isolines interval in meters.

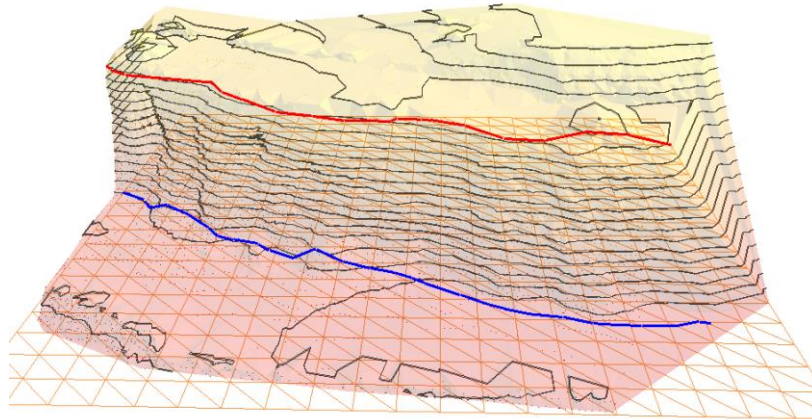


Fig. 90 - Isolines visibles on the terrain

8.1.6. Cutting terrain - ✂

To cut a terrain region the **Cut Terrain** icon allows the user to select a work area and erase the surround zones. The user must click in the terrain to define the cutting borders and press the **Enter** or **Double-Click** in order to execute the command (Fig. 91).

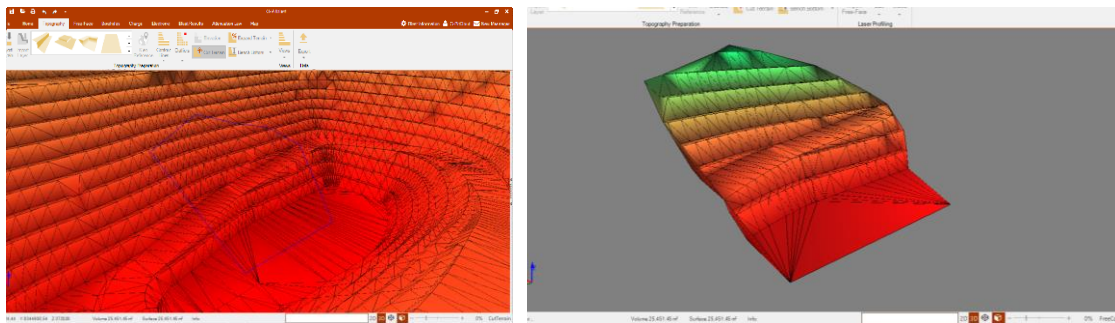


Fig. 91 – Area selection and terrain cutting

8.1.7. Expand Terrain - %

The terrain expansion tool generates a new set of points that allows the actual terrain expansion. In Fig. 92 is possible to observe results of this tool and it can be applied. The user must select the percentage of terrain expansion and click in **Apply**.

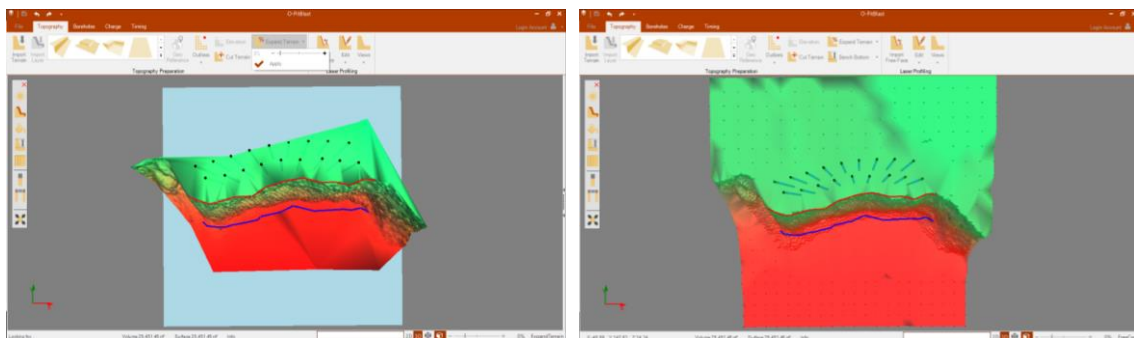


Fig. 92 - Expansion terrain tool results



8.1.8. Bench Bottom -

The Bench Bottom tool permits the adjusting the bench bottom level, inclination and azimuth (Fig. 93).

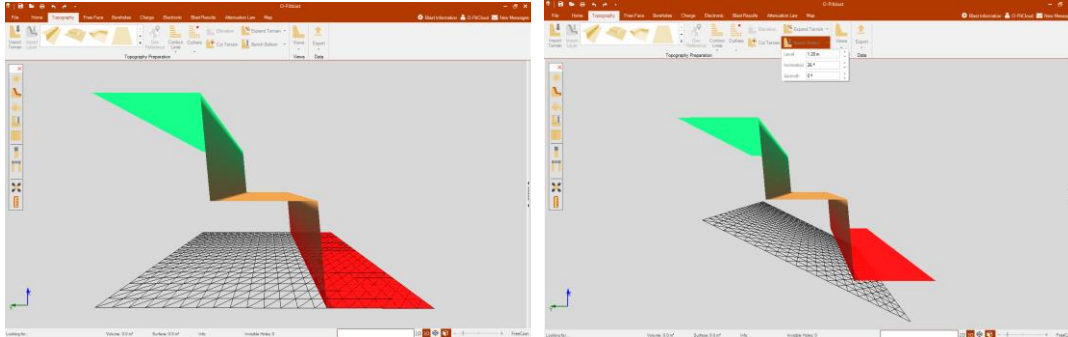


Fig. 93 - Bench Bottom edition

8.1.9. Edit Cloud

In this option the user can edit cloud points.

First of all, he needs to check if the points are visible or not. If not, needs to put them visible (Topic 6.4.2).

After clicking on **Edit Cloud** button it will pop a window (Fig. 94) explaining how to delete points.

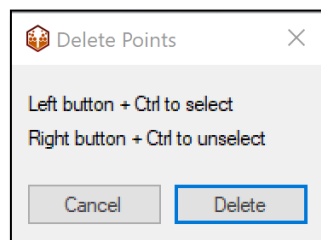


Fig. 94 - Delete cloud points window

The user must click over a point with the left mouse button, press ctrl and drag the mouse on the terrain until all points that he wants to delete are select (Fig. 95). After that just click in **delete** the select points.

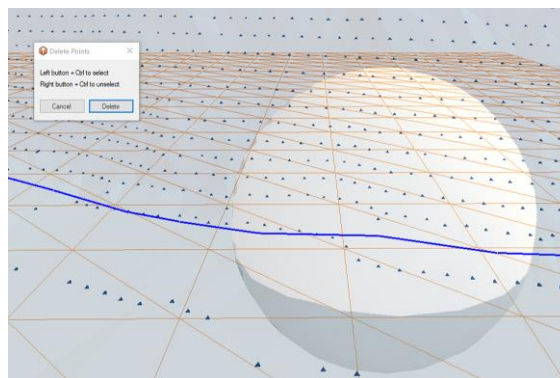


Fig. 95 - Area with selected points



It's important to refer that select points will turn **red** (Fig. 96), before that they are in the terrain color.

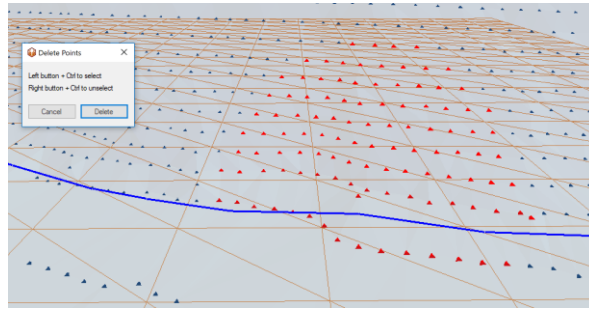


Fig. 96 - Red points: selected

8.1.10. Eliminate triangles

This option allows the user to eliminate triangles that create the triangulation of the terrain.

After clicking in this tool, it will appear a window (Fig. 97) explaining how to use it.

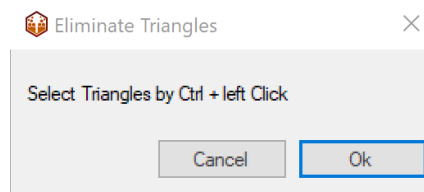


Fig. 97 - Eliminate triangles window

The user can select the triangles by clicking in **left mouse button** and **ctrl**. After that, they will turn **red** (Fig. 98) and if the user clicks in **OK** the triangles will be eliminated.

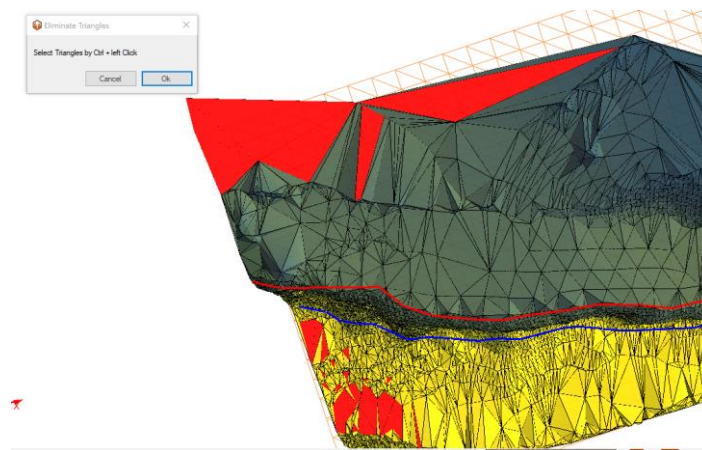







Fig. 98 - Selected triangles (in red)


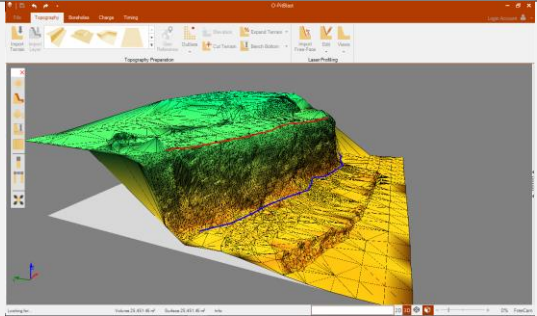

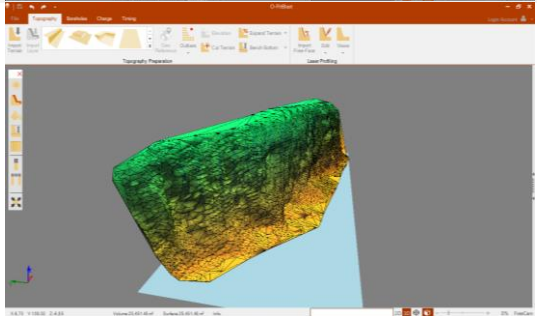

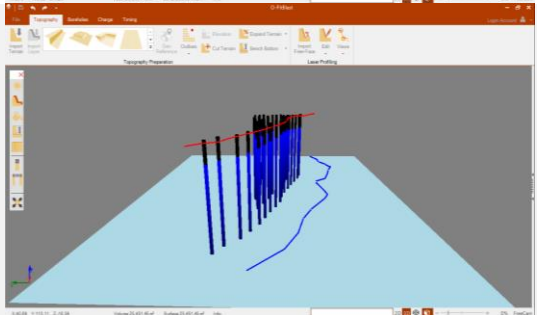

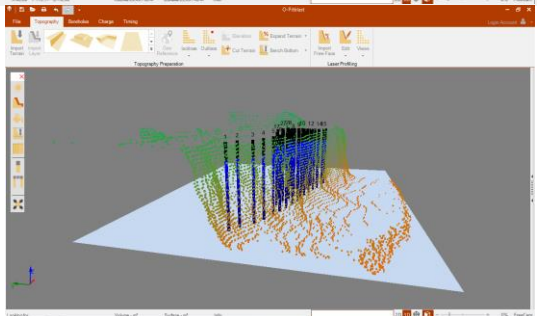
8.1.11. Views

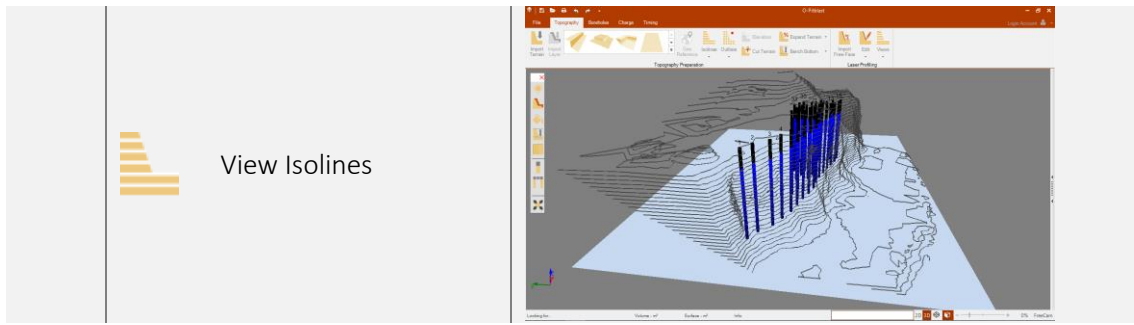
This tool will help the user to see some important aspects of the terrain. The user will be able to see the **Free Face**, the **Crest and Toe**, **Dots or Isolines**, as shown above.



	View All	View all elements in the project
	View Free-Face	View free-face data
	View Crest/Toe	View crest and toe reference lines
	View Dots	View terrain cloud point
	View Isolines	View terrain isolines

Terrain Views

	View All	
	View Free-Face	
	View Crest/Toe	
	View Dots	



9. Free-face

Free-face module includes all the important tools for the free-face importation and edition, like hole deviation data.



Fig. 99 – Free-Face Module

In the next table the user can see the main options of this module.

Icon	Description	
	Import Free-Face	Free-Face importing tool – Renishaw (.FSC) and Quarryman (.CDU)
	Free Face Edit	Free Face edition tool.
	Crest Edition	Crest definition tool. Edit previous measures – Add or remove existent points
	Toe Edition	Toe definition tool. Edit previous measures – Add or remove existent points
	From Device	Import the borehole deviation data directly from device
	From file	Import the borehole deviation that from a local file
	Rodded	Import the rodded boretrak information
	Cabled	Import the cabled boretrak information

9.1. Importing Free-Face -

In order to import a free face model, the user must select the origin of it (Fig. 100) and the correspondent codes. For *.fsc and *.cdu codes the platform has the default values, because of that the importation is automatic.

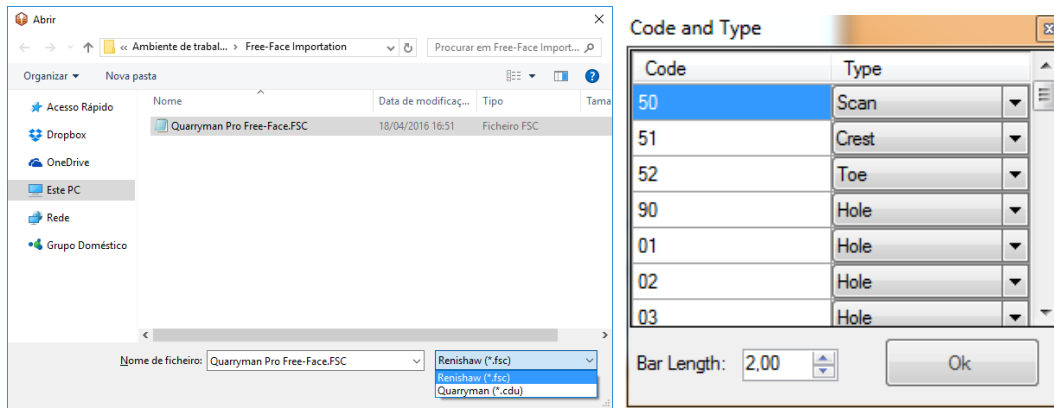


Fig. 100 - Importing free face data and code selection

The Import Data table (Fig. 101) shows the raw data divided by codes. With the objective to improve the visualization of pattern holes, O-Pitblast has a **Pattern Definition Algorithm**, which erases outliers point in the pattern area that will decrease the definition of the terrain surface. The user can select or unselect this function by clicking in the check-box in Import data window. Also, if the user used a bar length on the field and didn't insert the length in the laser can insert now (Fig. 100).

Radio	Vertical	Horizontal	Signal	X	Y	Z	Type	Code	barLength	Face
87.56	81.7	-255.4	0	-21.84	83.845	12.64	Floor	07	0	0
53.17	77.04	-353.88	0	51.52	5.524	11.924	Floor	07	0	0
87.73	81.87	-255.65	0	-21.525	84.139	12.407	Reference	01	0	0
84	82.32	-261.09	0	-12.893	82.242	11.226	Reference	01	0	0
82.5	82.82	-267.16	0	-4.056	81.753	10.311	Reference	01	0	0
82.22	82.98	-271.16	0	1.652	81.587	10.049	Reference	01	0	0
81.07	83.7	-276.01	0	8.437	80.138	8.896	Reference	01	0	0
79	82.55	-280.16	0	13.818	77.105	10.243	Reference	01	0	0
77.1	81.88	-284.16	0	18.672	74.008	10.89	Reference	01	0	0
76.28	81.37	-286.31	0	21.179	72.381	11.446	Reference	01	0	0
73.65	81.79	-288.79	0	23.48	69.01	10.517	Reference	01	0	0
73.36	82.38	-293.32	0	28.784	66.772	9.728	Reference	01	0	0
71.4	82.3	-296.68	0	31.77	63.223	9.567	Reference	01	0	0
75.22	81.71	-303.75	0	41.353	61.89	10.845	Reference	01	0	0
74.29	80.8	-309.25	0	46.399	56.79	11.878	Reference	01	0	0
74.86	79.96	-314.53	0	51.694	52.549	13.051	Reference	01	0	0
76.58	80.03	-319.87	0	57.668	48.612	13.258	Reference	01	0	0

Fig. 101 - Import free-face data

3D Laser user understand that some point obtained by this tool can be out of free-face range. This outlier points can be generated by:

- Dust
- Obstructing objects
- Wide scan window

O-Pitblast has an automatic detection algorithm for these cases and, when importing a free-face, the following message is presented (Fig. 102).

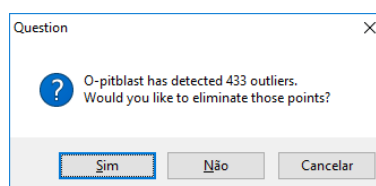


Fig. 102 - Outliers detection algorithm



The result from the use of this tool can be observed in Fig. 103.

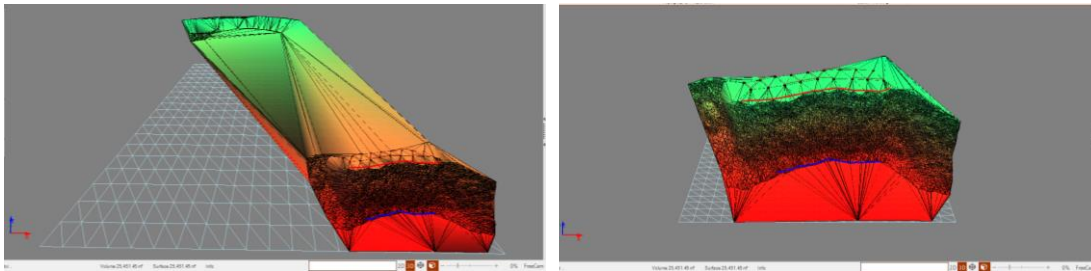


Fig. 103 - Outliers detection algorithm results (Left: without outlier detection; Right: With outlier detection)

If the imported data does not have the hole length the user is directed to choose this value. From Fig. 104 is possible to observe that there are two options:

- Select the bench bottom level and design the hole length until that level
- Select a determinate length value for all the holes

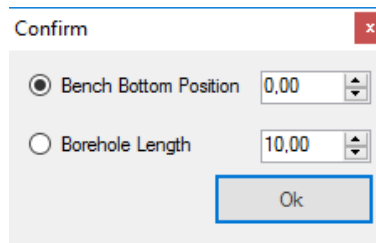


Fig. 104 - Borehole length definition

The results from the borehole length definition can be analyzed in Fig. 105.

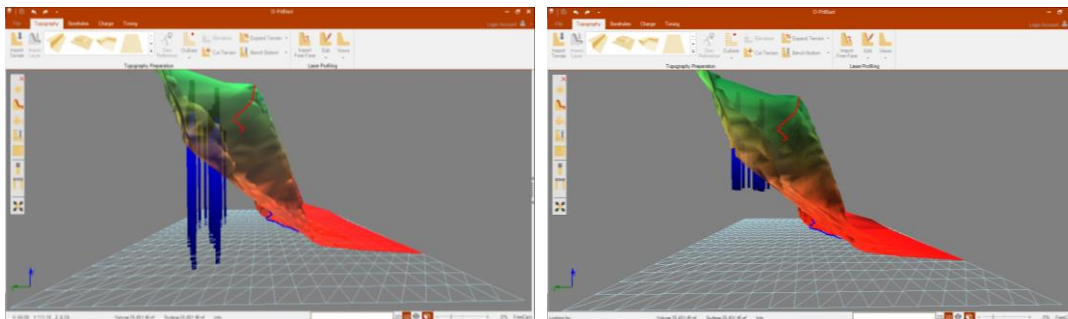


Fig. 105 - Borehole length definition (Left: Bench bottom position; Right: Borehole length)

9.1.1. Importing options

The user, when importing a laser file, as some option to optimize the importation ().

- Hole Offset
- Add as extra points
- Clockwise
- Coordinate system
- Multiple station
- Georeferentiation of the terrain



Radio	Vertical	Horizontal	Signal	X	Y	Z	Type	Code	barLength	Face
87.56	81.7	-255.4	0	-21.84	83.845	12.64	Floor	07	0	0
53.17	77.04	-353.88	0	51.52	5.524	11.924	Floor	07	0	0
87.73	81.87	-255.65	0	-21.525	84.139	12.407	Reference	01	0	0
84	82.32	-261.09	0	-12.893	82.242	11.226	Reference	01	0	0
82.5	82.82	-267.16	0	-4.056	81.753	10.311	Reference	01	0	0
82.22	82.98	-271.16	0	1.652	81.587	10.049	Reference	01	0	0
81.07	83.7	-276.01	0	8.437	80.138	8.896	Reference	01	0	0
79	82.55	-280.16	0	13.818	77.105	10.243	Reference	01	0	0
77.1	81.88	-284.16	0	18.672	74.008	10.89	Reference	01	0	0
76.28	81.37	-286.31	0	21.179	72.381	11.446	Reference	01	0	0
73.65	81.79	-288.79	0	23.48	69.01	10.517	Reference	01	0	0
73.36	82.38	-293.32	0	28.784	66.772	9.728	Reference	01	0	0
71.4	82.3	-296.68	0	31.77	63.223	9.567	Reference	01	0	0
75.22	81.71	-303.75	0	41.353	61.89	10.845	Reference	01	0	0
74.29	80.8	-309.25	0	46.399	56.79	11.878	Reference	01	0	0
74.86	79.96	-314.53	0	51.694	52.549	13.051	Reference	01	0	0
76.58	80.03	-319.87	0	57.668	48.612	12.258	Reference	01	0	0

Apply Pattern Definition Algorithm Hole Offset: 0.00 Add as extra points clockwise

Fig. 106 - Importation option

9.1.1.1. Hole offset

Once on the field, the conditions sometimes are difficult. If the operator can't get to the hole near to the free face, for example, can put the laser aside from the hole (with some offset) and once importing it add that information on the tool appropriate for that.

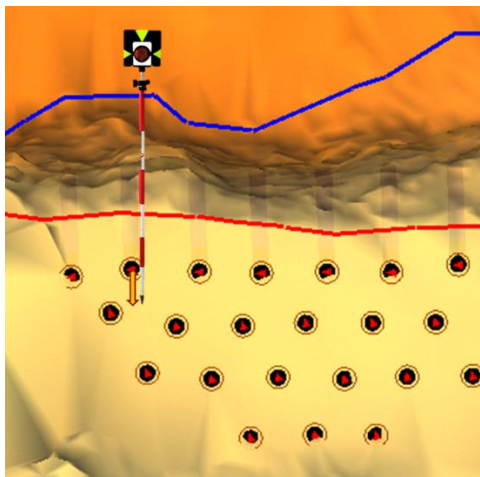


Fig. 107 - Example of the laser position (arrow is the offset)

9.1.1.2. Add as extra points

When importing laser information, you can **add** that data to the **actual** one. This will keep the points of the actual one and insert the new points on the terrain.

9.1.1.3. Clockwise

If the user has **Counter Clock** option defined as default on the laser, it can turn it on here. This will define the rotation of the laser counter clock side.



9.1.1.4. Change data coordinate system

Check Topic 8.1.2 to know how to use this option.



9.1.1.5. Multiple Station

In the field sometimes, the operator needs to make multiple scans from different places. If that the user is importing was made using multiple stations this option must be selected. After that the user must choose the way that it was made on the field and merge the information (Fig. 108):

- GPS information for each laser position and reference;
- Two fixed references for each face (to see how it was to be made on the field click on question button 
- Based on previous laser position (to see how it was to be made on the field click on question button 

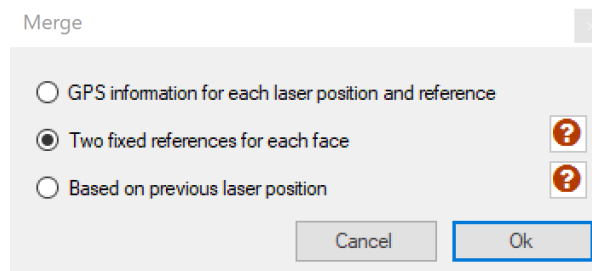


Fig. 108 - Merge information tab

9.1.1.6. General information

Here the user can import GPS information to georeferenced the terrain (Fig. 109). It can put manually, get reference from GPS file, use previous information or use rotation option.

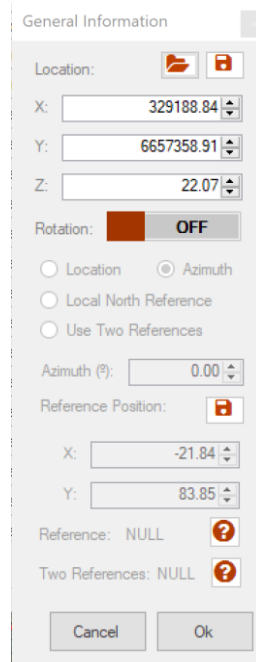


Fig. 109 - General information tab



9.2. Editing Crest/Toe -

With the Crest/Toe tool is possible to create or edit a crest and toe reference lines. When the tool is selected, using the mouse left-click in the crest or toe real points, a new reference line will be generated. To erase existent points is just right-click above them. These reference lines will be used for the calculation of critical profile/burden.

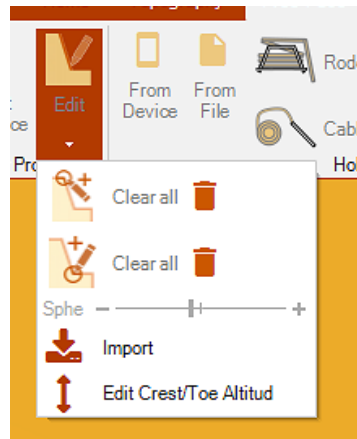


Fig. 110 - Crest/Toe tool

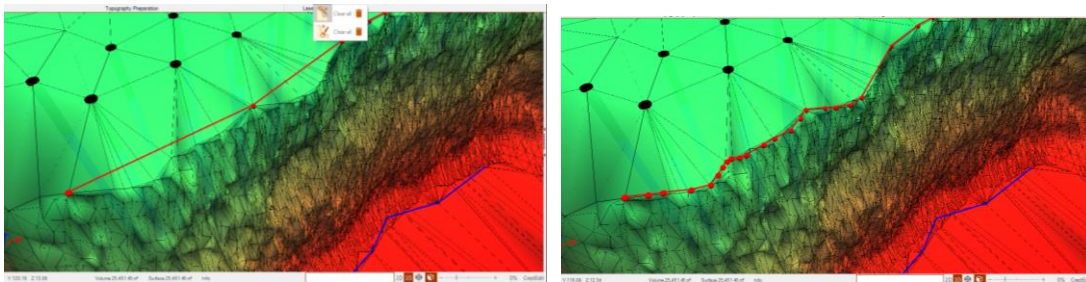


Fig. 111 - Crest reference line edition

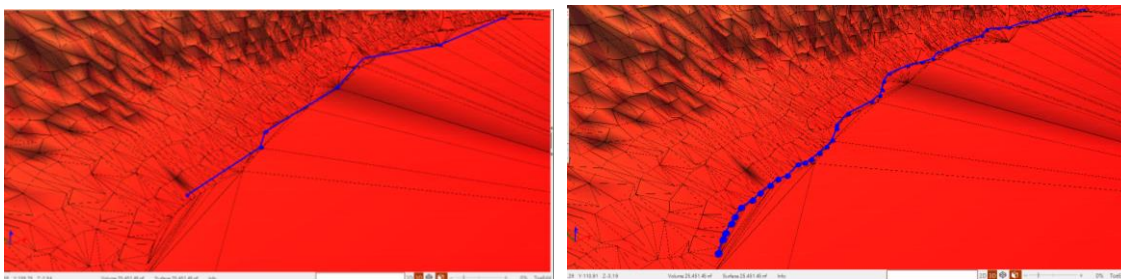


Fig. 112 - Toe reference line edition

9.2.1. Import

The user can import crest and toe directly from file.

9.2.2. Edit crest/toe altitude

In this option the user can change the altitude of crest and toe.

To do this the user must choose between crest and toe, put an altitude (meters) and click in apply.

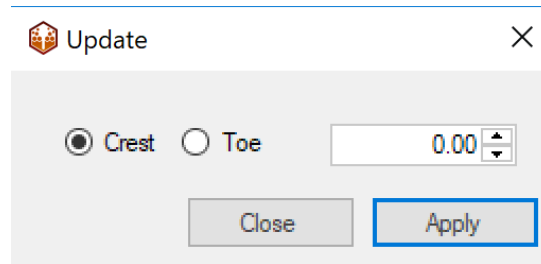


Fig. 113 - Update altitude window

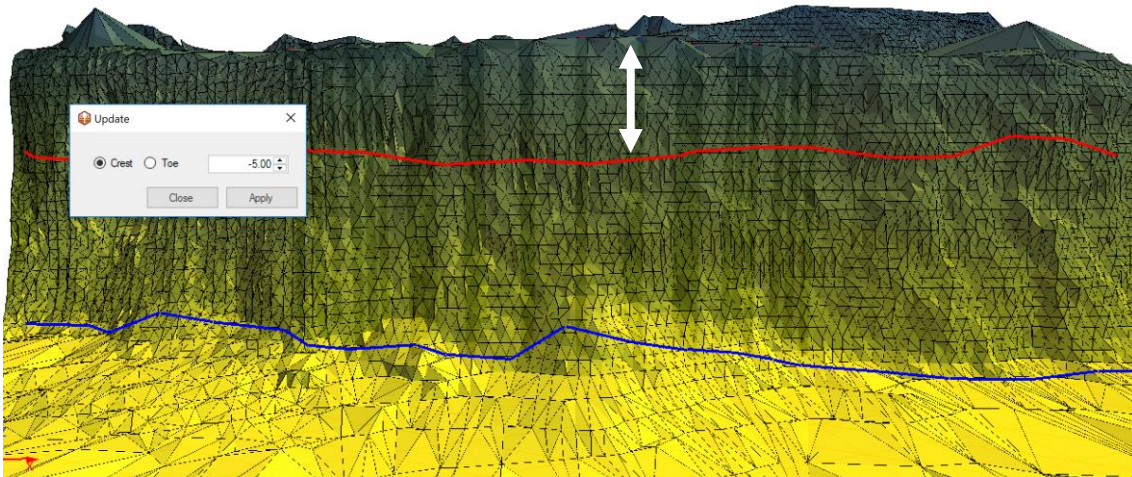


Fig. 114 - Example of changed altitude in crest (minus 5 meters from top).

9.3. Borehole deviation data

With **Rodded**, **Cabled**, **Swap hole**, **Delete**, **Select** and **Edit** the user can import, edit and interact with boretrak information.

9.3.1. Rodded

Clicking on **Rodded** the user can import the boretrak information. It will pop a window like the one below. The user can import .cdp files to **Probe data** and .cdl files to **CDU Data**.

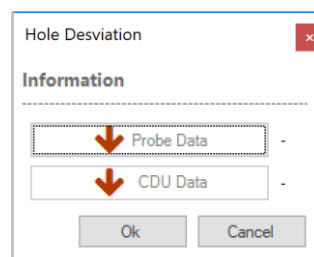


Fig. 115 - Import boretrak information window (1)

When the user inserts the data, it will appear a message saying “Data uploaded successfully”.

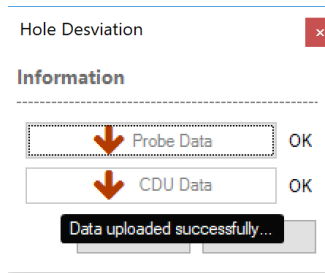


Fig. 116 – Message about the boretrak data

Then the user applies the boretrak information to the respective holes - Fig. 117 and click on the “OK” button.

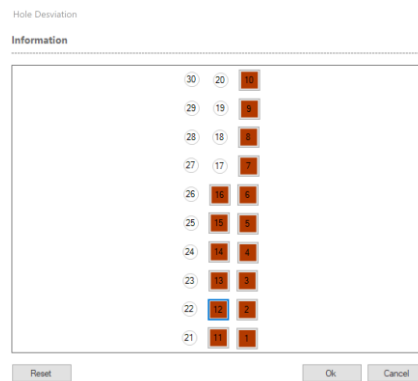


Fig. 117 - Import boretrak information window (2)

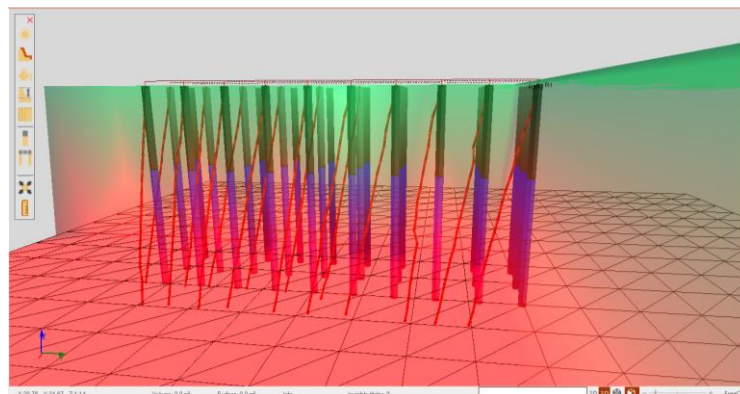


Fig. 118 - Boretrak information successfully imported

9.3.2. Cabled

The user can import cabled boretrak information. All data files must be .rhd type. When the user inserts the data, it will appear a message saying, “Data uploaded successfully”.

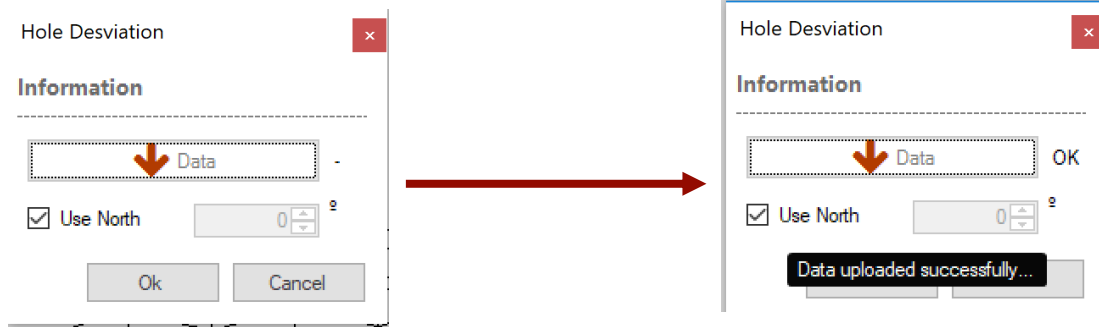


Fig. 119 – Import cabled boretrak information windows

Then the user applies the boretrak information to the respective holes (like we saw in 9.3.1) and click on the “OK” button.

9.3.3. From device and from file

In these two options the user can import information directly from a file or by connecting the borehole deviation device directly to the computer.

First the user must connect the device to the computer, then choose the COM PORT associate with it and finally give order to the device to send the data to O-Pitblast (Fig. 120).

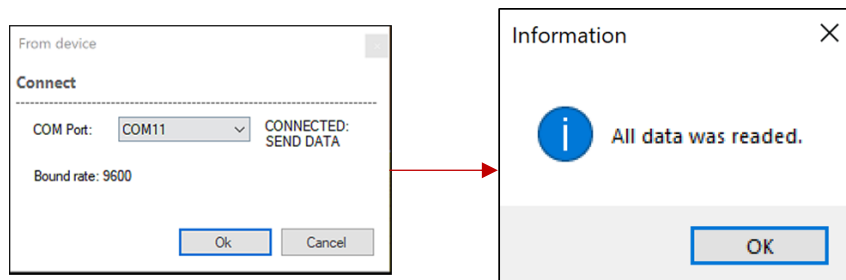


Fig. 120 – Sending data from device

Also, O-Pitblast ask the user if he wants to save a local file from borehole deviation device (Fig. 121).

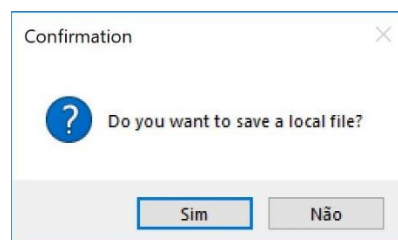






Fig. 121 - Save local file

Then the process is the same explained on the rodded and cabled.



9.3.4. Swap hole, delete, select and edit

In the table below the user can see the main boretrak interaction buttons from Free-Face module.

	Swap hole	Change the boretrak information between holes	The user clicks on the first hole and drags the mouse until the second hole to change the holes boretrak information.
	Delete	Delete the boretrak information	The user can delete all boretrak information or just the information he selects.
	Select	Select a set of holes	The user must left-click in the terrain and build the polygon around a conjunct of holes. To finish the selection is necessary to right-click in order to close the polygon.
	Edit	Change the azimuth of the boretrak data	The user can drag the arrow (that appears after the user clicks on Edit button) to point to the azimuth that he wants.









10. Boreholes

The Boreholes Tab presents all the tools and applications for borehole design and edition.



Fig. 122 – Boreholes Module

10.1. Boreholes Edition

Icon	Description
	Add Holes Add holes to an existent terrain
	Edit Holes Edit a single hole or a conjunct of holes
	Delete Holes Delete a single hole or a conjunct of holes
	Move Holes Move a single hole or a conjunct of holes
	Edit Toe Edition of toe position of a single hole or a conjunct of holes
	Select Holes Holes selection tool
	Hole shape Hole not charge
	Hole Shape Hole charged (no detonator)



10.1.1. Add holes -

To add individual holes, the user must select the **Add Hole** icon and then Left-Click in the terrain surface.

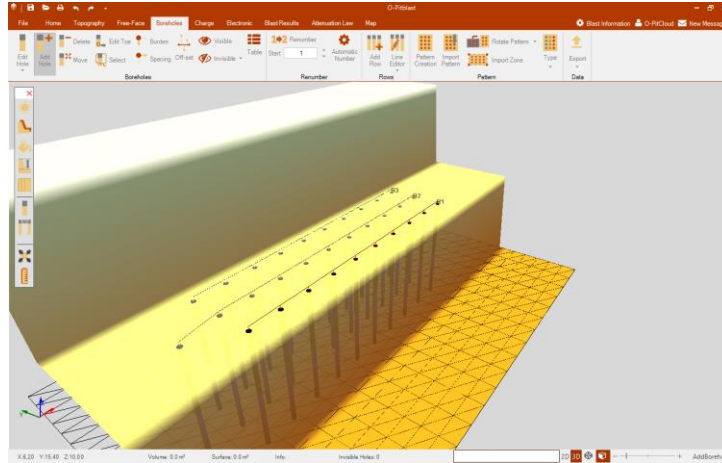


Fig. 123 - Add Holes tool

10.1.2. Edit Holes -

To edit a hole, the user can either click twice over a determinate hole or recur to **Radial Menu** (Chapter 6.8) and select the edit hole icon. In a single hole edition is possible to analyze and edit several characteristics (Fig. 126).

By clicking in **Edit** icon the user will be able to choose which type of holes he wants to change: **All Blastholes**, **Production Blastholes**, **Buffer Blastholes**, **Contour Blastholes** and **Ghost Blastholes**. The user can also edit the information from the **First Row** of boreholes or the information of a labeled borehole by clicking in **Label**.

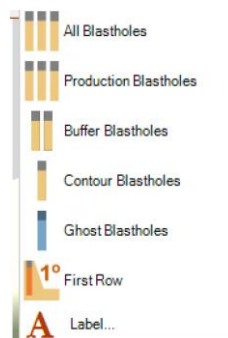


Fig. 124 – Types of boreholes that can be edit

The user can create label, a comment or a water column by double-clicking in the borehole and going to **Others** menu – Fig. 125.

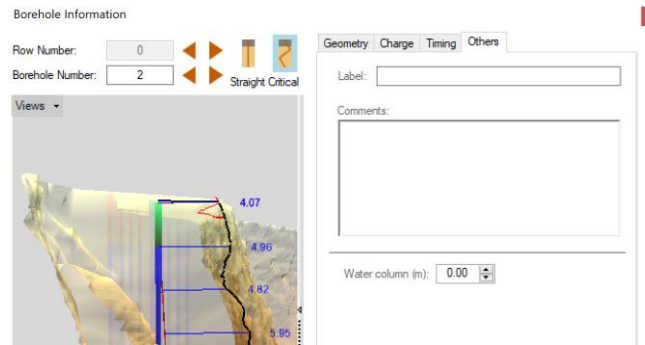


Fig. 125 – Others menu: create label, comment or water column

In the case of the selection of more than one hole the **Borehole Information Window** will be presented like the example of Fig. 127.

This screen allows the user to control the geometrical characteristics of multiple holes. To change the **Burden** and **Spacing** it is necessary an individual selection, since this option is not available in the multiselection holes edition. In the other hand, if the user pretends to change parameters like **Bench Height**, **Hole Length**, **Stemming**, **Subdrilling**, **Inclination** and **Azimuth** they can be modified by checking the **CheckBox** and clicking in **Apply Changes**. If the checkbox, of any item, presents this shape - means that there are more than one hole with different features.

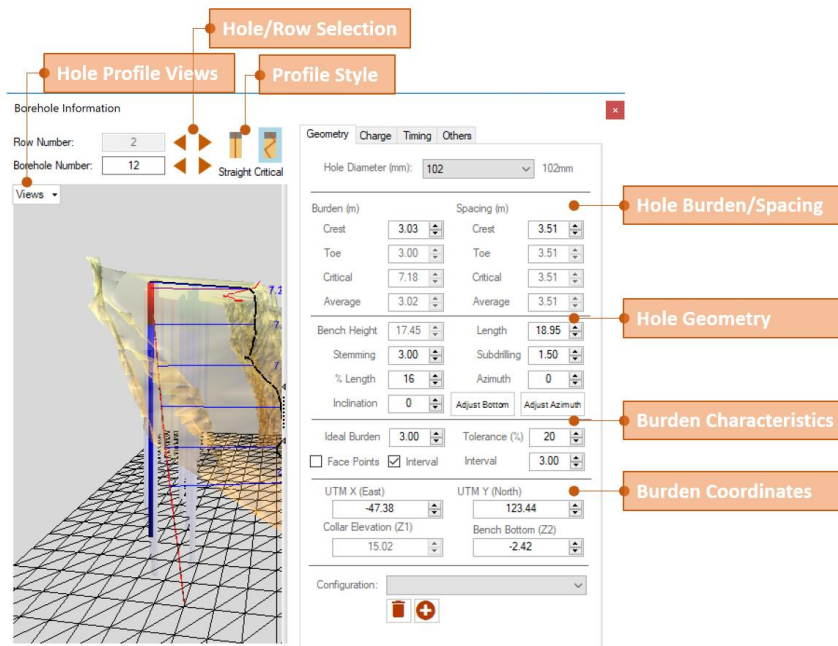


Fig. 126 - Borehole Information Window

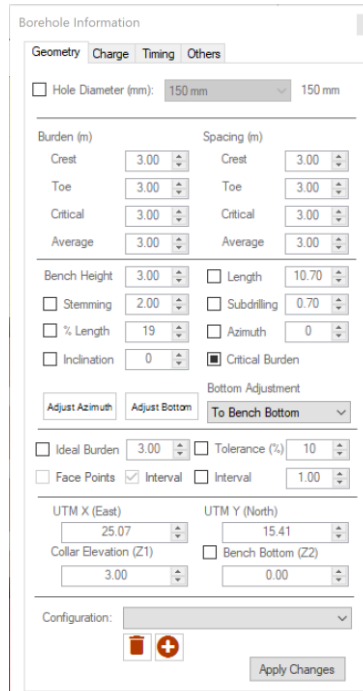


Fig. 127 - Borehole Information Window (Several holes selected)

10.1.2.1. Hole Burden/Spacing

This information is showed if there is a row associated to the holes (Fig. 128). O-Pitblast calculates automatically the burden and spacing and, for that, it is necessary the definition of each row in order to identify the closest rows and neighbor holes. You can define your rows like is explained in chapter 10.6.

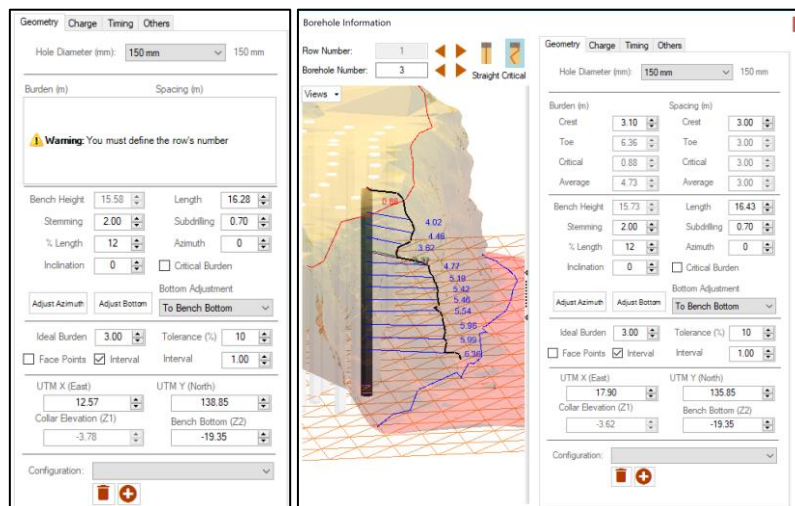


Fig. 128 - Burden/Spacing info - Rows definition



10.1.2.1.1. Holes Inclination and Bench Bottom adjustment

To change the inclination of a set of holes the user must select them and click on the **Edit Hole** icon, check the **Inclination** Checkbox and make the desired changes. In the example of Fig. 129 is possible to observe that the subdrill of the edited holes was not achieved. To correct this situation, the user must select the **Adjust Bottom** button and click **Apply Changes** (Fig. 130). Also, the user can choose until where he wants to adjust holes: bench bottom or layers.

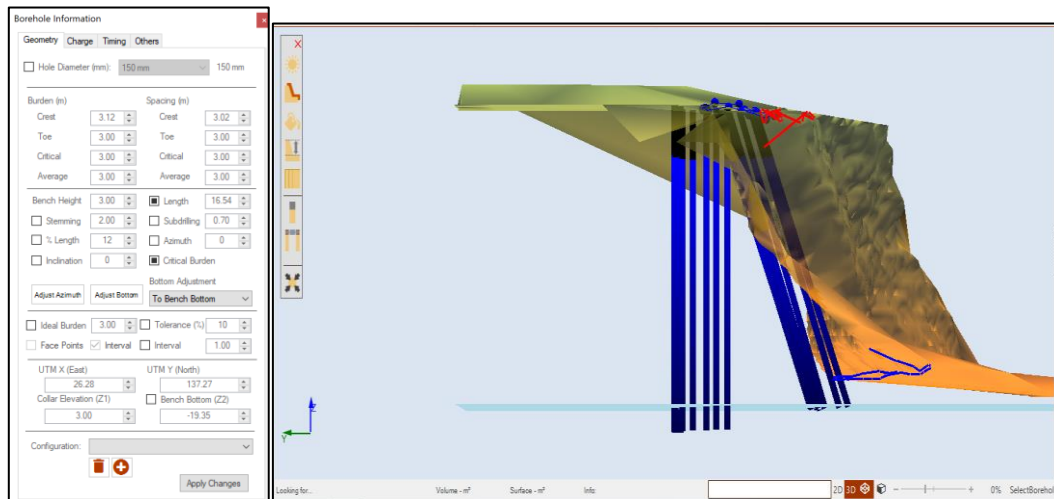


Fig. 129 - Changing holes' inclination (no bottom correction)

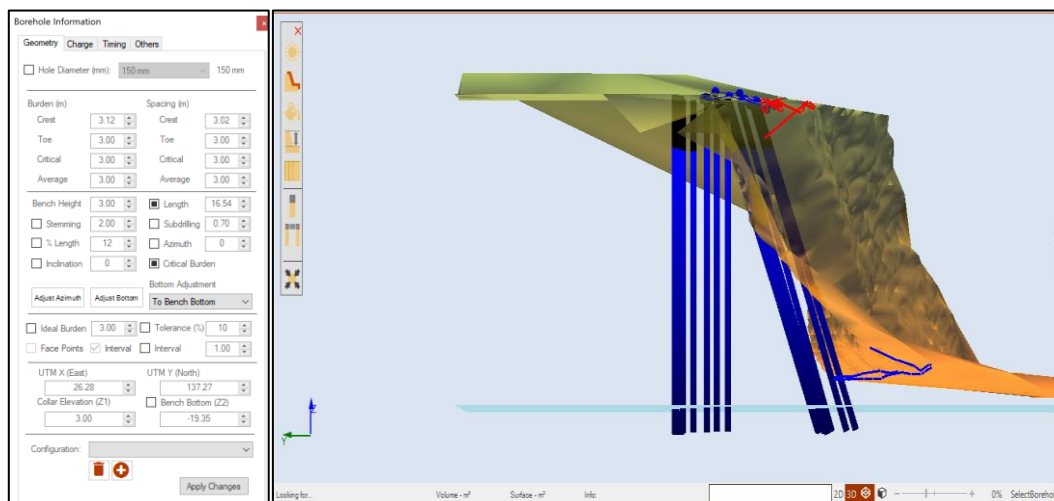


Fig. 130 - Changing holes' inclination (with bottom correction)

10.1.2.1.2. Holes Azimuth

If the azimuth of the holes is not defined, when the user changes the inclination direction can take a wrong value – Fig. 131 - A.

To correct this issue, the user can either put the azimuth value manually or, if the crest and toe are defined, select the **Adjust Azimuth** button - Fig. 131 – B.

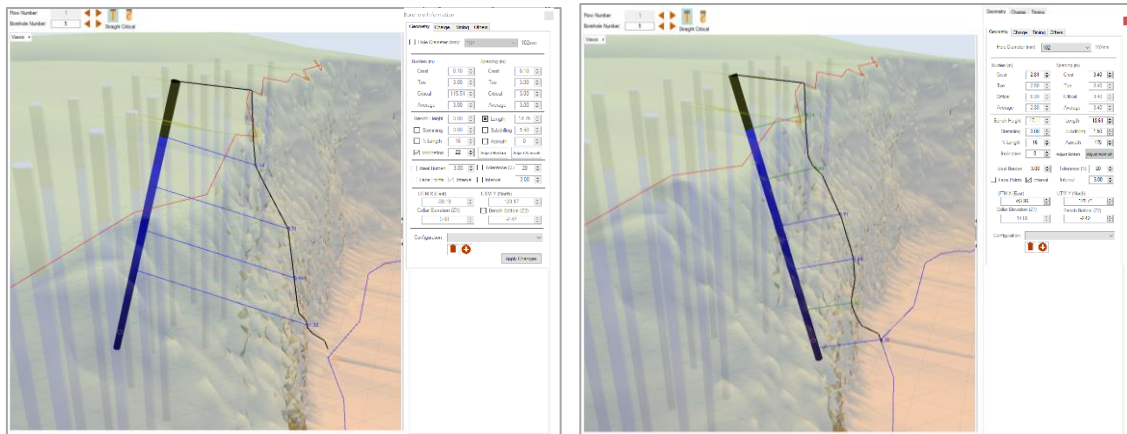


Fig. 131 - Adjusting azimuth. A (left): azimuth not adjusted; B (right): azimuth adjusted automatically

10.1.3. Delete Holes -

The **Delete** holes icon if clicked will erase all the existent holes in the project. To delete individual holes the user must use the **Radial Menu** (Chapter 6.8).

To delete a conjunct of holes is necessary to use the **Select** tool (point: 10.1.6) and click in the **Delete** icon.

10.1.4. Move Holes -

To move individual holes, the **Move** tool must be selected and then, with left-click, drag the hole to the new position (Fig. 132).

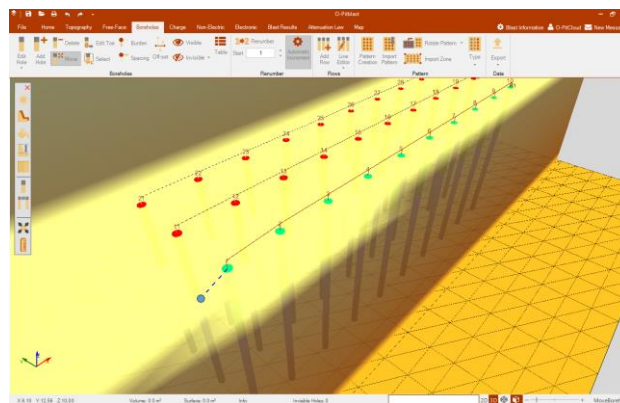


Fig. 132 - Moving a single hole

To move more than one hole is necessarily **select** polygon (point: 10.1.6), left-click in one hole and drag all the holes to their new positions.

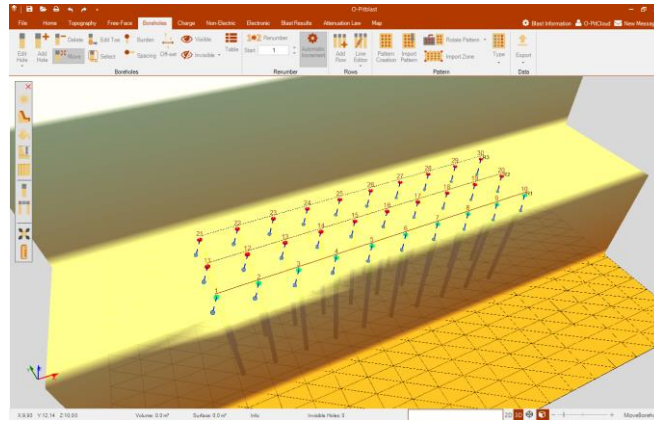


Fig. 133 - Moving a conjunct of holes

10.1.5. Edit Toe -

Hole inclination is directly connected with toe position. To change it, the user must click on the **Edit Toe** and orange dots will appear on top of the hole's collars. With the left-click the user must drag these dots in order to positioning the hole's toe (Fig. 134).

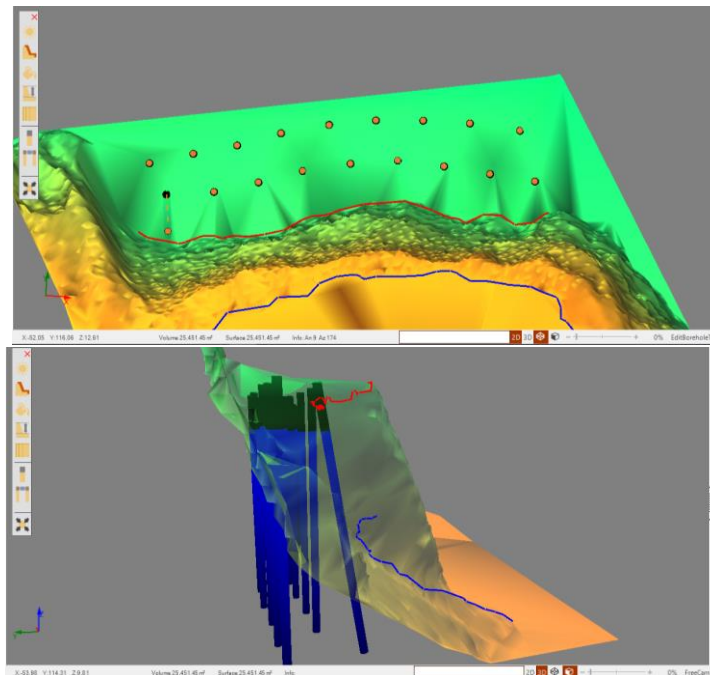


Fig. 134 - Toe Edition (Single hole)

For a conjunct of holes, the procedure is to select them (point: 10.1.6) and drag to the desired position.

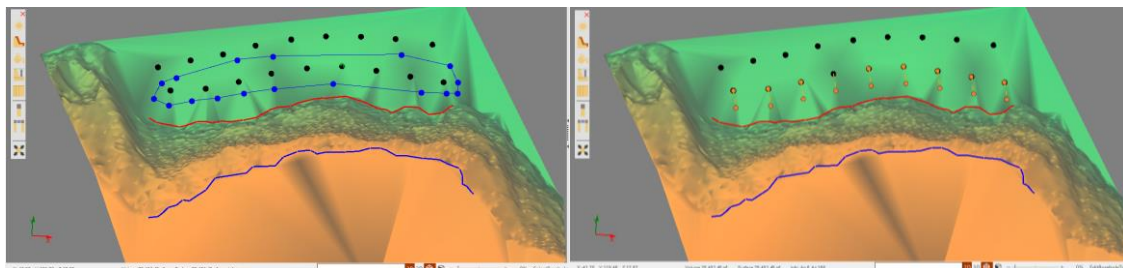


Fig. 135 – Selecting a conjunct of holes

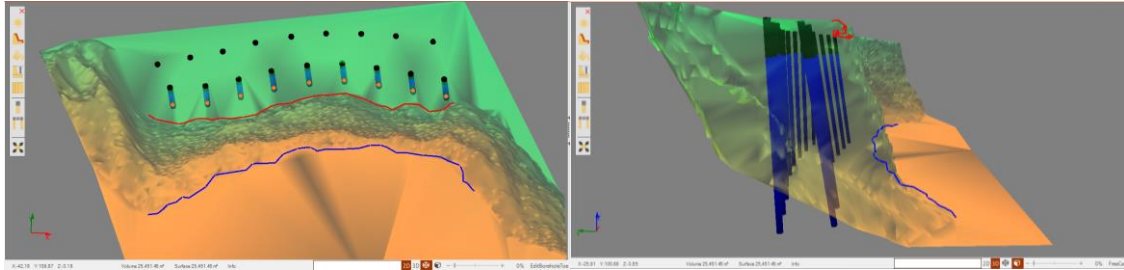


Fig. 136 - Dragging a conjunct of holes

10.1.6. Select Holes -

The **Select** tool allows the selection of a set of holes in order to delete them or change their characteristics. To proceed, the user must left-click in the terrain and build the polygon around a conjunct of holes. To finish the selection is necessary to right-click in order to close the polygon (Fig. 137).

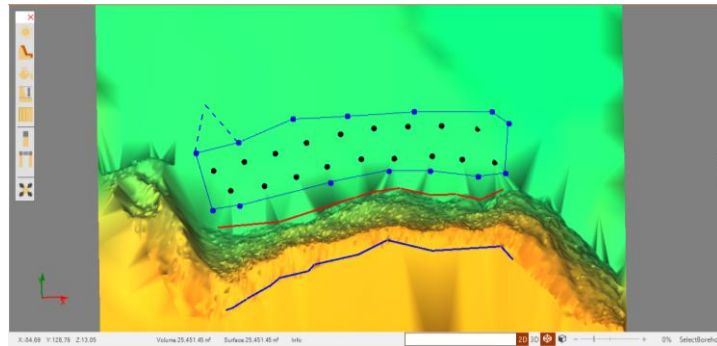


Fig. 137 - Holes Selection tool

Other way to select holes is to press **ctrl** and **left mouse button** over the holes (Fig. 138).

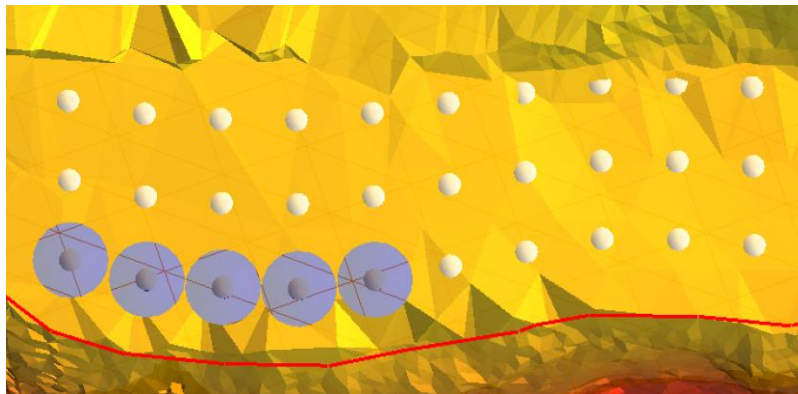


Fig. 138 - Holes selection one by one

To move, delete or add polygon points, the user must left-click on polygon points and use the **Polygon Selection Radial Menu** (Fig. 139) to proceed with the desired action.

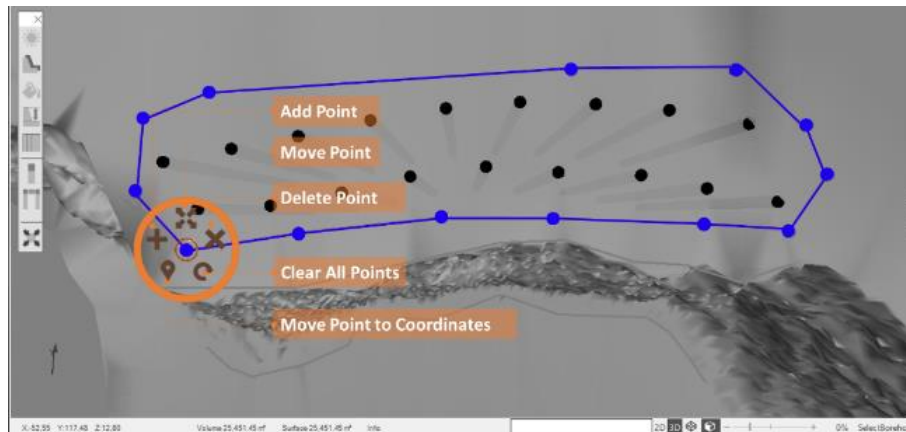


Fig. 139 – Polygon Selection Radial Menu

10.1.6.1. Use crest

The user can select using crest points – like shown in polygon using crest (chapter 7.2)

10.1.7. Free-Face Profile Control - 🖱️

O-Pitblast® determines the free face profile for the all holes. After defining the rows, the user can check each profile on **Edit Hole Window** (Chapter 10.1.2).

10.1.7.1. Straight/Critical Profile style

This option permits select the views between a straight profile or a critical one (Fig. 140). The **Straight View** defines a straight profile in accordance with the free face. In the other hand, the **Critical** profile identifies the line that connects all the critical points along the free face.

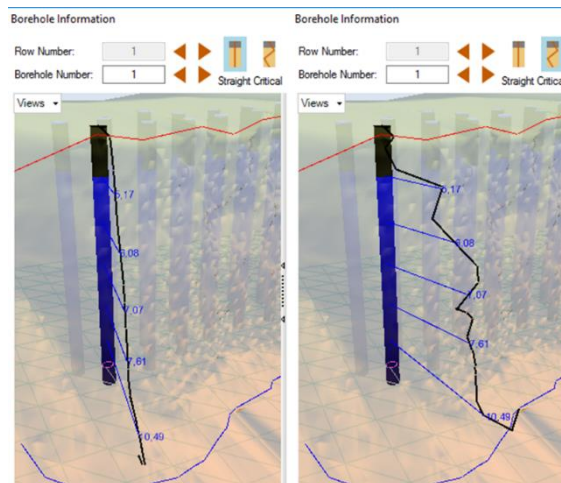


Fig. 140 - Profile Style: Straight/Critical

10.1.7.2. Analyzing Critical Burden

To analyze the critical zones of each hole the user must define the **Ideal Burden**, the **percentage Tolerance**, the **Face Points** and the visualization **Interval** (Fig. 141).



<input type="checkbox"/> Ideal Burden	<input type="text" value="3.00"/>	<input type="checkbox"/> Tolerance (%)	<input type="text" value="20"/>
<input type="checkbox"/> Face Points	<input checked="" type="checkbox"/> Interval	<input type="checkbox"/> Interval	<input type="text" value="3.00"/>

Fig. 141 - Critical Burden Definition

This info is important to identify projections potential risk zones (like the red zones) (Fig. 142). In order to eliminate this risk zones, the user can, in advance, adjust the crest burden or inclination of each hole.

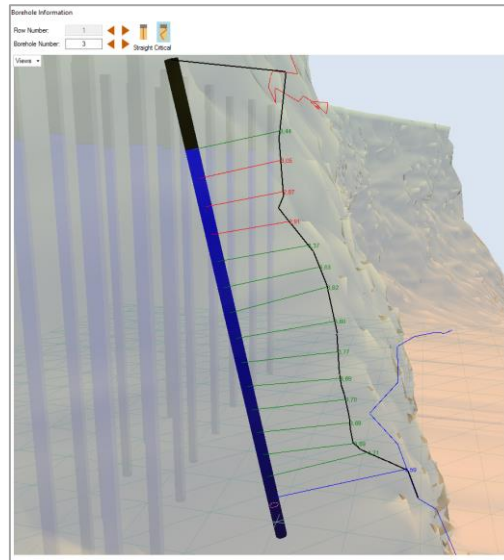


Fig. 142 - Projection potential risk zones

For better viewing by the user, is possible to define a 3D limit zones and analyze with a full definition (Fig. 143).

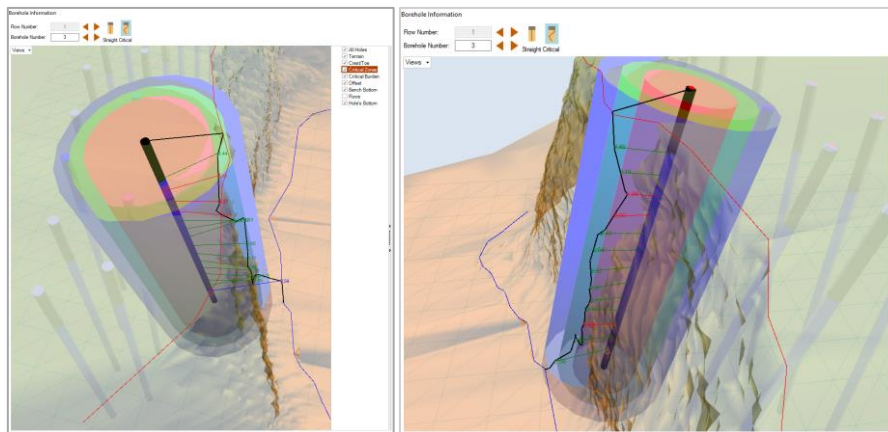


Fig. 143 - 3D Burden Limit Zones

To see the critical profile of the holes that are not in the first row the user has to click on critical burden button (Fig. 134).

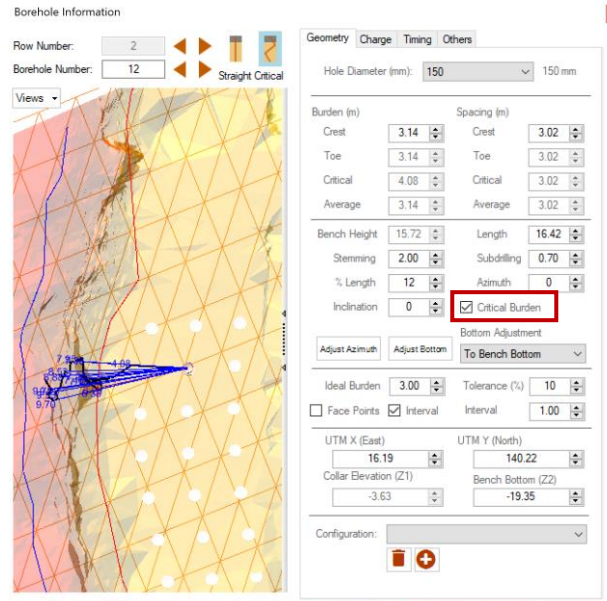


Fig. 144 - Critical burden

10.2. Table

Here the user can see all the information of the holes on a list. Also, he can put visible or invisible the holes on the terrain (one by one) by check or uncheck the option **Visible**.

Boreholes: 30

Number	Label	Burden	Spacing	Stemming	Subdrilling	Diameter	Visible
1		2.715	3.108	0.7	0	150	<input checked="" type="checkbox"/>
2		2.943	3.021	0.7	0	150	<input checked="" type="checkbox"/>
3		3.1	3.002	0.7	0	150	<input checked="" type="checkbox"/>
4		3.138	3.016	0.7	0	150	<input checked="" type="checkbox"/>
5		3.18	3.04	0.7	0	150	<input checked="" type="checkbox"/>
6		3.2	3.043	0.7	0	150	<input checked="" type="checkbox"/>
7		2.984	3.036	0.7	0	150	<input checked="" type="checkbox"/>
8		3.014	3.001	0.7	0	150	<input checked="" type="checkbox"/>
9		2.998	3.013	0.7	0	150	<input checked="" type="checkbox"/>
10		2.937	3.013	0.7	0	150	<input checked="" type="checkbox"/>
11		3.137	3.078	0.7	0	150	<input checked="" type="checkbox"/>
12		3.145	3.015	0.7	0	150	<input checked="" type="checkbox"/>
13		3.289	3.001	0.7	0	150	<input checked="" type="checkbox"/>
14		3.309	3.012	0.7	0	150	<input checked="" type="checkbox"/>
15		3.236	3.029	0.7	0	150	<input checked="" type="checkbox"/>
16		3.16	3.031	0.7	0	150	<input checked="" type="checkbox"/>
17		3.094	3.026	0.7	0	150	<input checked="" type="checkbox"/>
18		3.064	3.001	0.7	0	150	<input checked="" type="checkbox"/>
19		3.071	3.009	0.7	0	150	<input checked="" type="checkbox"/>
20		3.101	3.009	0.7	0	150	<input checked="" type="checkbox"/>
21		3.145	3.053	0.7	0	150	<input checked="" type="checkbox"/>
22		3.183	3.01	0.7	0	150	<input checked="" type="checkbox"/>
23		3.3	3.001	0.7	0	150	<input checked="" type="checkbox"/>
24		3.314	3.008	0.7	0	150	<input checked="" type="checkbox"/>
25		3.249	3.02	0.7	0	150	<input checked="" type="checkbox"/>
26		3.173	3.021	0.7	0	150	<input checked="" type="checkbox"/>
27		3.102	3.018	0.7	0	150	<input checked="" type="checkbox"/>

Fig. 145 - List of information of the boreholes

10.3. Burden and Spacing

By clicking on this option, the user will be able to see the burden and spacing design by the topography and holes pattern (Fig. 146 and Fig. 147).

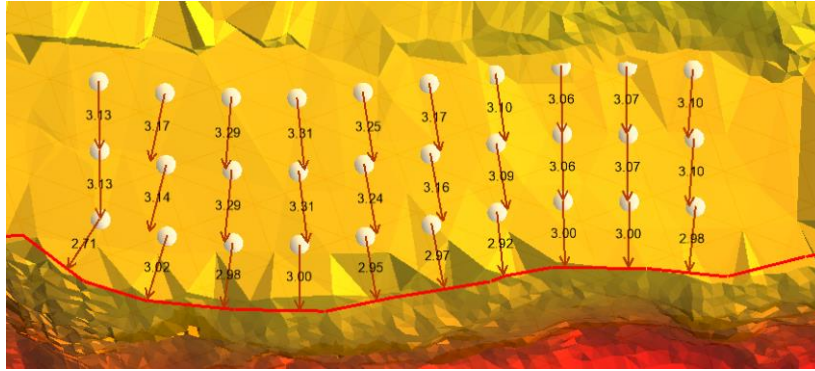


Fig. 146 - Burden tool

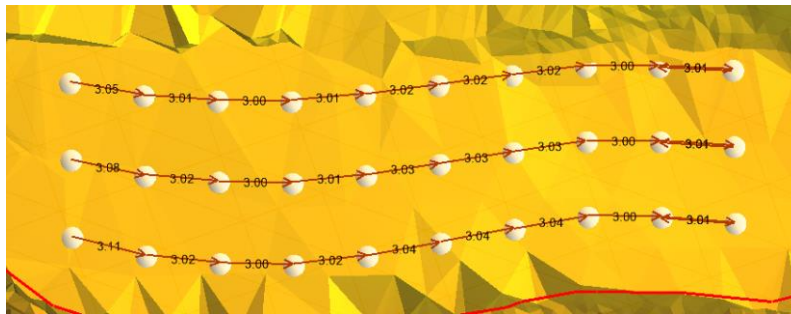


Fig. 147 - Spacing tool

If the user wants to change the burden defined by the software, he needs to click on the arrow present in burden/spacing tool near to holes and drag it to the place he pretends (Fig. 148).

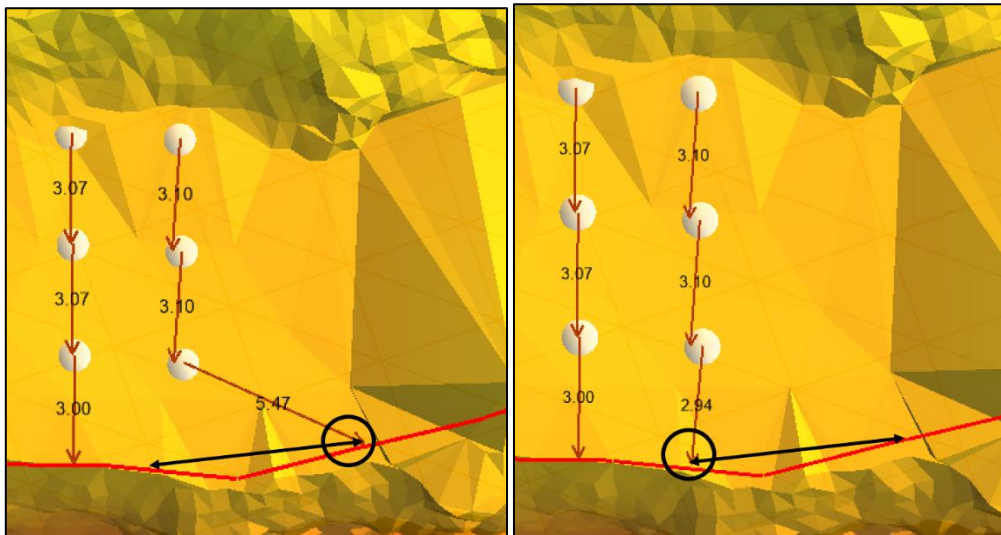


Fig. 148 - On the left: first position of the burden; on the right: new burden position

Another option inside of this tool, is the option to see the radial menu by clicking on the arrow present on burden/spacing option. The user can:

- Reset burden/spacing
- Get coordinates of the position of that burden/spacing
- See the size of burden/spacing

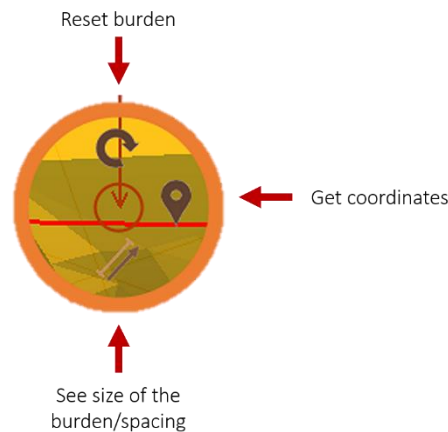




Fig. 149 - Radial menu of burden/spacing tool

10.4. Visible/invisible and renumber

	Renumber	By choosing a star point the user can renumber de boreholes that he wants (Erro! A origem da referência não foi encontrada.) Edit's hole label
	Automatic Increment	Saves the last number that the user use to renumber the next borehole.
	Renumber all	Renumber automatically all boreholes
	Visible	All boreholes get visible (Erro! A origem da referência não foi encontrada.-A).
	Invisible	The selected boreholes get invisible.
	With deviation data	The boreholes with boretrak information get invisible (Erro! A origem da referência não foi encontrada.-B).

10.4.1. Visible or invisibles holes

The user can hide the **select** holes in the terrain by clicking on the **Invisible** button (). To put them back **visible** just click on the **Visible** button ().

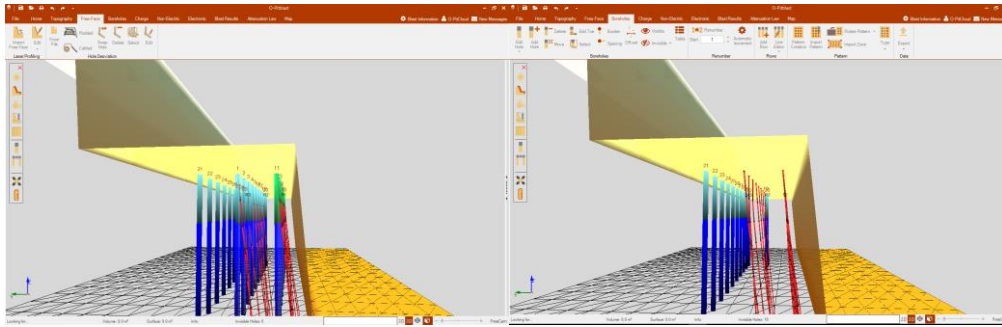


Fig. 150 – Left (a): visible boreholes; Right (B): invisible boreholes (with deviation data).

Another option inside of the Invisible button (Fig. 151) is to with all holes with borehole deviation data.

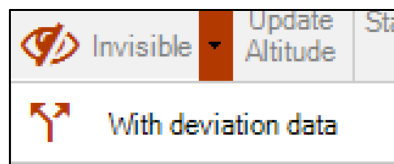




Fig. 151 . Option to hide holes with borehole data

10.4.2. Renumber

The user has many ways to renumber the holes. First way is clicking on the renumber tool () , choose a start number and start dragging the hole between holes (Fig. 153). If the “Automatic Increment” () is **on**, when the user take the mouse out, the starting point will be automatically update to the next number where the user were. If it is **off**, it will keep the number defined in the start point.

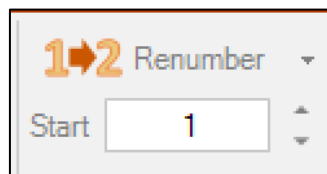


Fig. 152 - Renumber tool and start point

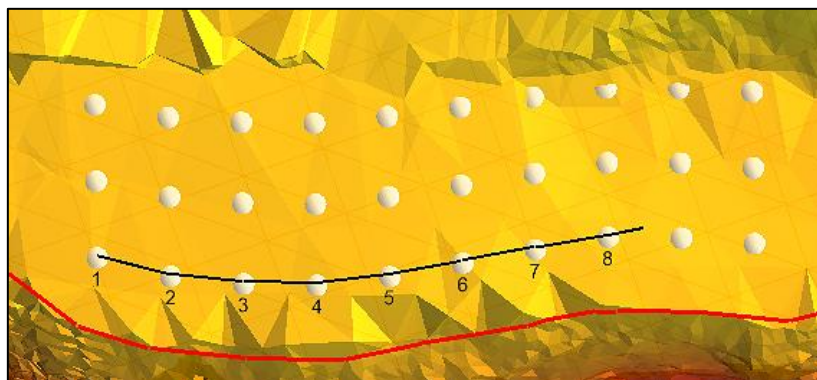


Fig. 153 – Renumber tool



If the user uses the option renumber all () it will automatically update all hole's number.

10.4.2.1. Edit hole's label

In this tool the user can create a label hole by hole or automatically.

If the option **one by one** is checked, the user can choose a **text**, a **number** to attached to the text and also if he wants that number to **increase automatically** (if yes must click on " Increase Number").

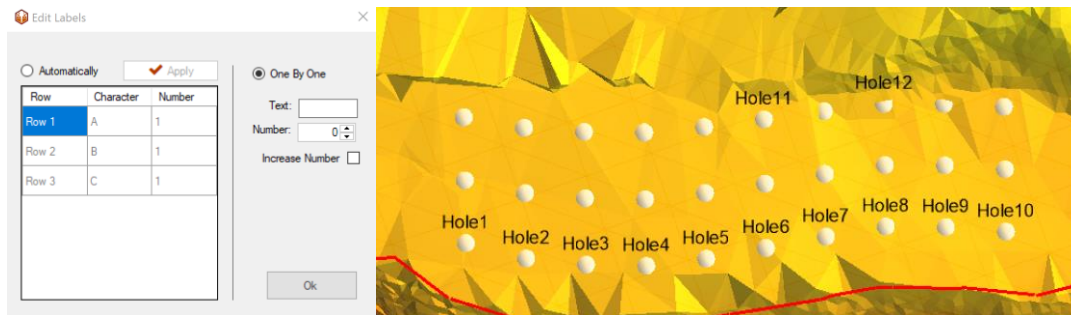


Fig. 154 – One by labeling

If the option **automatically** is checked, the user must define for each row what **text** he wants, the **number** that will start in each hole (of a row) and after that click in **apply**.

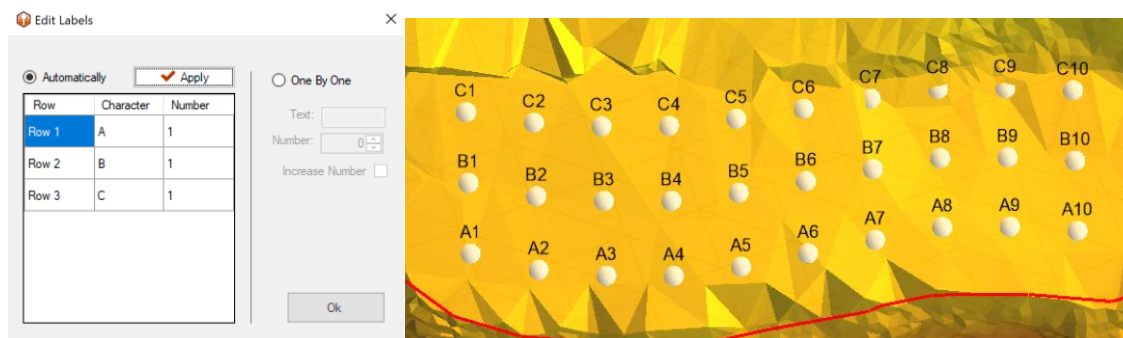


Fig. 155 - Automatic labelling

10.5. Update altitude

This option allows the user to update the altitude of the boreholes. Clicking in this tool it will appear and option to open a file (this file must contain hole numbers and new altitude of the hole). After choosing the file it will pop up a window to connect hole number with altitude (Fig. 156). After that the user clicks on the download button and the altitude of the holes will be updated.



Column0	Column1
NUMBER	ALTITUDE
1	271.33
2	271.3
3	271.36
4	271.4
5	271.45
6	271.6
7	271.68
8	271.8
9	271.84
10	271.9
11	271.92
12	271.94
13	272.05
14	272
15	272.23
16	272.21

Use separator
 Headers Name

Fig. 156 - Update altitude window

10.6. Rows: Creation and Edition

Icon	Description
	Add row Create a new row
	One by one Create a row near to other
	Line Editor Select holes to define from which row they are.
	Hole by Hole Define rows by holes individual select
	By line Define rows by drawing a line over a conjunct of holes
	Clear all Eliminate all rows

10.6.1. Add row

When the user clicks on the **Add row** icon () it will pop up a window to define the row number and the spacing between the holes.

Add Row

Row Number:

Spacing (m):

Fig. 157 - Add row window



After defining the parameters, the user must click one time on the field (1) and then drag the mouse until the place where he wants to build the row (2) - Fig. 158.

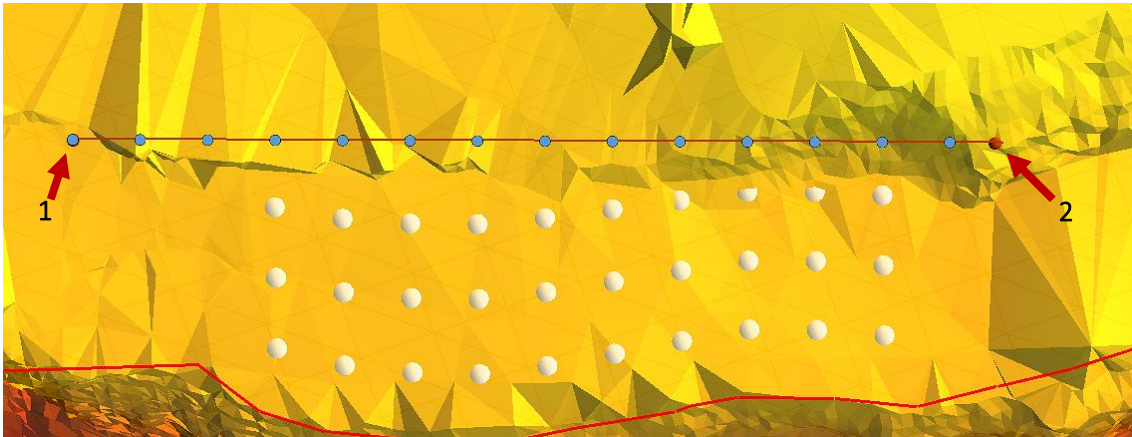



Fig. 158 - Creating new row

On the other hand if the user wants to create a row near to other it has one option for that. On **create row near to another** () the user it will be forwarded to a window with the option to define **spacing**, **burden**, **after which row** he wants to put the new one, **the row number** and **type of pattern**.

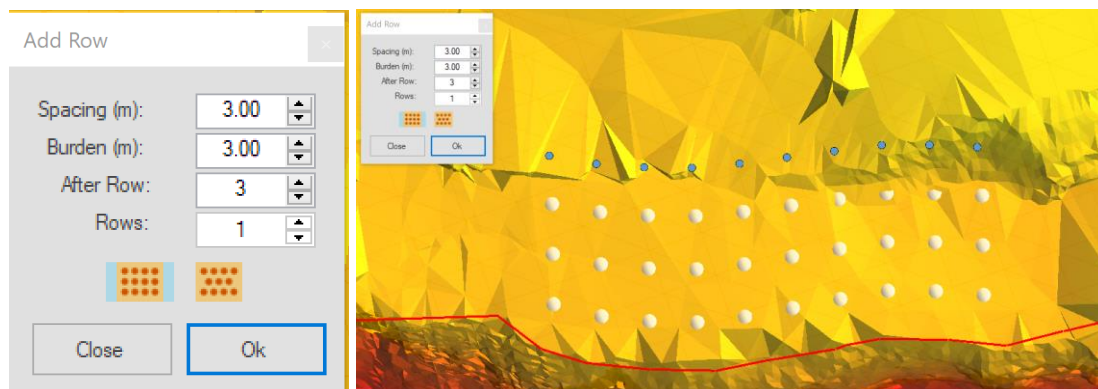


Fig. 159 - Create row near to another

10.6.2. Line Editor

The Line Editor tool permits the attribution of a row ID to each hole. There are two main options:

- Hole by hole: The user must define the row number in the **Row Control Box** and drag the mouse over a hole to assign a row ID (Fig. 160).
- By line: The user must define the row number in the **Row Control Box** and draw a line over a set of holes to assign a row ID (Fig. 161)

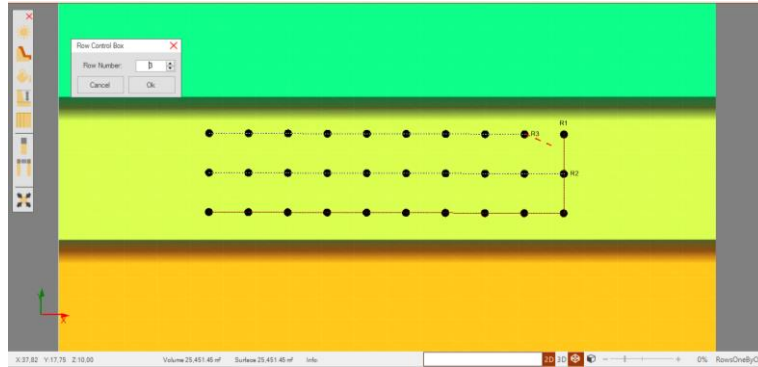


Fig. 160 - Line Editor: One by one

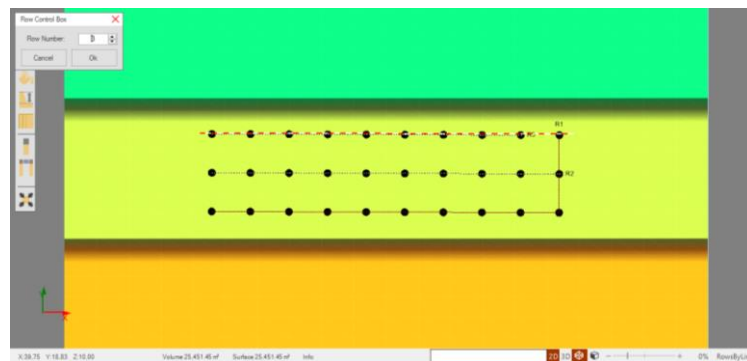


Fig. 161 - Line Editor: By Line

- To delete the information of the rows the user just has to click on **Clear All** button.

10.6.3. Prepare rows

When the user uses this option, it will pop up a window that works the same way AS the **Row Control Box**. If select a row or numerous rows the holes with hole deviation measurements will appear all align on the report (as they were on the same row). To delete the information of these tool just click on reset button.

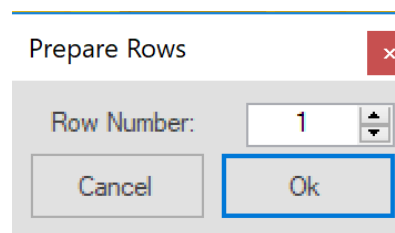


Fig. 162 - Prepare rows window

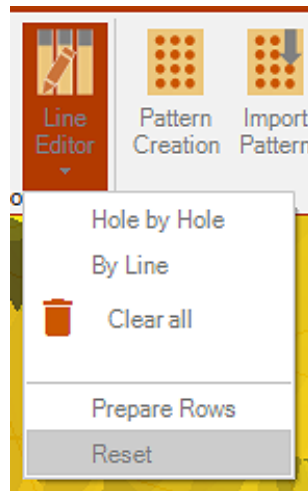


Fig. 163 - Reset tool

10.7. Pattern

Icon	Description	
	Pattern Creation	Create a pattern over an existent terrain
	Import Pattern	Import holes from file
	Rotate Pattern	
	Rotate 90° to the Right	Rotate the entire pattern or a conjunct of selected holes 90° to the right
	Rotate 90° to the Left	Rotate the entire pattern or a conjunct of selected holes 90° to the left
	Turn Vertically	Turn the entire pattern or a conjunct of selected holes vertically
	Turn Horizontally	Turn the entire pattern or a conjunct of selected holes horizontally
	Import Zone	Import blast polygon from file
	Type	
	Production Blastholes	Attribute the Production Blasthole ID to a hole or a conjunct of holes
	Buffer Blastholes	Attribute the Buffer Blasthole ID to a hole or a conjunct of holes
	Contour Blastholes	Attribute the Countour Blasthole ID to a hole or a conjunct of holes
	Ghost Blastholes	Attribute the Ghost Blasthole ID to a hole or a conjunct of holes
	1 st Hole	Attribute the 1 st hole ID to the holes that where defined as the first row
	Export	Export your borehole information (only .csv files)



10.7.1. Pattern Creation - 🗺️

For the simple pattern creation, over an existent terrain, the user must select the **Pattern Creation** tool. It is necessary select the pattern characteristics on the **Pattern Window** (Fig. 164) and then, left-click in the terrain.

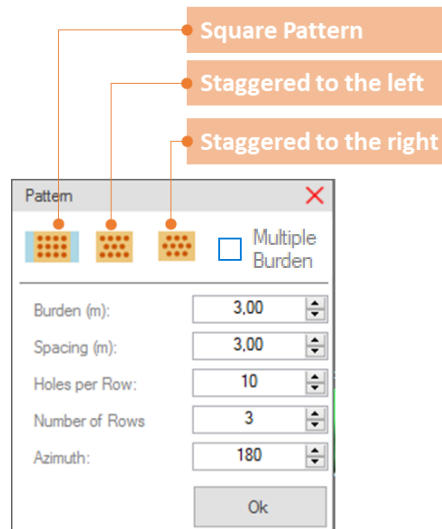


Fig. 164 - Pattern Characteristics Window

The user can pre-visualize the hole's position in the terrain (by clicking on the terrain once) and do changes in the characteristics before confirming the final position (Fig. 165).

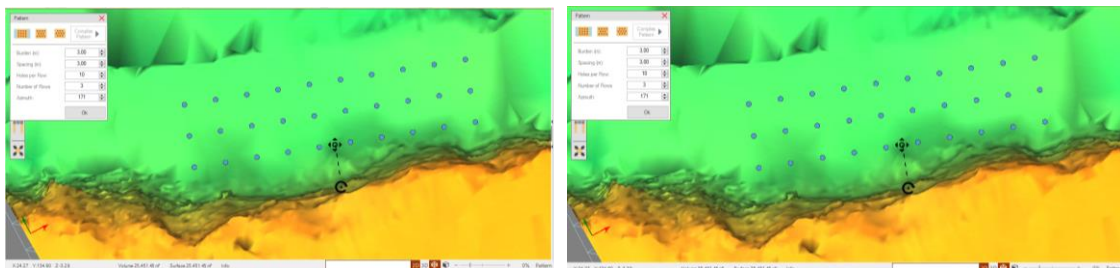


Fig. 165 - Changing Pattern Characteristics

Besides that, the pattern position can be manually adjusted by moving the **Pattern Position Adjustment** icon 📍 and the azimuth can be changed in the **Pattern Characteristics Window** or by dragging the **Rotating** icon 🔄.

The user can check the option **Multiple Burden/Spacing** to create a pattern with multiple burdens between rows.

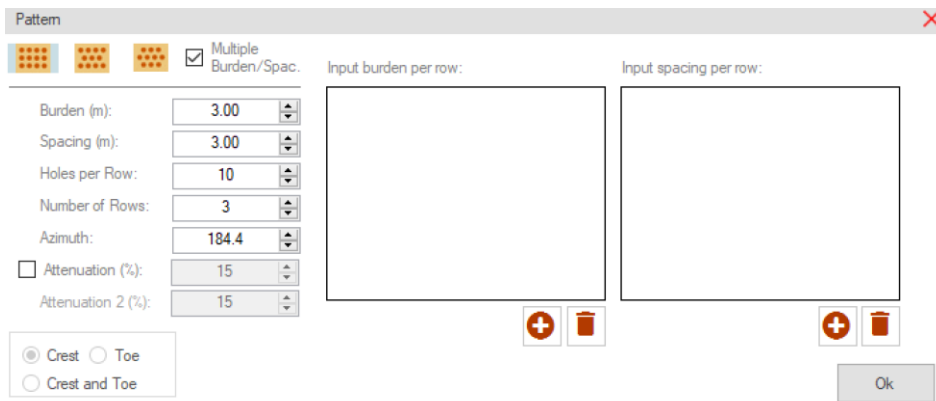


Fig. 166 – Multiple burden per row

The user clicks on the **Plus** button to add the number the rows that he wants. To delete just click on the **Delete** button. To change the burden just click on the row you want to change and write the number of burdens/spacings.

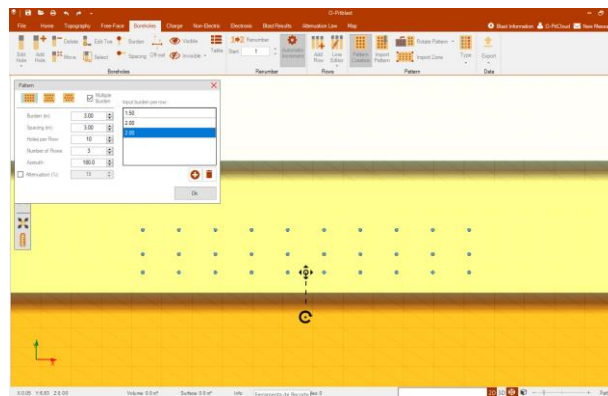


Fig. 167 – Editing the burden between rows

10.7.2. Attenuated pattern adjusted to crest, to or crest and toe

In this option the user can (if the crest and toe is defined) attenuate the pattern to the crest, toe or both.

10.7.2.1. Attenuation

If this option is on, the user will have an attenuation on the burden. This value means that the burden is attenuated by, for example, 15% in each row (Fig. 168).

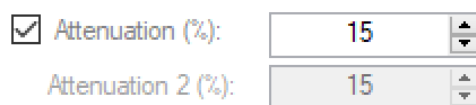


Fig. 168 - Attenuation option



For example, if the user wants the last line horizontal, the attenuation between rows must increase (Fig. 169).

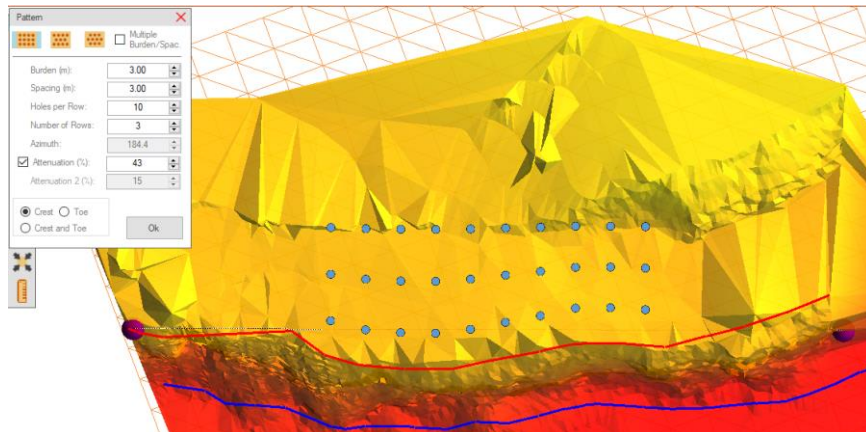


Fig. 169 - Last row horizontal

After that the user has three options. Adjust only to crest (Fig. 170), only to toe (Fig. 171) or crest and toe (Fig. 172).

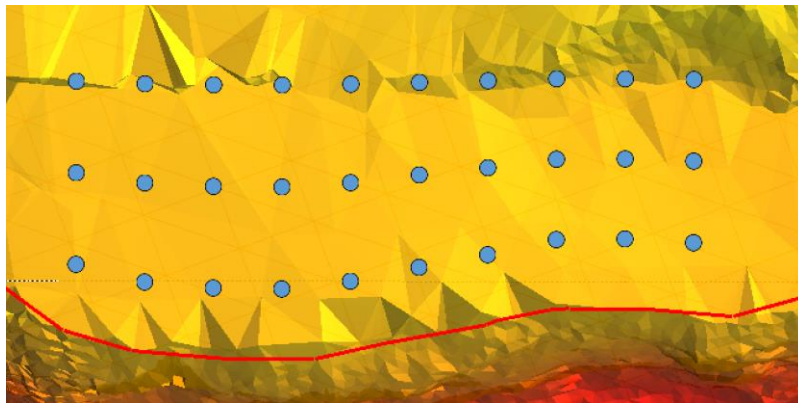


Fig. 170 - Adjusted to crest

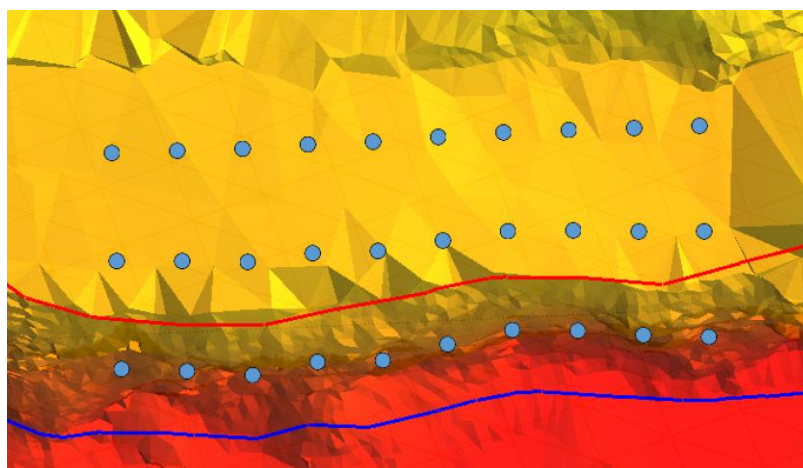


Fig. 171 - Adjusted to toe (the blue circles represent the toe of the borehole)

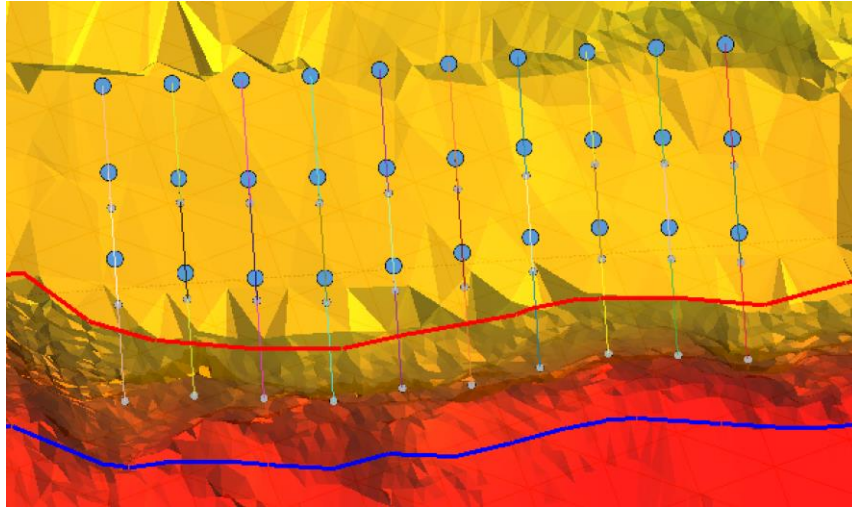


Fig. 172 - Adjusted to crest and toe

If the user clearly sees that the line from one point of the blast to another (on the free face is not well defined can change it) by right-clicking on the purple spheres (Fig. 173).

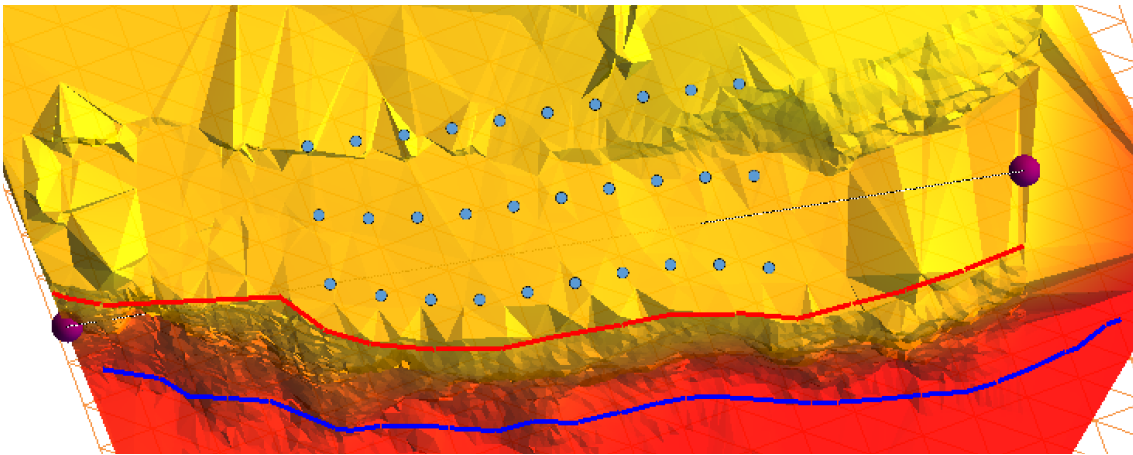


Fig. 173 - Purple spheres (on both sides)

It will pop up a radial menu where the user can:

- Move the point
- Eliminate the point
- Clear all points
- See the coordinates of the points

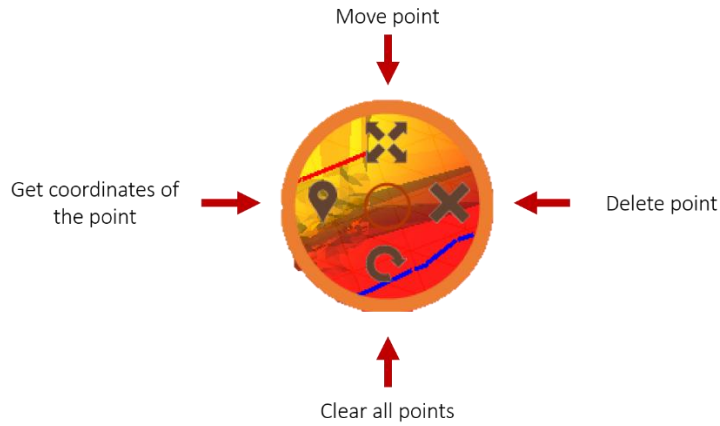


Fig. 174 - Radial menu of attenuation points

10.7.3. Import Pattern - 🗄️

To import a pattern, the user must have a list with hole coordinates. This list can be imported by pressing the **Import Pattern** icon in order to open the importation window (Fig. 175).

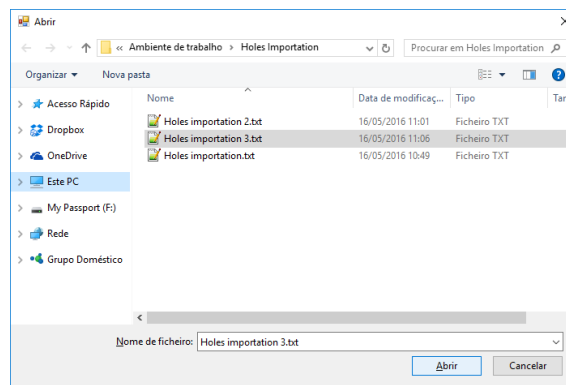


Fig. 175 - Selecting hole coordinates file for importation

The user must define the X, Y and Z coordinates (Fig. 176) and all parameters in Fig. 177 and define if the terrain can be generated by the borehole's collar position (Fig. 178). Also, the user can change the diameter units and change the coordinate system (see chapter 8.1.2).

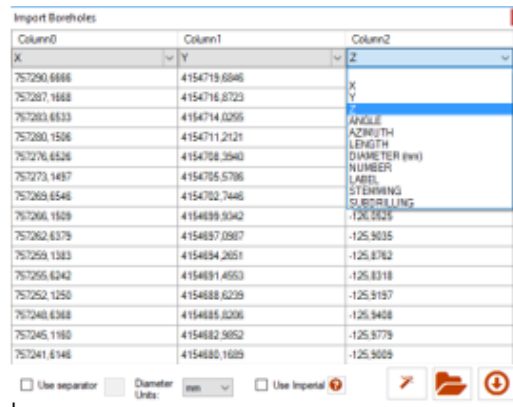


Fig. 176 - X, Y and Z coordinates definition

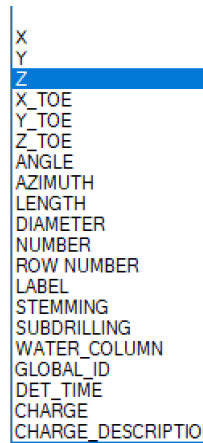


Fig. 177 - Parameters to import holes

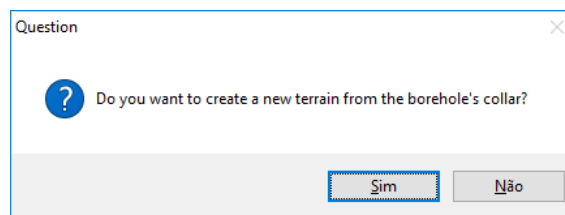


Fig. 178 - Terrain from borehole's collar

The final stage of hole's importation, and if the hole's length was not imported, it is necessary to define it. It can be possible by defining the **Bench Bottom Position** or by establishing a **Borehole Length** (Fig. 179).

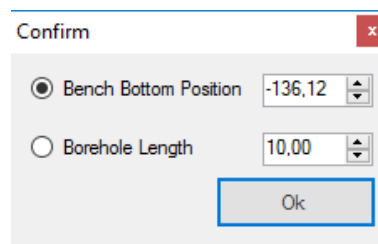
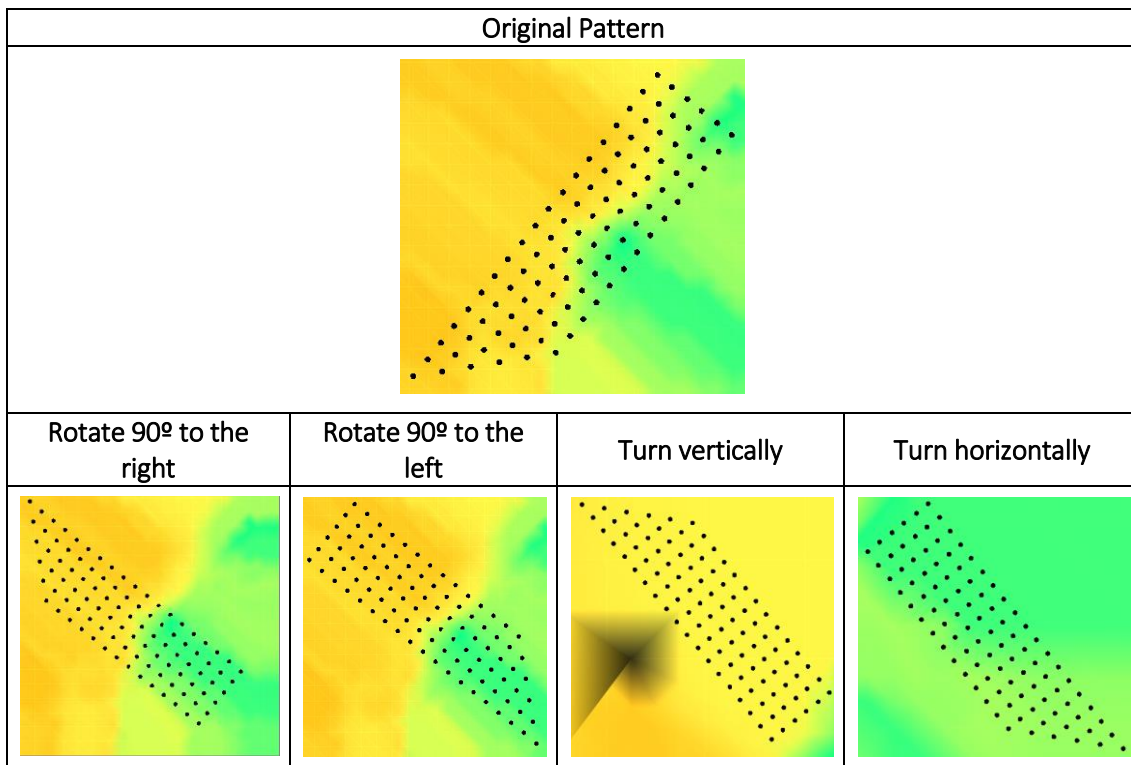


Fig. 179 - Borehole length definition

10.7.4. Rotate Pattern - 🏠🏠

The **Rotate Pattern** tool allow the user to rotate each pattern in the following ways:

- 🏠🏠 Rotate 90° to the right
- 🏠🏠 Rotate 90° to the left
- 🏠🏠 Turn vertically
- 🏠🏠 Turn horizontally



To use this tool is necessary to have one point into consideration: if the transformed holes are positioned out of the existent terrain they will not be moved. For that the user must expand the terrain previously to the pattern transformation.

10.7.5.Import Polygon -

To import a blast polygon, the user must select the **Import Polygon** icon, selecting the polygon file and define the X and Y coordinates (Fig. 180).

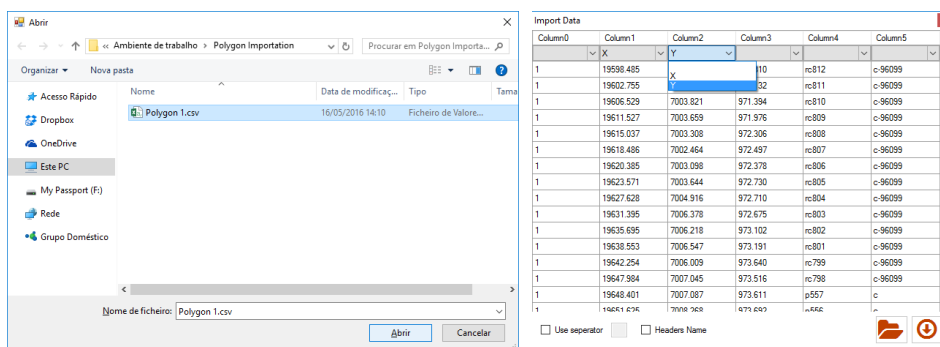


Fig. 180 - Polygon importation (file selection)

Automatically, the pattern creation tool will generate holes inside the polygon which ones the user will be able to edit their characteristics on the **Pattern Characteristics Window** and confirm that action (Fig. 181).

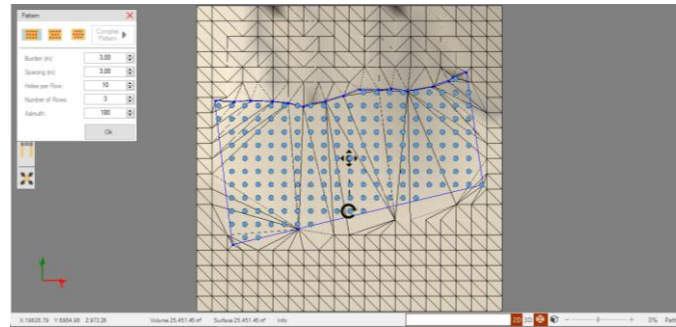


Fig. 181 - Edition of polygon pattern

10.7.6. Type -

In order to define the hole type ID (for a conjunct of holes), the user must do a selection around a set of holes and, in the **Type** expansion tab, select the color for each selection (Fig. 182).

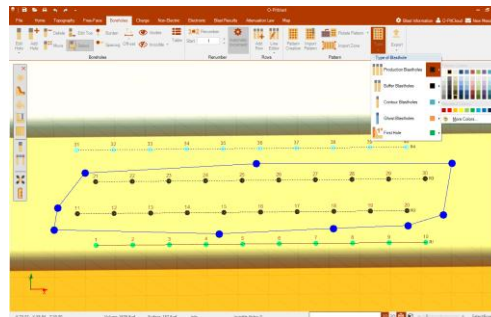


Fig. 182 - Hole type selection

To edit the Type ID to an individual hole the user can appeal the **Radial Menu** (Chapter: 6.8).

10.8. Export pattern

The user can export the pattern no .csv, IREDES or .dxf. Also, it can export the coordinates of the center of the blast in .txt.

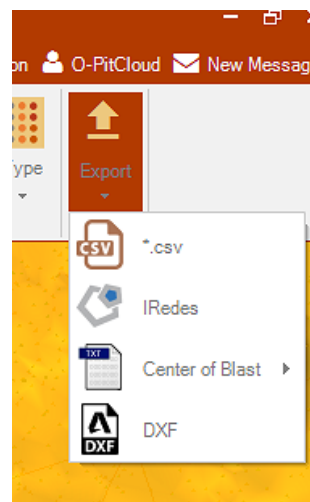


Fig. 183 - Export pattern options



When exporting, the user has the option to choose between some fields that he wants to be exported (Fig. 184).

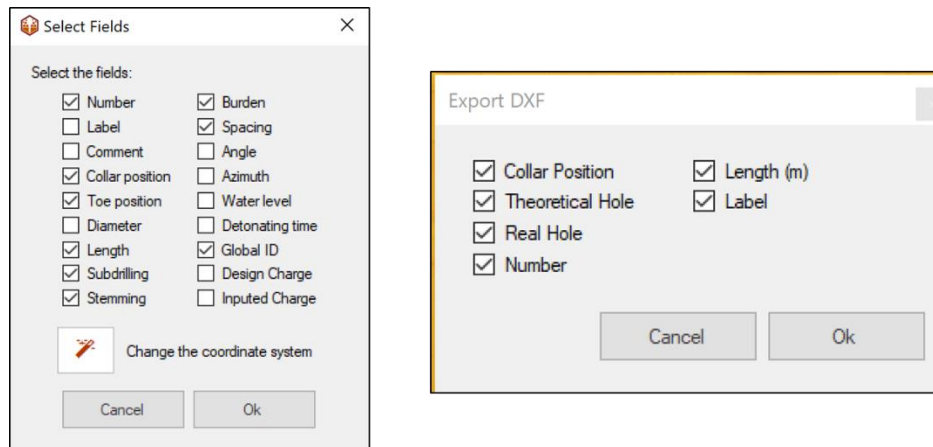


Fig. 184 - .dxf and .csv fields to export

11. Charge

On this module the user has multiple options to help him charging the holes in different ways.



Icon	Description
	Edit Rule Edit charge rules
	Add Charge Add charge
	Discharge Unload holes
	Select Select holes
	Import charge Import a local file with charge information
	By powder factor Charge your holes by defining a limit of powder factor

11.1. Add Charge -

In the charge edition panel, the user will be able to define the charge of individual or a conjunct of holes. Through the **Radial Menu** the user can access to the charge tab of each hole and apply the desired charge by adding elements in the **Quantity of Elements** option (Fig. 185).

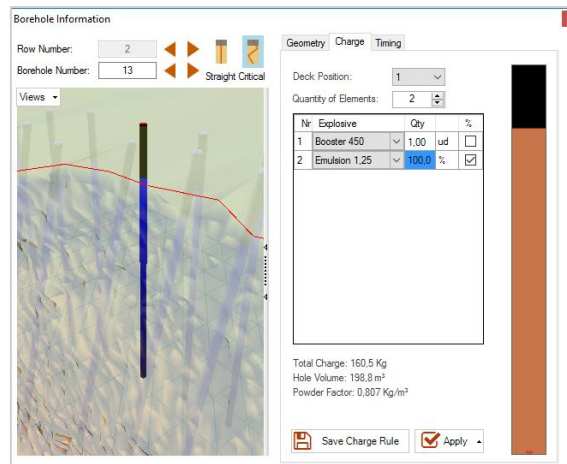


Fig. 185 - Charge Tab Window

11.1.1. Add Primer (Booster)

To add a primer (booster) the user must select it from the dropdown list of the added element and introduce the quantity of the components. The percentage (%) is not available for this element.

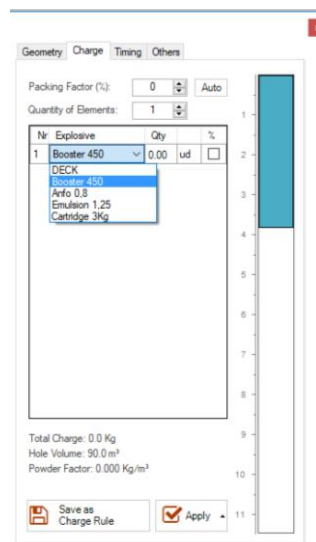


Fig. 186 - Adding primer

11.1.2. Add Column Charge

To add the column, charge the user must add another element and select from the dropdown menu the desired component. There are two options to add cartridges or bulk explosives:

- by percentage: the user selects the hole percentage to be filled by the product (Fig. 187 A)
- by meters: the user selects the meters to be completed by using the product (Fig. 187 B)

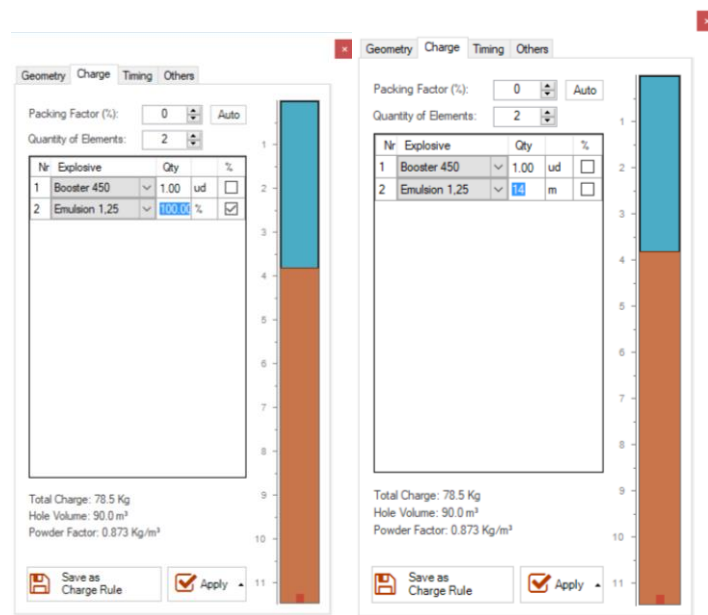


Fig. 187 - Left (A): Adding column charge by percentage; Right(B): Adding column charge by meters

11.1.3. Add Cartridges

The addition of more than one product must follow an order, this means, that the first element to be added will be plotted in the bottom of the hole and the following ones above each other's.

To add a cartridge, the user can also select by quantity or percentage. Nevertheless, in this case the charge model will present the number of cartridges to be loaded (Fig. 188). After creating the charge column, the user can apply a **packing factor** to all boreholes (on the top of the page) and define the percentage that he wants.

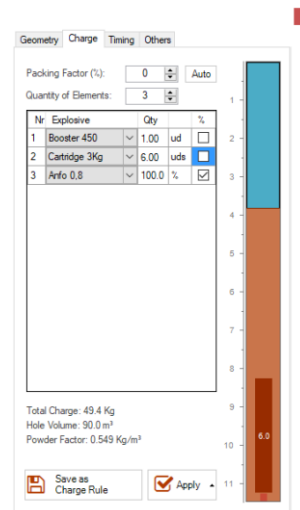


Fig. 188 - Add Cartridges and packing factor



11.1.4. Apply Charge Rule

The user can mark the option **Apply** and choose which holes he wants to apply the charge rule.



Fig. 189 – Apply button

To enable the option to apply a saved rule to a set of holes, the user must check the **Checkbox** on the **Charge Tab** (Fig. 190).

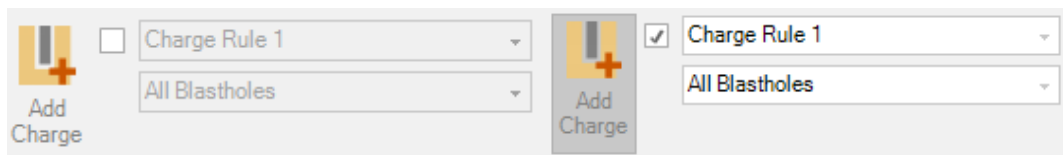


Fig. 190 - Applying Charge Rule

The user must select the charge and the selection to apply the rule and click in the **Add Charge** icon (Fig. 191).

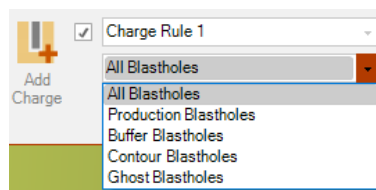



Fig. 191 - Apply Charge rule to a type of holes

11.2. Edit Charge Rule -

To create a rule, the user must define it by selecting the elements on the **Borehole Information Window**. With the charge defined, the user must click on the **Save Charge Rule** button and generate a new charge rule - Fig. 192.

To edit a current rule, the user must click on the **Edit Rule** icon, select the rule to be update, change its parameters and click in the update icon -  - Fig. 193.

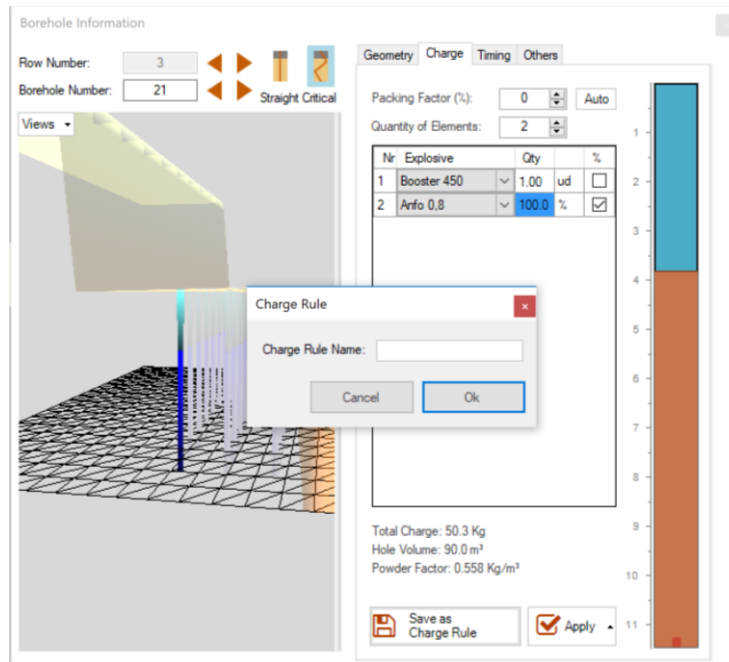


Fig. 192 - Create Charge Rule

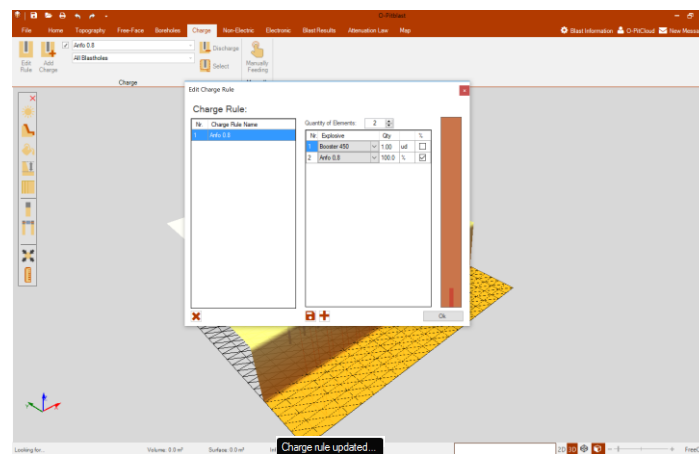


Fig. 193 - Edit Charge Rule Window

11.2.1. Discharge -

The **Discharge** option, when clicked, will eliminate all the charge from the totality of holes or a selection of them.

11.2.2. Select -

The **Selection** tool allows the user to select a set of holes and apply or erase a charge rule (Fig. 191). The user can also use the crest to select, like shown on the polygon (chapter 7.2).

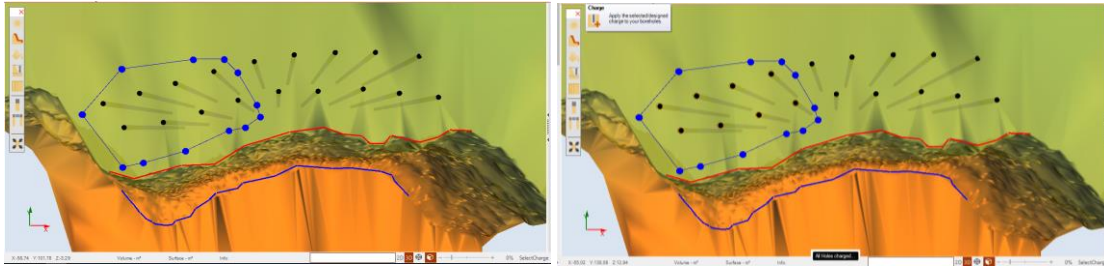


Fig. 194 - Applying charge rule to a selection of holes

11.3. Import charge

In this option the user can import a local file with boreholes charge information. First, it will open a window to connect the information to the hole number and the respective charge (Fig. 195). Then the user has to select the type of explosive (Fig. 196) and then, select the holes that wants to be charged with that explosive (Fig. 196).

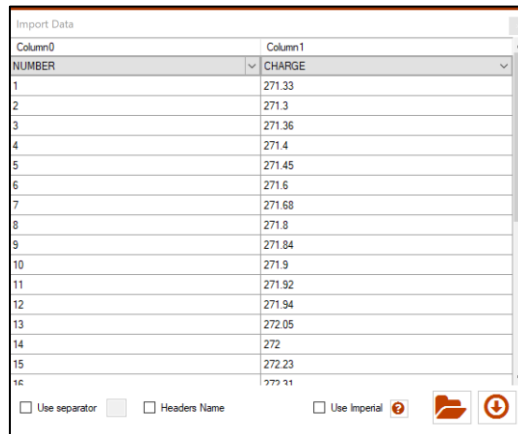


Fig. 195 - Import data (charge) window

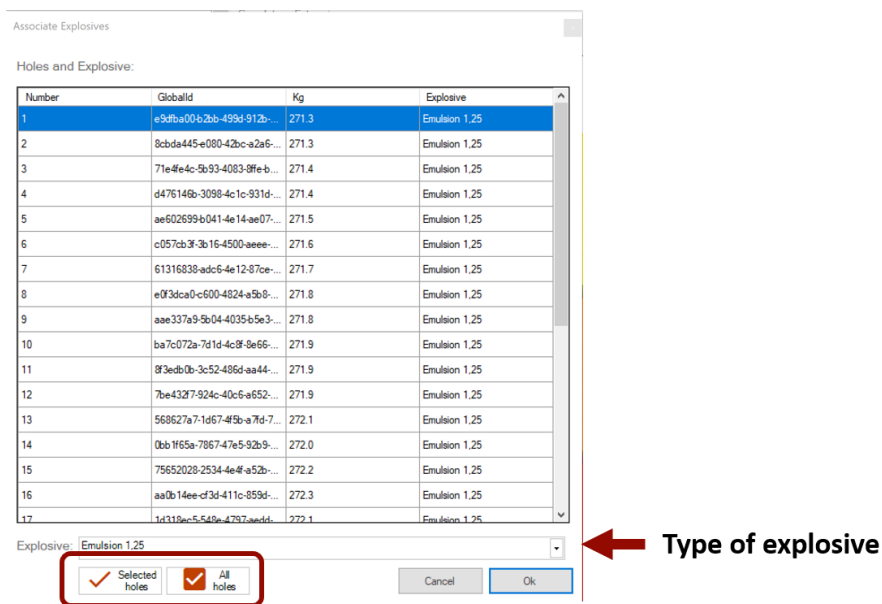
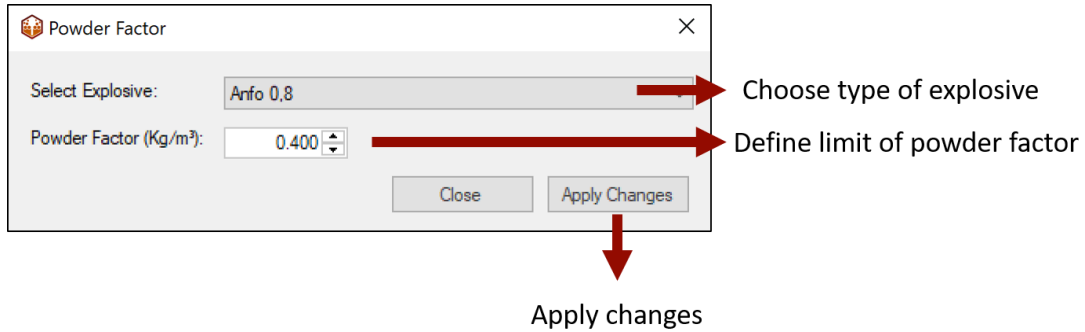


Fig. 196 - Choose type of explosive and associate to boreholes



11.4. By powder factor

The user can charge the holes up to a limit of powder factor. First, needs to choose the type of explosive that he wants to charge the holes. Then needs to define the limit of powder factor to be apply **to every hole**. Finally clicks on **Apply changes**. All holes will be charge **only until the limit** of powder factor (taking into account the borehole length of each hole).



11.5. Manually feeding

The user can charge the holes manually.

First, he needs to add (+) the number of products that he wants to use. To delete must click on the cross (×).

After that, the user chooses the **total quantity** of explosive that he wants to use, and it will have automatically the kg that will be distributed **per hole in average**. To complete the action, just needs to click on **Apply**.

Nr	Product	Qty	Kg	Use Kg	Per Hole (average)
1	Emulsion 1,25	1000	Kg	<input type="checkbox"/>	33.33

Fig. 197 - Manually charge window



11.6. Complete charge

If in the end the user has some left boreholes that need to be charged with a certain quantity of explosive, he can use this option.

It will open a window equal to **Manually Feeding** but it will open apply the explosive to hole not charged yet (topic 11.5 to know how to use this window).

11.7. Extra charge

If the user wants to order extra charge to the supplier, just need to add it here. It only appears the extra charge on the report (this charge will not charge the holes) as extra charge.

To use it, the user has to add (+) the how many types of explosive he wants to order, the type and associate a quantity (Fig. 198).

To delete needs to click in the (-) button.

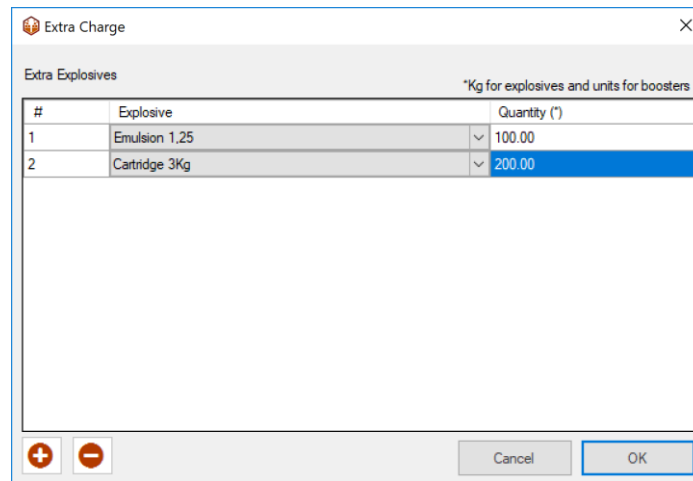




Fig. 198 - Extra charge window

12. Non-electronic detonators

This tab will allow the user to add, edit and delete timing to the boreholes with non-electronic detonators.



Fig. 199 – Non-electronic detonators module

Icon	Description
	Add Timing Add a single connection
	Line Connect holes by drawing a line over them



	Edit Timing	Edit In-hole delay
	Initiation Hole	Select the Initiation point
	Time Tool	Make connections by giving a choose interval between the holes
	Delete	Delete connection
	Select	Select a conjunct of connections
	Surface Detonator	Surface detonator delay selection
	In-hole Detonator	In-hole detonator delay Selection
	Dual Detonator	Dual detonator delay selection
	Hole Shape	Hole not loaded with dual detonator
	Hole Shape	Hole with deck and dual detonator
	Hole Shape	Hole not loaded with In-hole detonator
	Hole Shape	Hole with deck and in-hole detonator
	Tie-up Warning	Hole not connected/without detonator
	Tie-up Warning	Extra Dual Detonator inside a hole
	Tie-up Warning	In-hole and Dual Detonator inside a hole
	Isolines	Show time isolines
	Histogram	Show histogram
	Play	Play blasting simulation
	Pause	Pause the blasting simulation

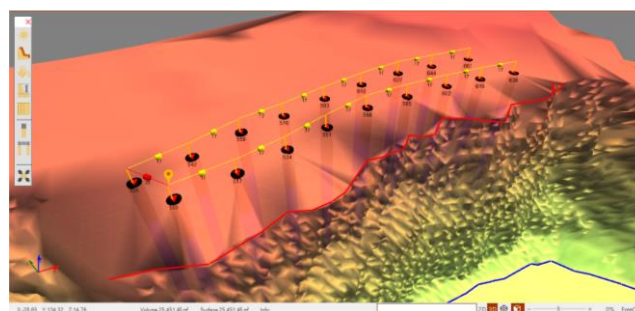


Fig. 200 - Non-Electric connections



12.1.1.1. Add Timing -

To add a connection, the user must select the surface detonator, in-hole detonator or dual detonator to be used on it. Then, with the **Add Timing** icon selected, is just draw a line between two holes to connect them (Fig. 201).

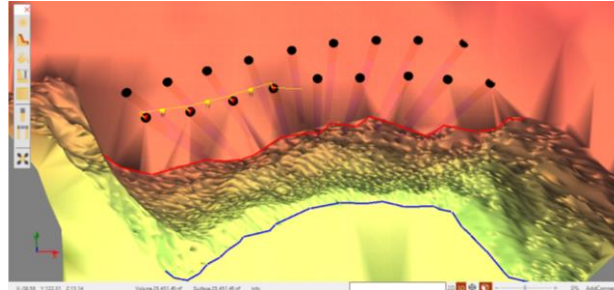


Fig. 201 - Single hole connection

12.1.1.2. Line -

The **Line** button allows the user to draw a line over a set of holes and connect them automatically. To increase the hole's influence area (in the **Toolbox** Chapter: 6.4) is possible to enhance the hole diameter scale, in order to facilitate the line connection.

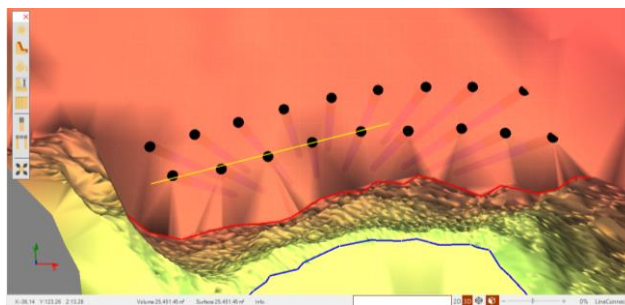


Fig. 202 - Line connection

12.1.1.3. Edit Timing -

The **Edit Timing** tool allows the user to change the in-hole detonator of each hole or a set of them (Fig. 203). This option can be accessed by the **Radial Menu** (Chapter: 6.8) or by the **Timing Tab**.

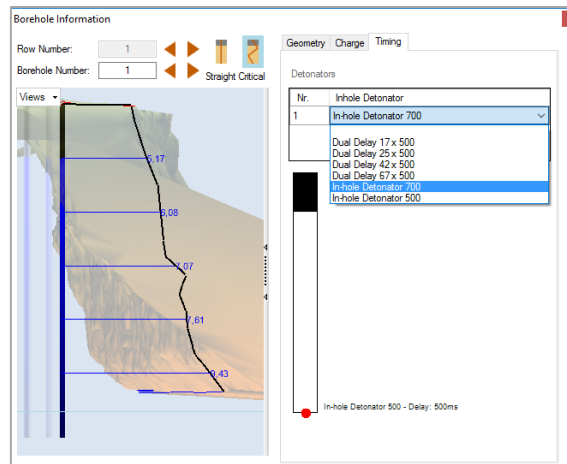



Fig. 203 - Editing in-hole detonator

12.1.1.4. Initiation Hole –

To define the initiation hole, the user must select the **Initiation Hole** icon and left-click on the desired hole. The initiation hole will be marked with the  symbol and it is possible to mark several initial holes.

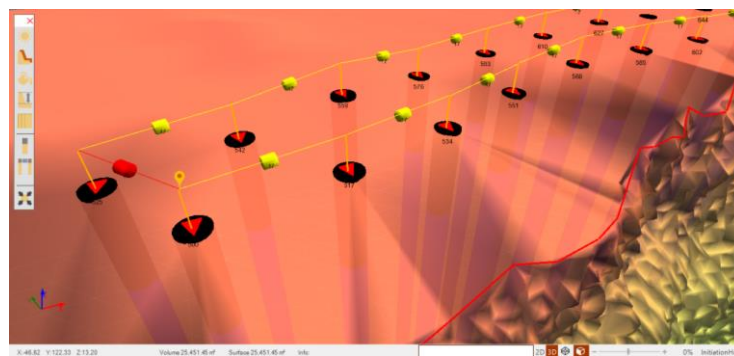


Fig. 204 - Initial hole

12.1.1.5. Time tool -

With this tool the user can make connections with a giving interval between holes. To use it the user must input the number of **Jump Holes** in the tab that will pop-up and click in the hole he wants/or make line.

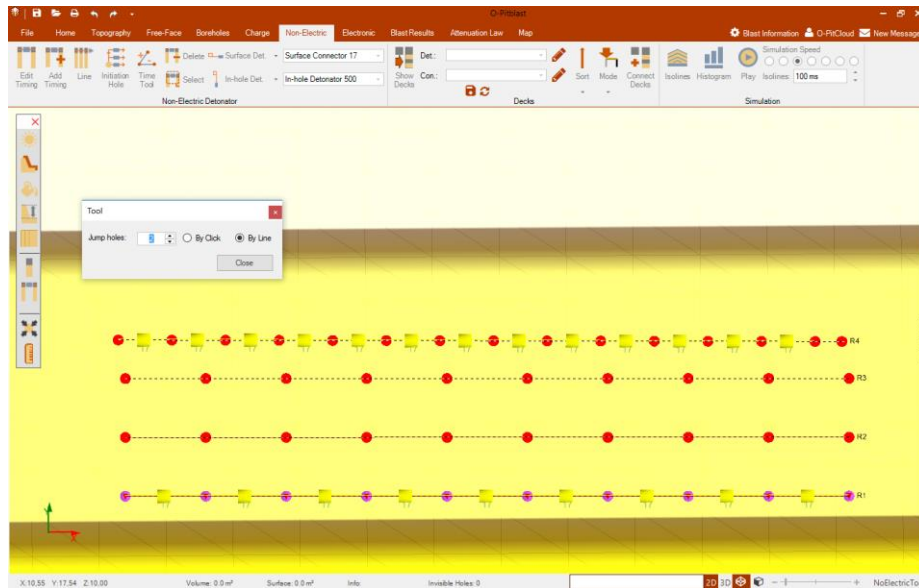


Fig. 205 – Time tool window: first row number of “Jump holes” equals 1; fourth row number of “Jump holes” equals 2

12.1.1.6. Delete Connections –

Clicking in the **Delete Connections** icon, a prompt-message will appear confirming to delete all connections.

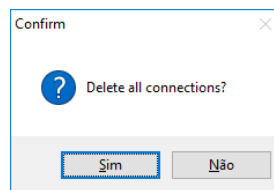


Fig. 206 - Deleting all connections

To delete a single connector, the user can right-click above the connector’s cylinder.

In order to delete a conjunct of connections the user must create a selection area (Point: 12.1.1.7) and click on **Delete Connection** icon (Fig. 207). Note: the detonator cylinder must be inside the selected area.

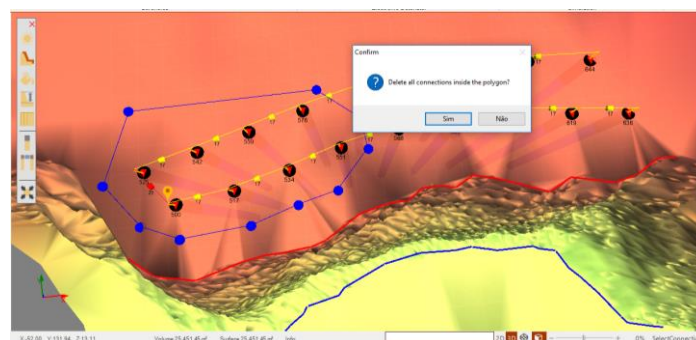


Fig. 207 - Delete a conjunct of connections



12.1.1.7. Select Connections –

The **Select** tool allows the selection of a set of connections in order to delete them or change their characteristics. To proceed, the user must left-click in the terrain and build the polygon around a conjunct of connections (the cylinder must be inside the polygon boundaries) (Fig. 208). To finish the selection is necessary to right-click in order to close the polygon.

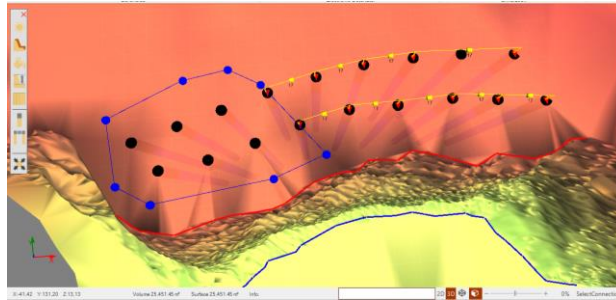


Fig. 208 - Selecting detonators

12.1.1.8. Surface & In-holes Detonators –

Surface detonators are used in the connections of down-lines in each hole. To design a time sequencing recurring a surface connector and in-hole detonators it is necessary to select each item from the validation boxes in the **Boreholes Tab**.

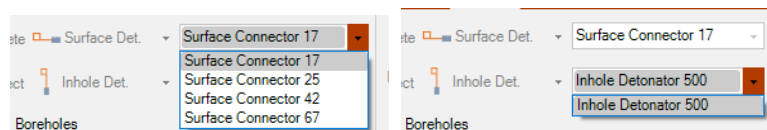


Fig. 209 - Selecting Surface Connector and In-hole detonator

Two holes connected with a surface delay and in-holes detonators presents the scheme of Fig. 211.

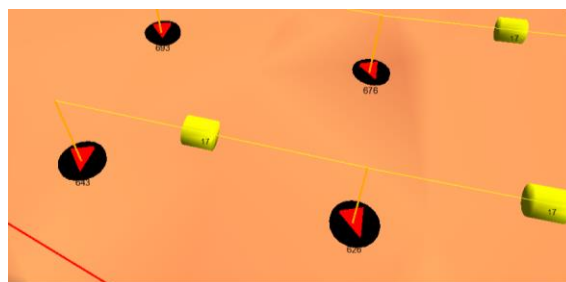


Fig. 210 - Surface delays and in-hole detonator visual feedback

12.1.1.9. Dual Detonators -

Since the application of dual detonators don't require the usage of in-hole delays, so that, the option to select it is blocked (Fig. 211).

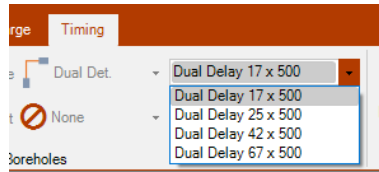


Fig. 211 - Dual Detonator Selection

For dual detonators the visual feedback is presented in the Fig. 212.

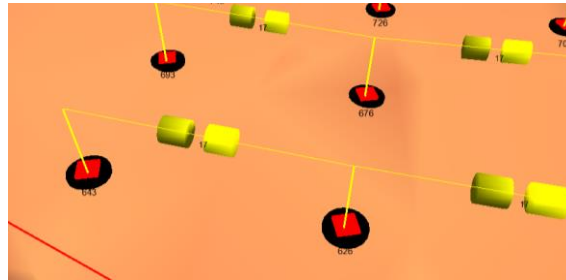



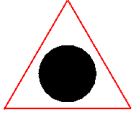
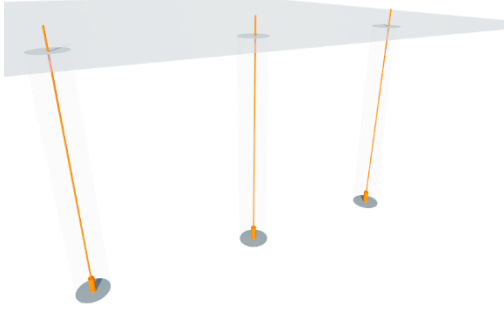

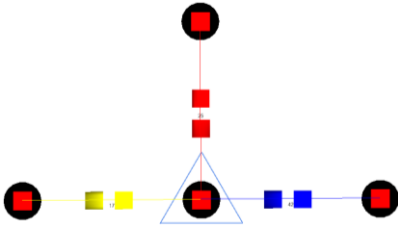
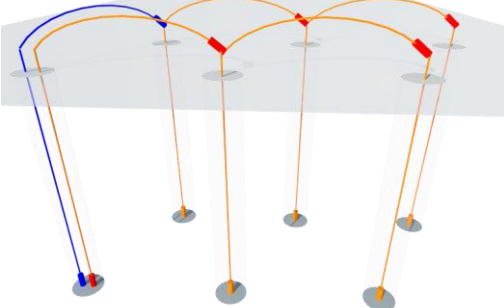

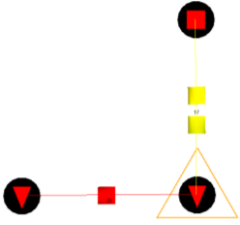
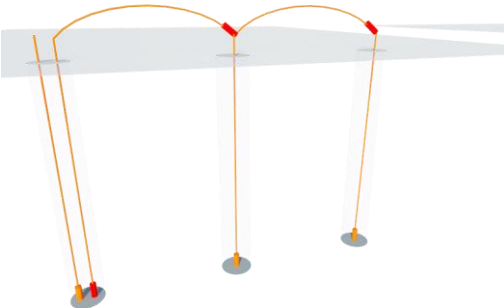
Fig. 212 - Dual Connectors visual feedback



12.1.1.10. Tie-Up Warnings -

O-Pitblast has sever warning signs. The objective of these visual feedbacks is to indicate some tie-up mistakes to the blast engineer (Tab. 1).

Tab. 1 – Tie-Up Warnings

Warning Sign	O-Pitblast	Example	Description
			<p>Hole not connected/without detonator</p>
			<p>Extra Dual Detonator inside a hole</p>
			<p>In-hole and Dual Detonator inside a hole</p>



12.1.2. Simulation

12.1.2.1. Isolines - 🏠

After defining the **Initiation hole** (Chapter: 12.1.1.4) and activating the **Isolines** icon the user will be able to observe the time isolines (Fig. 213).

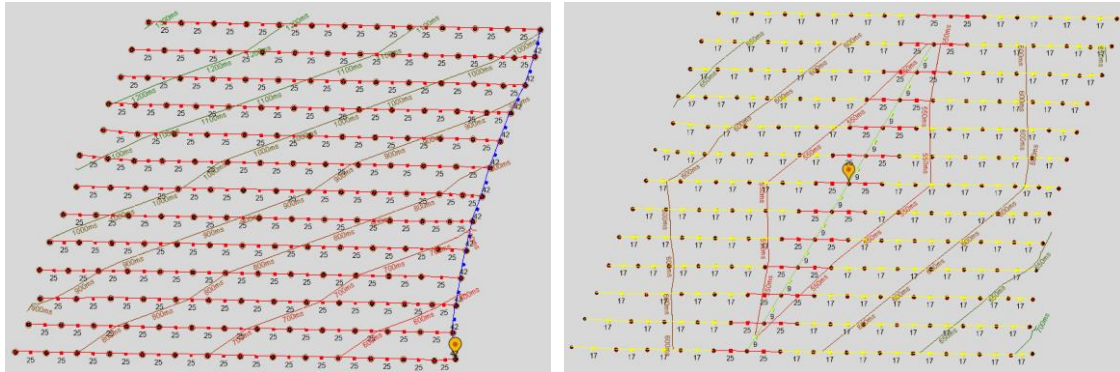


Fig. 213 - Time Isolines

To change the time isoline's interval, in the **simulation** section, the user must adjust the box presented in the Fig. 214.

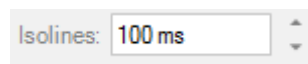
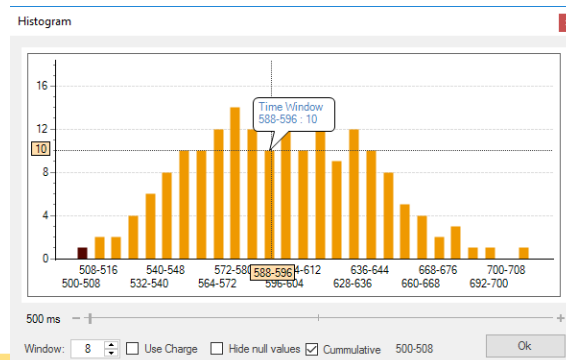


Fig. 214 - Adjust Isoline's Interval

12.1.2.2. Histogram - 📊

The Histogram gives a graphic feedback of the behavior of the tie-up applied to the project. Analyzing the blast histogram is possible to identify the number of holes initiated at the same time (

Fig. 215) and the maximum instantaneous charge (MIC) (Fig. 216). For the last one, the user must check the **Use Charge** checkbox.



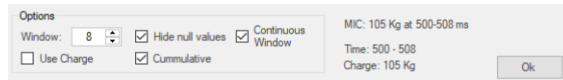


Fig. 215 - Histogram - Number of Holes per Delay

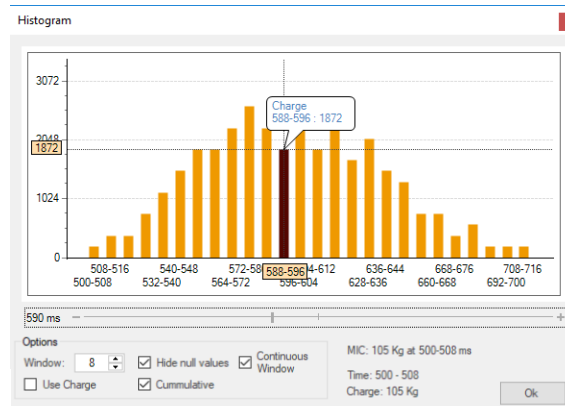
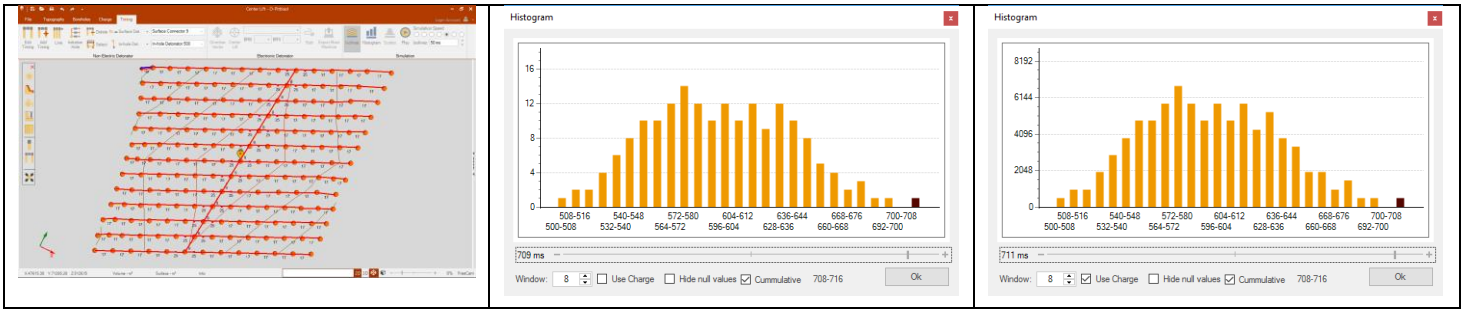


Fig. 216 - Histogram - Charge per Delay

Tab. 2 - Simulation

Simulation	Histogram – Nº Holes/Delay	Histogram – Charge/Delay



12.1.2.3. Play -

The **Play** button will start the blasting simulation. During the simulation, user can press the play/pause button to freeze the image and evaluate possible issues from the time design.

By the Simulation Speed buttons, it is possible to adjust the simulation velocity (Fig. 217).

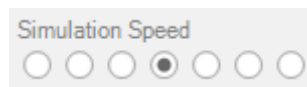
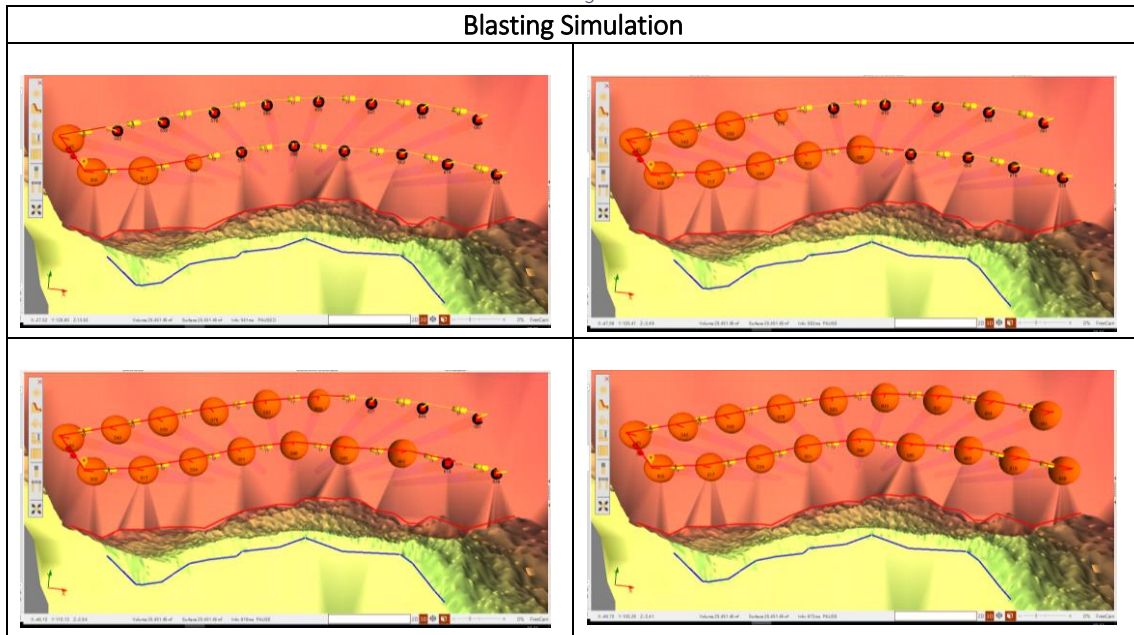


Fig. 217 - Simulation Speed Adjustment

Tab. 3 - Blasting Simulation



12.2. Decks

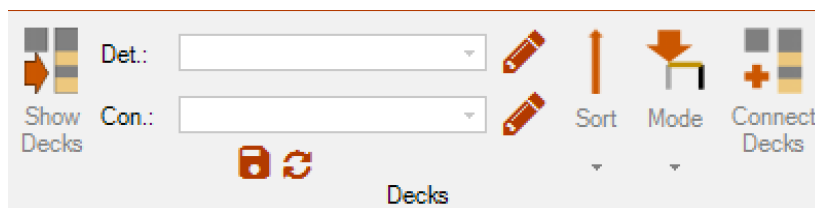


Fig. 218 - Decks options



This option allows the user to add timing to holes with decks. First of all, the user must choose the decks that he wants to use by clicking on the pencil (✎). The user chooses the detonators that he wants to use on decks () and add them by click on the arrow (◀).



Fig. 219 - Add detonator window

After choosing the time for the decks, the user must define if wants to connect from the bottom or from the top (↑). Then chooses the **Mode** to connect decks: surface in-hole, dual in-hole or in-hole connection (Fig. 220).

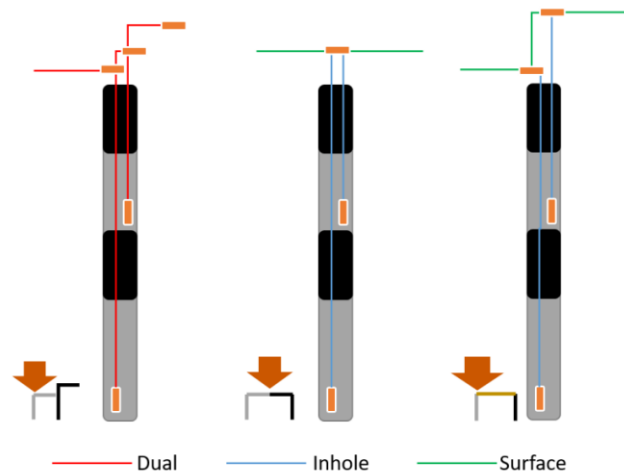


Fig. 220 - Type of deck connections

After those steps, the user clicks on connect decks button (⇨) and left click on the holes he wants to connect.

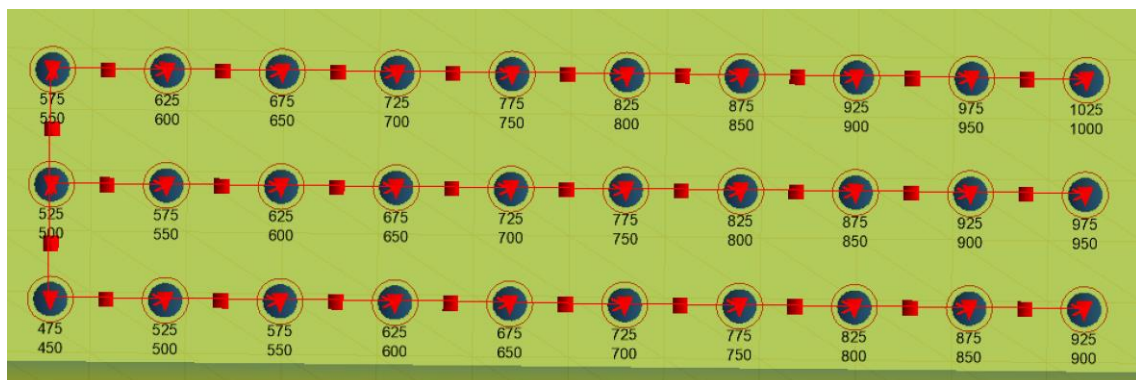


Fig. 221 - One deck per hole (decks with connector of 450ms)



If the user clicks on **Show Decks** will see how many decks every hole has and the timing.

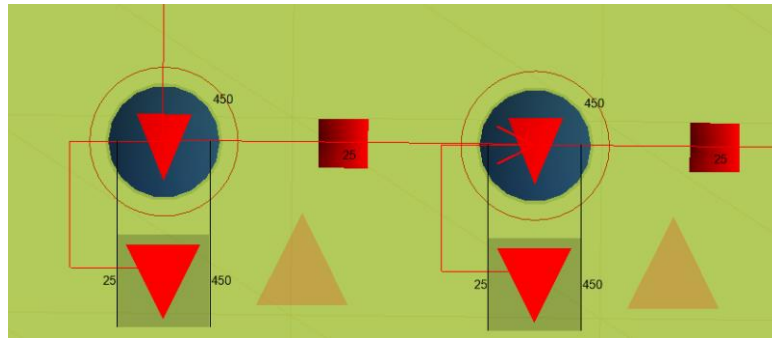


Fig. 222 - Show decks option

12.3. Relief Tool

The relief tool shows the relative difference of blasting time of each hole in one pattern.

Once selected the user will see a column with color and timing in (ms) and the gradient of colors on pattern.

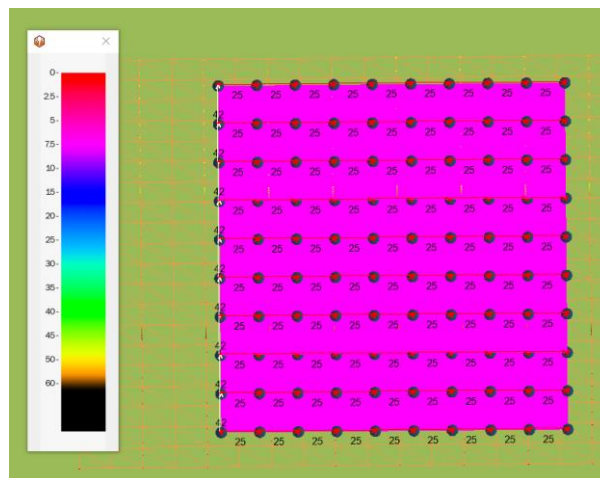


Fig. 223 - Relief tools

12.4. Add extra detonators

The user can add extra detonators in one (or more) holes. Just needs to left click twice in one hole and open the timing tab ().

He clicks on plus sign (+) to add extra detonators and left clicks along the hole to position them. To delete just clicks inn the garbage sign (🗑).

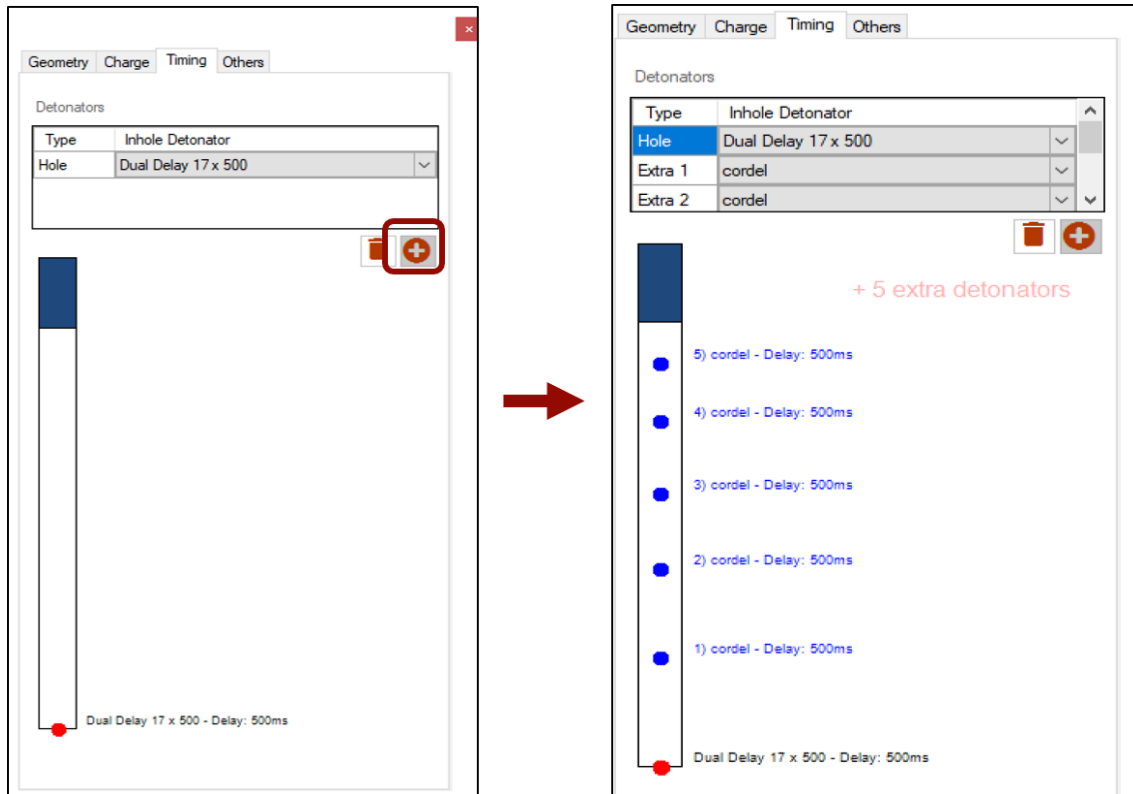


Fig. 224 - Adding extra detonators

13. Electronic Detonators

This tab will allow the user to add, edit and delete timing to the boreholes with electronic detonators.

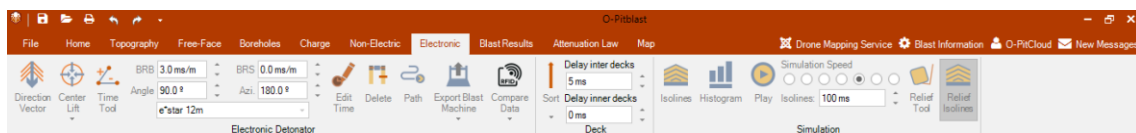


Fig. 225 – Electronic Detonators Module

Icon	Description
	Direction Vector Make connection with the possibly to define the direction of the blasting
	Center Lift Make a center lift blasting
	Time Tool Multiple directions Make Inter-Rows and Inter-Holes connections



Edit Time	Change time connections individually (hole by hole)
Delete	Delete connection
Isolines	Show time isolines
Histogram	Show histogram
Play	Play blasting simulation
Pause	Pause the blasting simulation

13.1. Direction Vector

To use this button the user must have boreholes. Then the user must select the direction that he wants for the blast.

Is possible to change the **Burden Relief Burden**, **Burden Relief Spacing**, **Angle** and **Azimuth** of the vector that the user wants for the blast.



Fig. 226 – Parameters that change the direction vector

The user can move the arrow or point it to anyplace he wants.

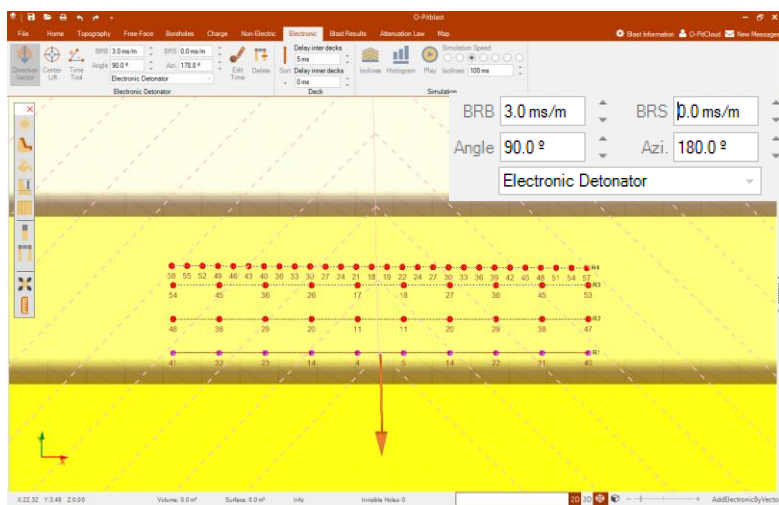


Fig. 227 – Direction Vector window



13.2. Center Lift -

The user can simulate a center lift blasting by click on the **Center Lift** button. It will appear a blue circle that can be moved around the blasting area, to create the condition that the user wants.

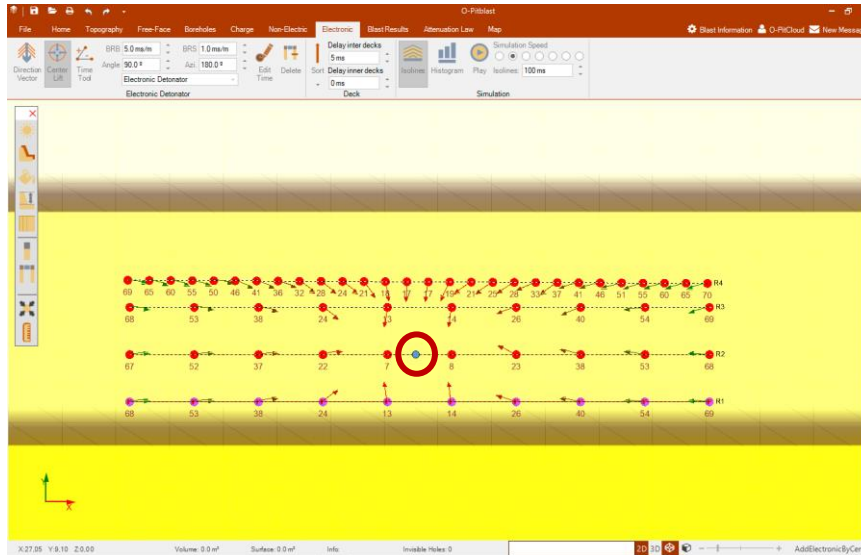


Fig. 228 – Center lift window

Inside of this option the user can use the tool **multiple direction**. The user draws the direction arrows from the center lift point and choose which BRB will be associate to that arrow (they are referenced by color). To **move** the center lift, the user must use **ctrl** and with **left button of mouse** drag the point.

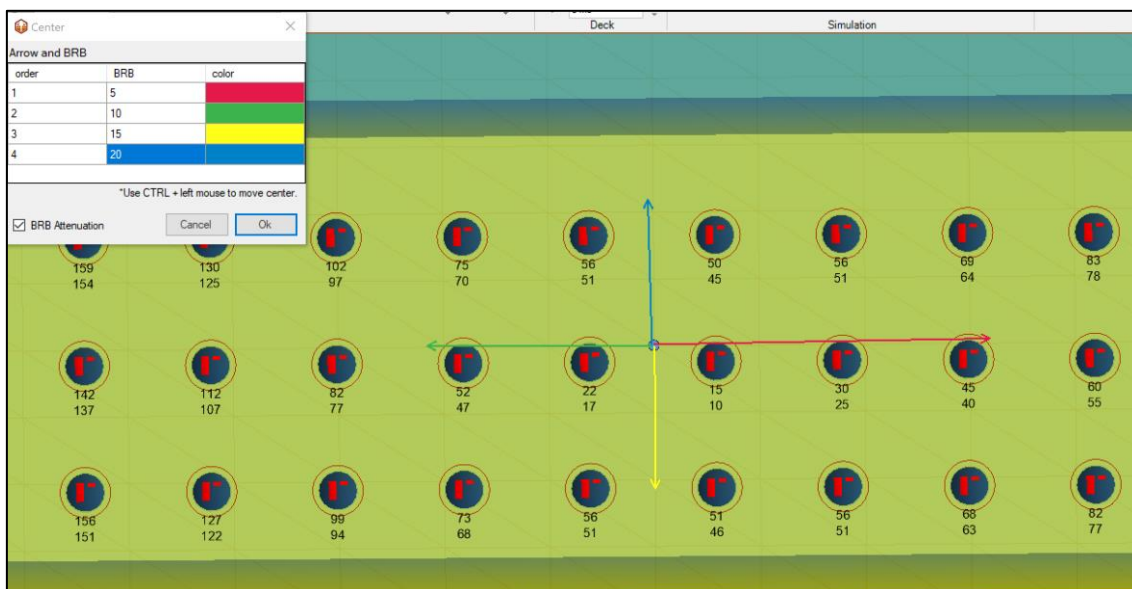


Fig. 229 - Multiple direction option



13.3. Time tool -

With this tool the user can create different times between rows and lines. It will pop-up a window that allows the user to choose the time that he wants and change the time **Inter-Rows** or **Inter-Holes**.

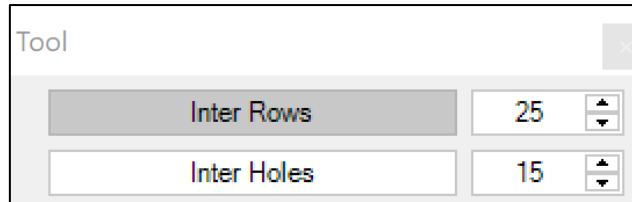


Fig. 230 - Time tool tab

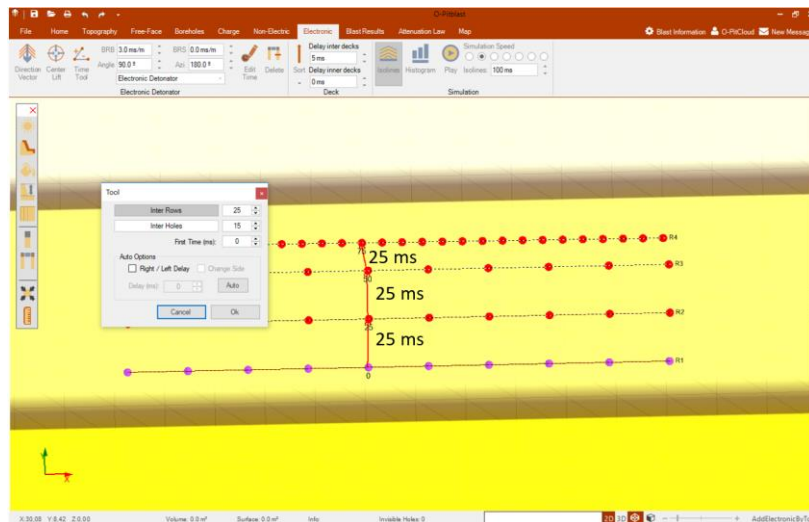


Fig. 231 - Timing between Rows

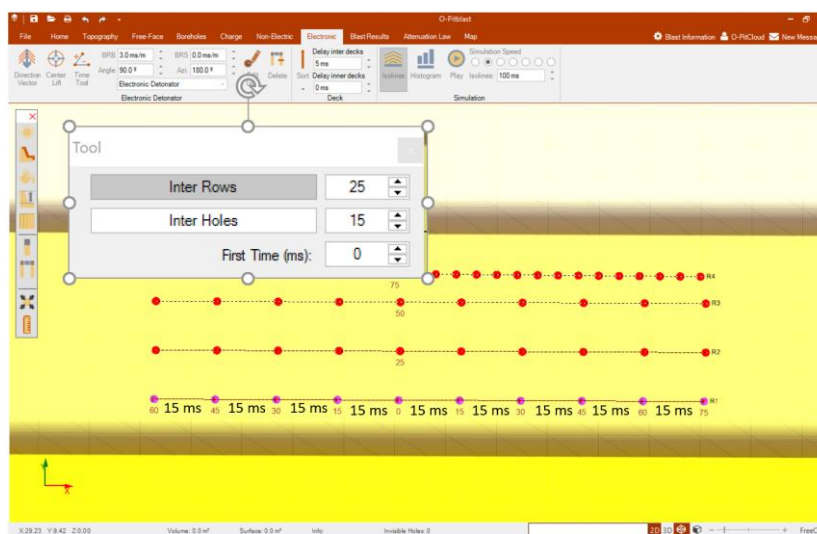


Fig. 232 – Timing between Holes



To use it the user needs to define if he wants to connect first inter-rows or inter-holes, choose the time and start dragging the mouse to create the connection between rows/holes. Also, he can define the first time (of the first borehole). Clicking on **Auto** the connection will be made automatically in inter-holes.

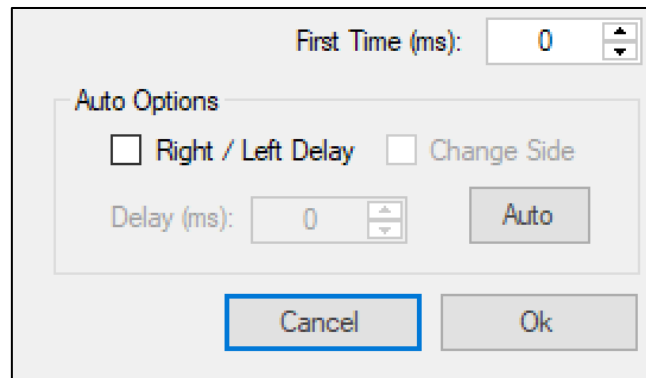


Fig. 233 - Time tool window

To delete a connection the user must right click on the first borehole that he pretends to keep. The connections and all information's after that borehole will be deleted.

13.4. Edit Time -

This tool allows the user to change timing individually (hole by hole). By clicking on Edit Time button a window will appear. In that window the user will be able to edit the in the desired hole.

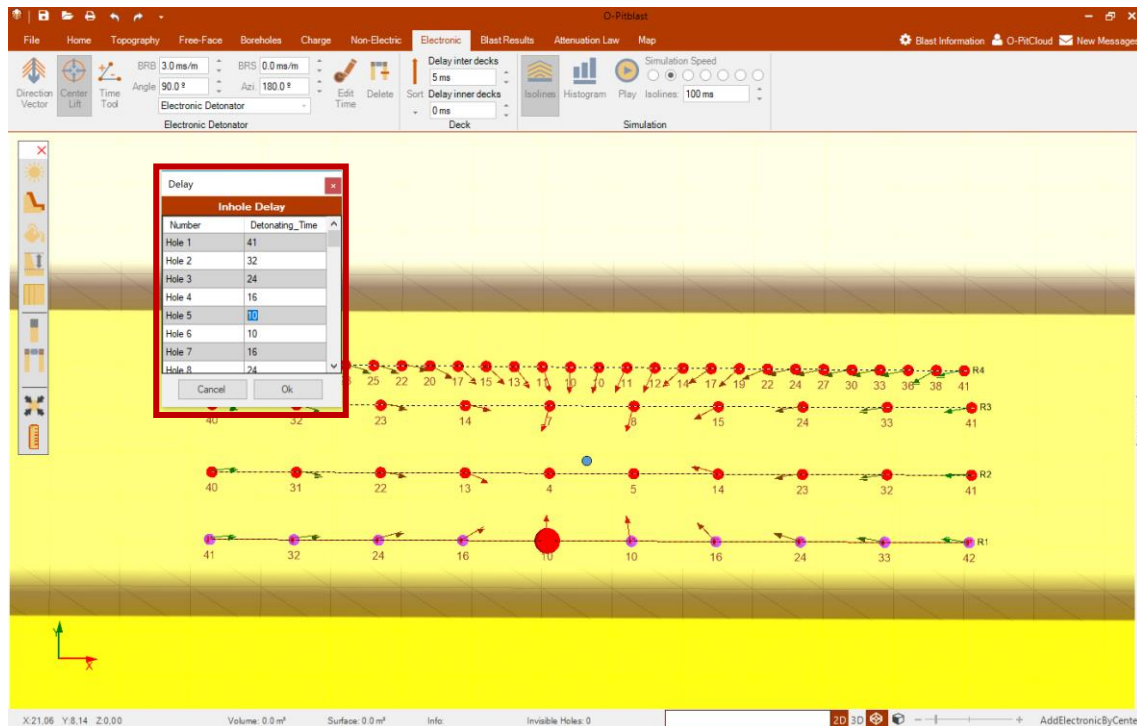


Fig. 234 – Edit Time window



13.5. Delete connections -

By clicking on the **Delete** button the user will delete all connections.

To delete a single connector, the user can right-click above the connector's cylinder.

In order to delete a conjunct of connections the user must create a selection area (Point: 12.1.1.7) and click on **Delete Connection** icon. Note: the detonator cylinder must be inside the selected area.

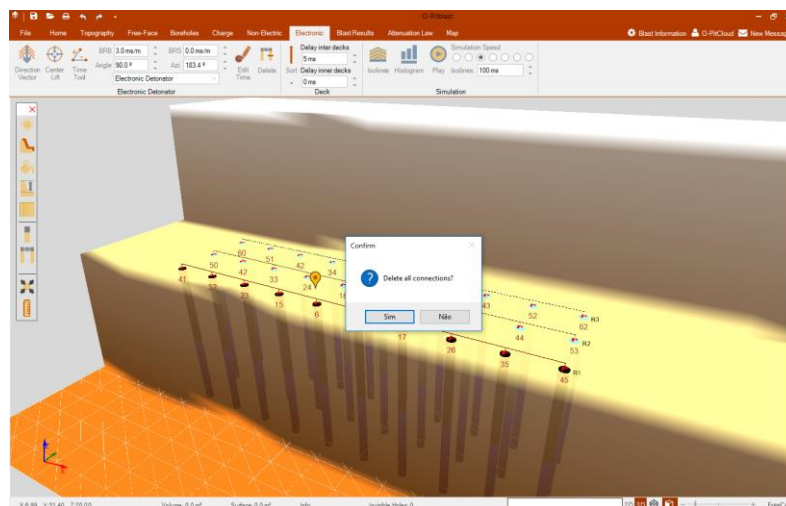


Fig. 235 – Delete all connections.

13.6. Isolines, Histogram, Play and Pause

All of this button works the same way as the Non-Electronic module. The user can check how this Simulation buttons works on Chapter 12.1.2. The only exception is that the user can **Fix** the blasting time automatically.

Holes Blasting at the same time can be fixed on the option fix inside of the **Histogram**. The user chooses the interval in milliseconds that wants to work (by clicking on the plus sign).

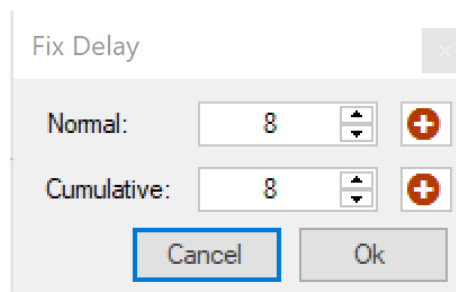


Fig. 236 - Fix delay option

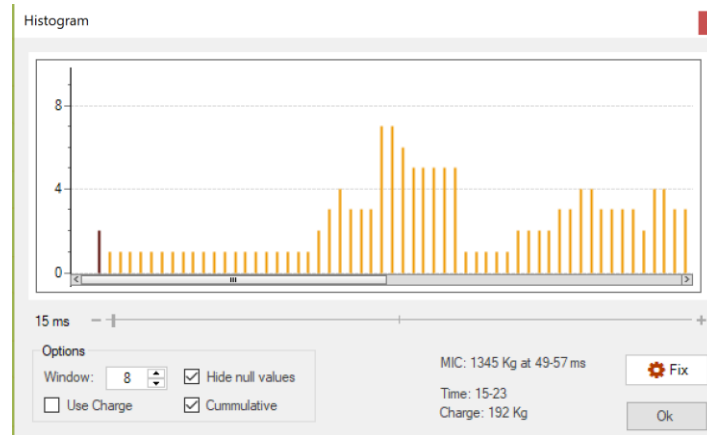


Fig. 237 - Holes blasting at the same time (before fix tool)

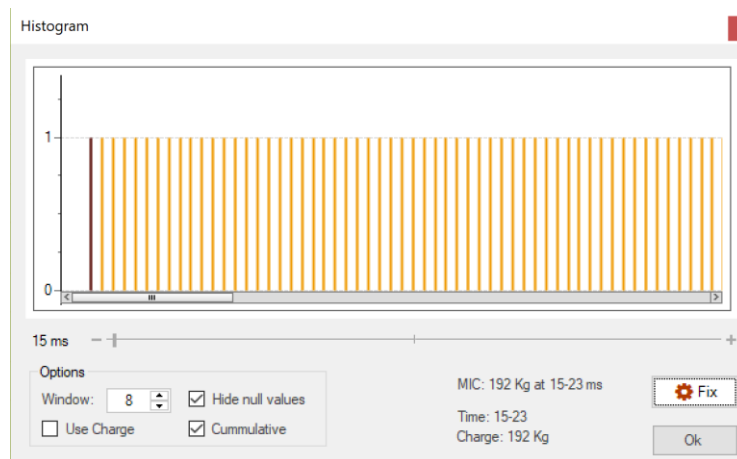


Fig. 238 - Holes not blasting at the same time (after fix tool)

13.7. Relief tool and Relief Isolines

All of this button works the same way as the Non-Electronic module. The user can check how this Relief buttons works on chapter 12.3.

13.8. Decks

In these options, the user needs to choose the delay inter decks, the delay inner decks and if it will start from bottom or top (Fig. 239).

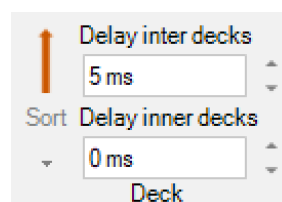


Fig. 239 - Decks options



13.9. Davey Bickford (Blast Machine)




Fig. 240 - Blast Machine communication (Davey Bickford)

13.9.1. Path

This option allows the user to prepare the path that it will be made by the PU. The pattern can have multiple path or just one.

It's important to have in mind that **ALL** holes must have timing associated or it won't be possible to export to the blast machine.

To do the pattern the user clicks on  button and start dragging the mouse between holes to start making the path. To a quick connection just need to click on the middle mouse button.

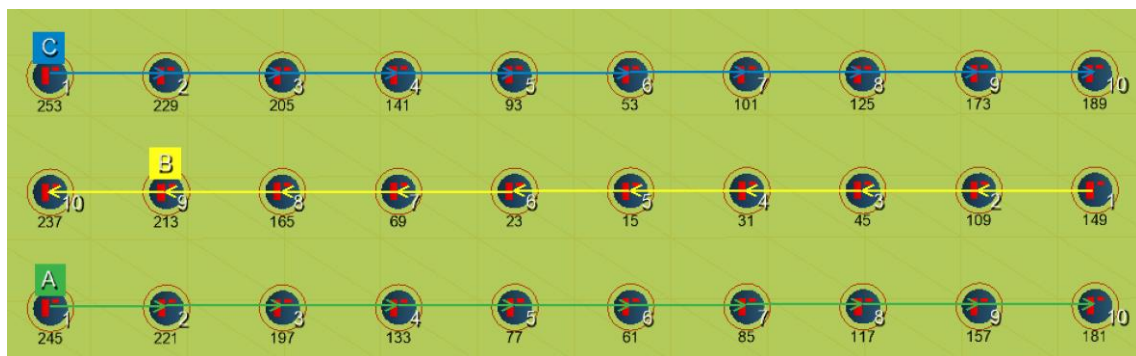


Fig. 241 - Multiple paths



Fig. 242 - Path (quick way)

To delete a path the user must right click on the first borehole that he pretends to keep. The path and all information's after that borehole will be deleted.




13.9.2. Export to blast machine

This option will allow the user to export the paths to one or more PU's. Also, it can save .rhd files (blast plan with the path).


After open the **Export Blast Machine** window the user can change: **display name, full name, site, location** and add **comments**.

Serial Number	Path	SN
	A	0
	B	0
	C	0

Fig. 243 - Export to blast machine window

Inside of this window the user can click on  button and save a local file (.rhd).

To export to blast machine the user needs:

1. Connect the PU to computer;
2. The software will recognize the PU number and the user can associate to a path (Fig. 244);
3. Repeat the previous points if has more than one PU;
4. In the end the user will have every path associated to a PU (Fig. 245);
5. After that, clicks on RFID () button and it will pop up a window asking if he wants to load the path to the PU (Fig. 246);
6. The exportation is complete (Fig. 247).

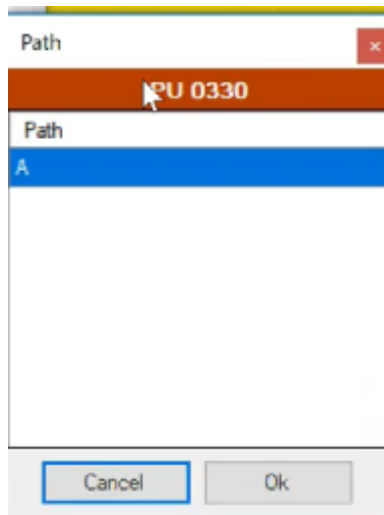


Fig. 244 - Connect path to PU

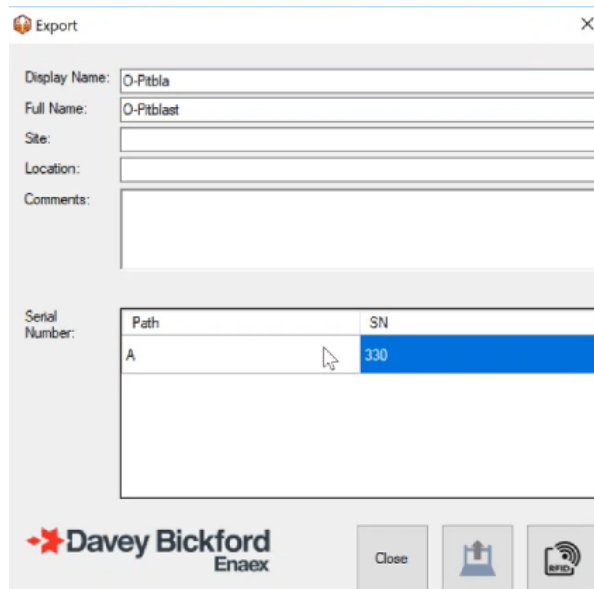


Fig. 245 - Confirmation Path-PU

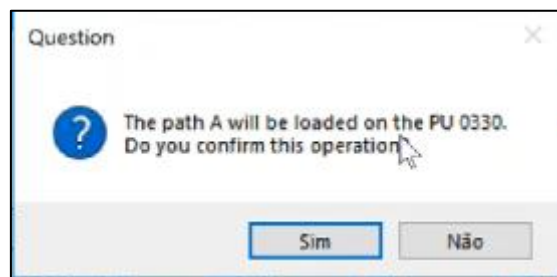


Fig. 246 - Confirmation message to exportation

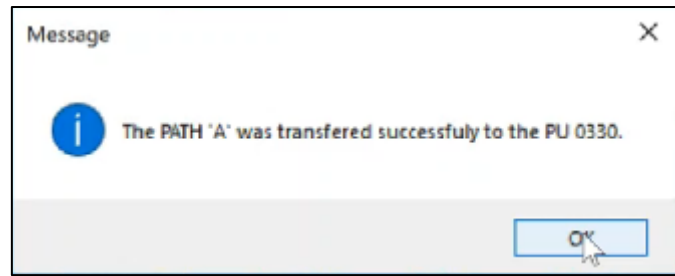


Fig. 247 - Message of successful exportation

13.9.3. Compare data

This option allows the user to:

- Transfer the timing inside PU to the timing on O-Pitblast
- Transfer the timing on O-Pitblast and Update the timing in the PU
- **Put to computer**
 1. Inside of the PU you have the previous information
 2. Click on the button “PU to computer” to transfer the timing of the PU to O-Pitblast (Fig. 250).

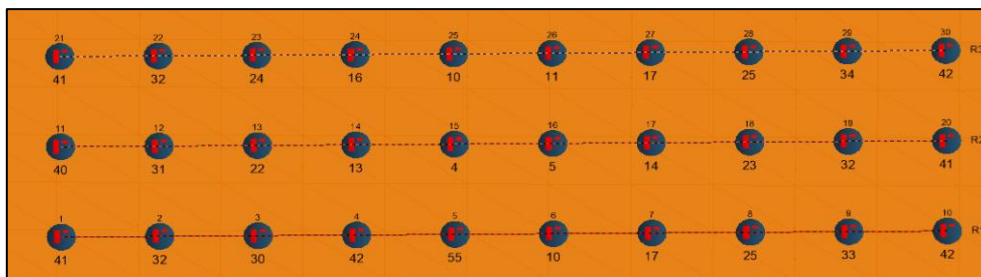


Fig. 248 - Time programed inside of the PU

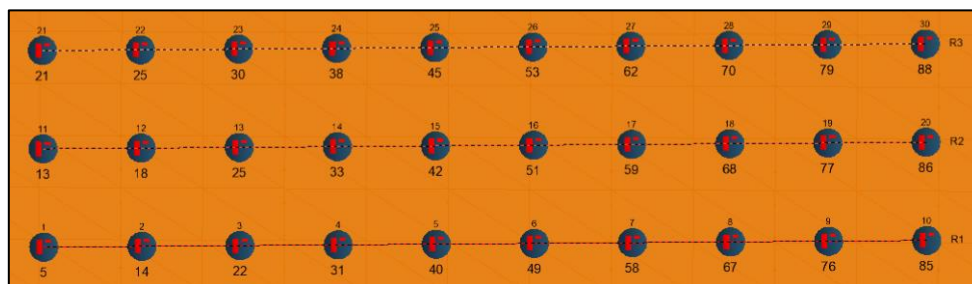


Fig. 249 - Timing on O-Pitblast that the user wants to transfer to the PU



#	Intended Delay	Programmed Delay	Detonator ID
1	5	-	-
2	14	-	-
3	49	-	-
4	58	-	-
5	67	-	-
6	76	-	-
7	85	-	-
8	86	-	-
9	77	-	-
10	68	-	-
11	59	-	-
12	51	-	-
13	42	-	-

Fig. 250 - Option "PU to computer"

- Update timing in the PU after it's programmed
1. The user clicks on the button "Intended to be programmed" (Fig. 251).
 2. Clicks on the button "Update PU" (Fig. 252).
 3. Confirmation message (Fig. 252).

#	Intended Delay	Programmed Delay	Detonator ID
1	113	113	-
2	101	101	-
3	52	52	-
4	40	40	-
5	28	28	-
6	15	15	-
7	7	7	-
8	19	19	-
9	23	23	-
10	26	26	-
11	36	36	-
12	48	48	-
13	61	61	-

Fig. 251 - Intended delay to being programmed

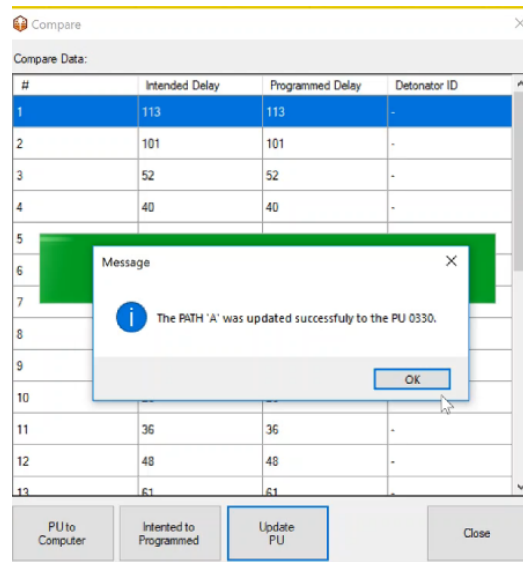


Fig. 252 - Update to PU option

14. Blast results

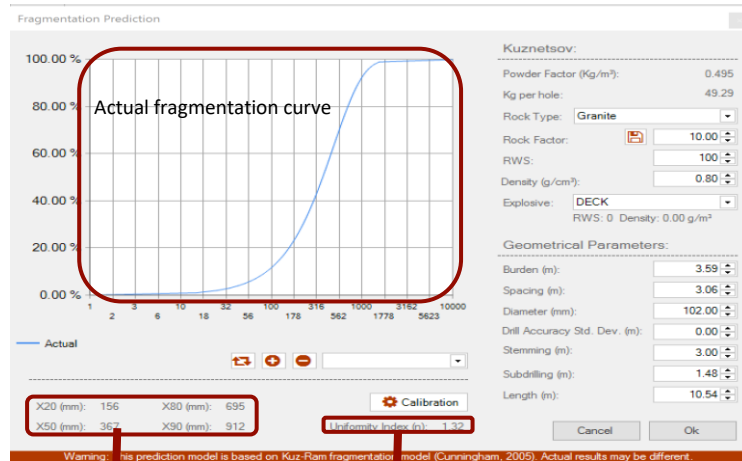
The Blast results Tab presents all the tools and applications for prediction and optimization of fragmentation. Also shows the costs of the selected blast.



Fig. 253 – Blast Results module.

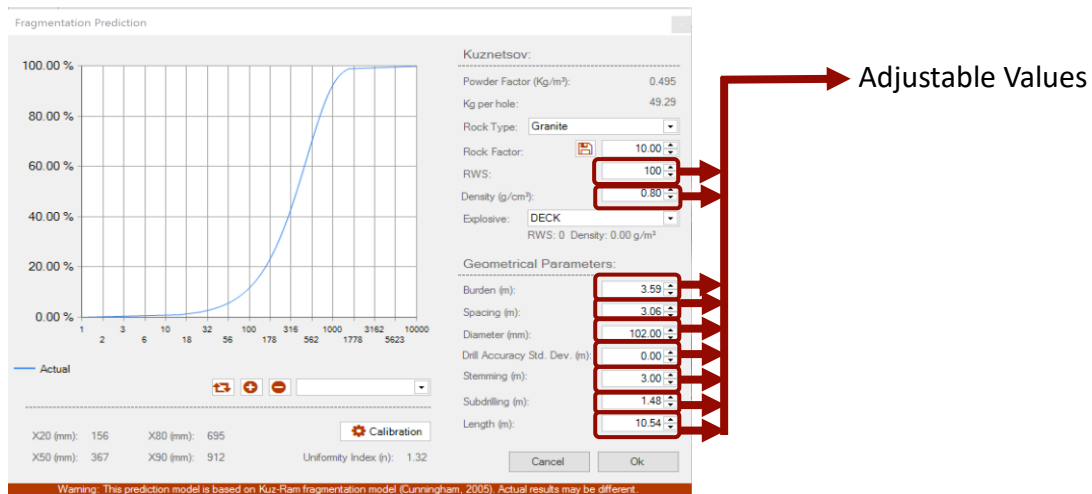
14.1. Prediction

By clicking on the prediction button, it will pop out a window that shows every parameter that the user can adjust and all the actual fragmentation results of the selected curve. The user can also change de **Rock Type** (Chapter 6.3.5.5).



Actual/Selected fragmentation curve results

The user can adjust the RWS, Density (g/cm²), Burden (m), Spacing (m), Diameter (mm), Drill Accuracy Standard Deviation (m), Stemming, Subdrilling(m) and Length (m).



14.2. Add or reset a fragmentation curve


The user can add a new fragmentation curve with new values by clicking on the button **Add+** and writing a new name. To delete the user must click on the button **Delete-**. The user can also clear all the curve by clicking on **Clear List** button .



Fig. 254 – Tab to create or delete a new fragmentation curve

14.3. Calibration

By clicking in the calibration button, the user can input the real values (that were the result of the blasting). Then, the model used in O-Pitblast will update the rock factor and a window will appear



asking if the user wants to confirm the changes (Fig. 255). If the user confirms the rock factor will be updated.

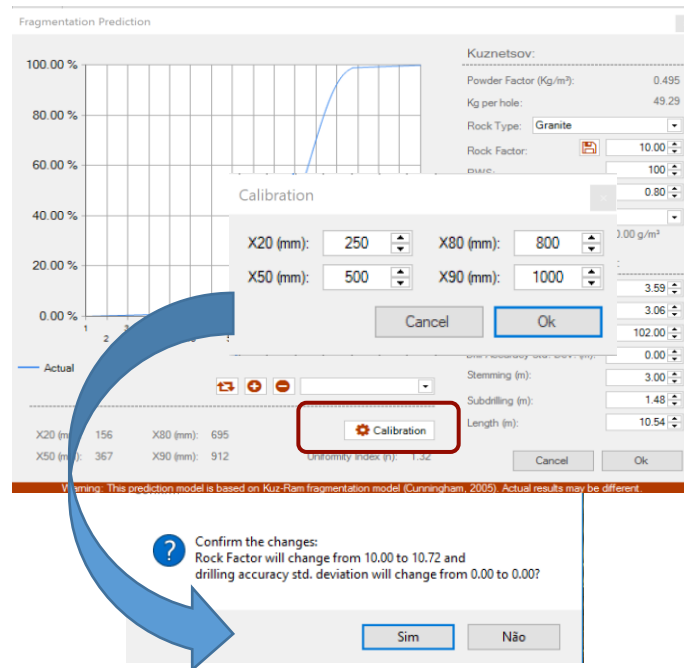



Fig. 255 – Calibration of the rock factor windows.

After this step, the user can save that rock factor by click on the **Update** button .

14.4. Optimization

At this point, the user can make, and optimization of the parameters present on the window bellow. The user can input some information like **Costs of Initiation (per hole)**, **Explosive (per Kg)**, **Drilling (per meter)** (Fig. 256-A). The operator can also add the **Density (Kg/m²)** and **RWS** (Fig. 256 - A).

The user can see the data of the select project (values of the actual design) (Fig. 256-B), that includes the **Diameter (mm)**, **Bench High (m)**, **Burden (m)**, **Spacing (m)**, **Subdrilling (m)**, **Stemming (m)**, **Number of holes**, **Number os Rows**, **Volume (m²)** and **Rock Factor**.

Then the user can define the constraints. Both for Fragmentations or Geometry. The user can define the **Limit (%)** of fragmentation and the **Oversize (mm)** (Fig. 256-C). Can also define the constraints of the **Spacing by burden**, **Stemming by burden**, **Subdrilling by burden**, **Uniformity Index**, **Stiffness Ratio**, **Volume (m²)** and **Oversize (mm)** (Fig. 256-E).

Finally, the user can see the Cost information in dollar (Fig. 256-F).

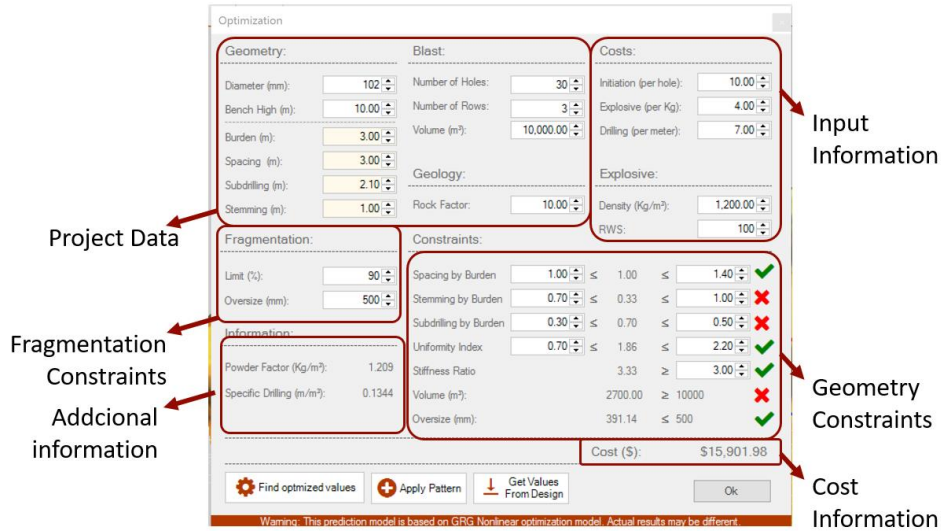


Fig. 256 – A: Input information; B: Project Data; C: Fragmentation Constraints; D: Additional information; E: Geometry constraints; F: Cost information.

14.4.1. Find optimized values

By clicking in this button, the software will find the better values to fit in the Burden, Spacing, Subdrilling and Stemming.

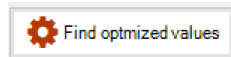


Fig. 257- Optimized value button

If everything is marked green, all the values are optimized and according to the constraints (Fig. 258).

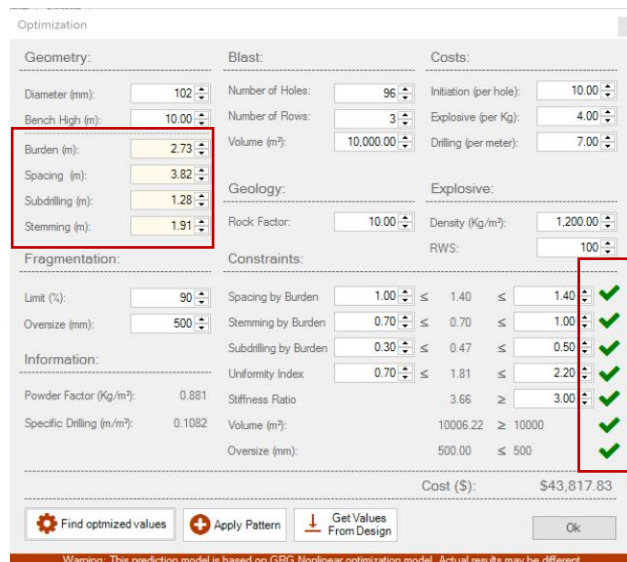


Fig. 258 – Optimized values



14.4.2. Apply pattern

With this button the user can create a new pattern with the new optimized values.

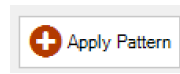


Fig. 259 – Apply pattern button

14.4.3. Get Values from Design

By clicking on the button **Get Values from Design** the user makes a reset to all the optimized values and gets the values from the beginning.

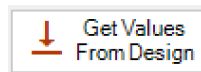


Fig. 260 - Get Values from Design button

14.5. Search: Geometry, Structures and Connections

The search button looks for abnormalities in some parameters like burden, spacing, subdrilling, stemming, length of the borehole (geometric parameters) and if the user as vibration data, this application also shows the critical structures that are going to be affected by the blast (structures parameters). Also, it gives problems with borehole connections, for example, too short detonator (connection parameters). You can see some examples of this messages in Fig. 261.

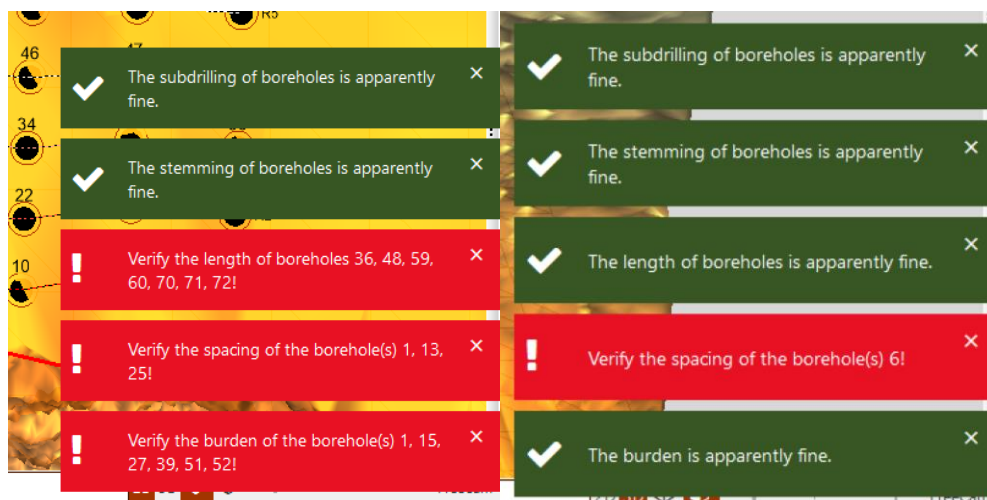


Fig. 261 – Search button results



14.6. Add costs

In this option the user can add extra costs to the blast.

First chooses the costs that wants to add, then chooses the quantity that want to add and finally apply all changes.

Description	Price	Use
Personal	100.00	<input checked="" type="checkbox"/>
Stemming	10.00	<input type="checkbox"/>

Description	Price	Qty	Total	Use
Personal	100.00	0	0.00	<input checked="" type="checkbox"/>

TOTAL: 0.00

And apply changes

Fig. 262 - Add costs window

14.7. Distribution

This option allows the user to see the pattern geometry distribution.

The red part tells us that you have a bad distribution (inclination of the holes, burden, stemming, etc.). The green part tells that it's well distributed (for example, inclination of the first row is well distance of the free face). In case it's blue, tells that is too far from the free face, for example.

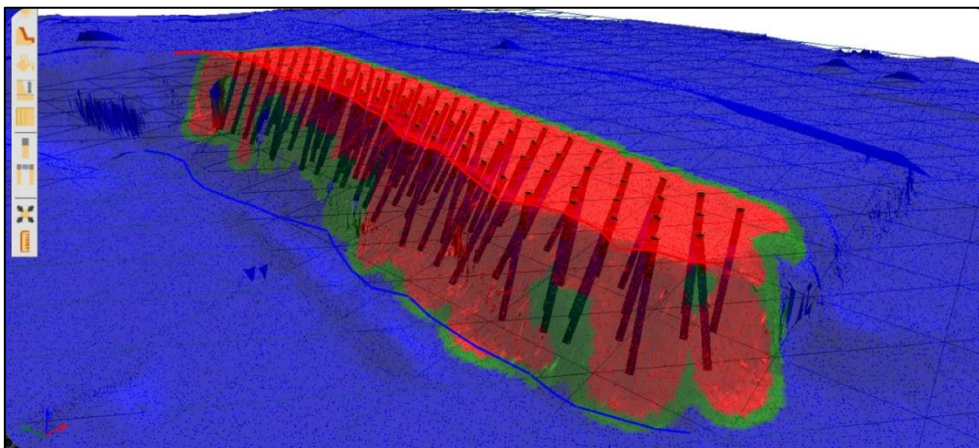


Fig. 263 - Distribution tool



15. Attenuation Law

The Attenuation Law tab presents all the tools and applications to predict and visualize different attenuation laws.

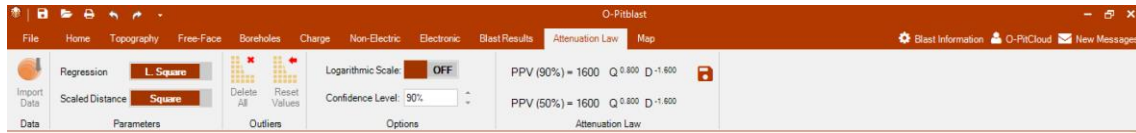


Fig. 264 – Attenuation Law module

15.1. Import data

To start the user can import their data by clicking in the button **Import Data**.






	PPV prediction	07/01/2017 19:37	O-Pitblast files	758 KB
	PPV prediction_2	08/01/2017 02:09	O-Pitblast files	738 KB
	Seismography data	18/09/2017 17:58	Documento de tex...	4 KB

Fig. 265 - Import seismography data

Then for each column the user must put the correct parameter or open a XYZ coordinates file by clicking in the **Open file** button . When everything is ready the user must click on **Import the coordinates** button  (Fig. 266).

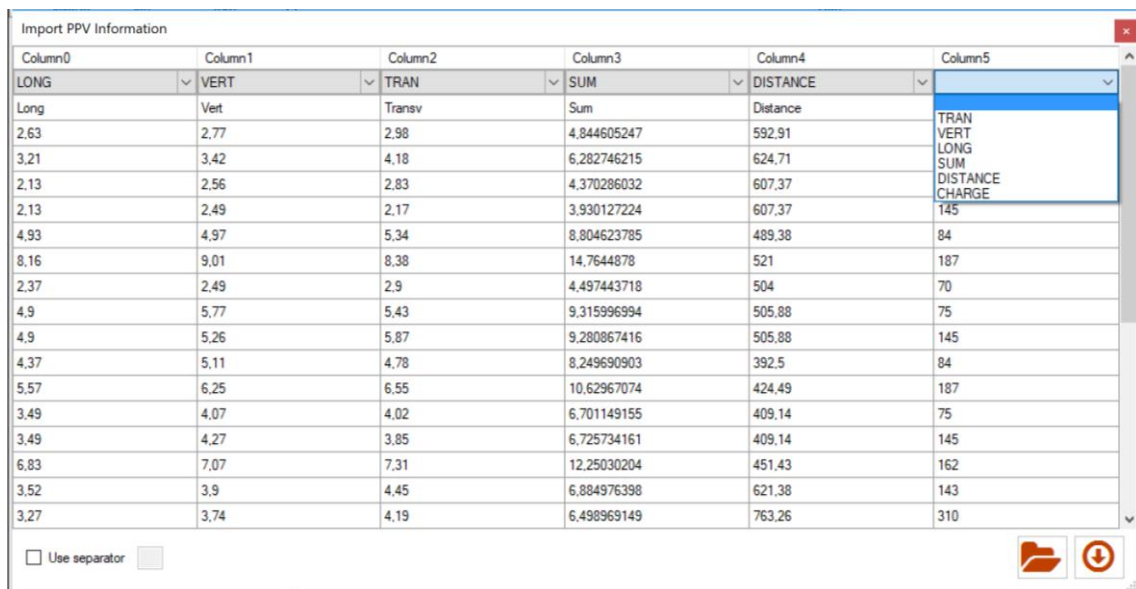


Fig. 266 – Import PPV data window

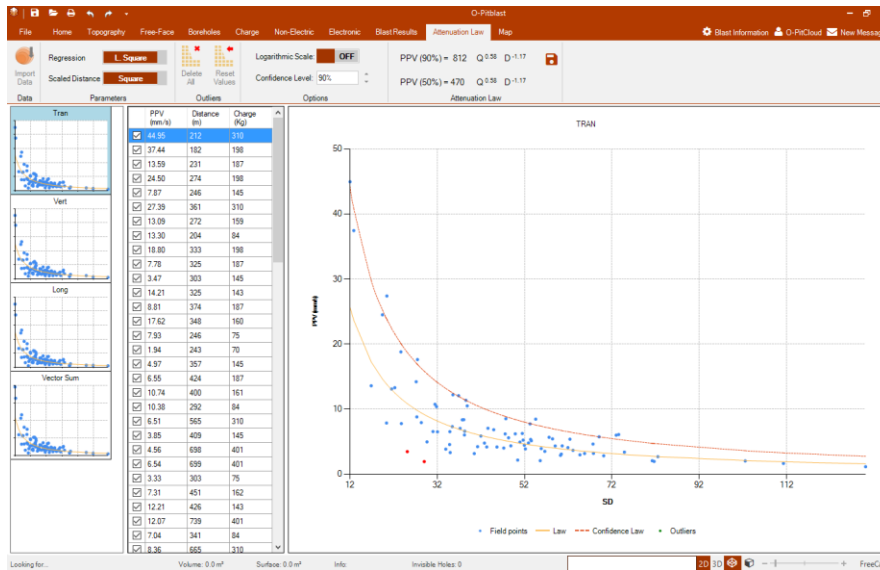


Fig. 267 – Final result of importing data

15.1.1. Overview of the imported data

The window will show three important screens. The channel data (Fig. 268 – A): along of that channel the user can see multiple choices of graphics that are associated to the information that was imported. The raw data that was imported by the user (Fig. 268 – B) and the PPV/SD Graphic where the user can see the graphics and all the field points and the law and confidence level curve (Fig. 268 – C).

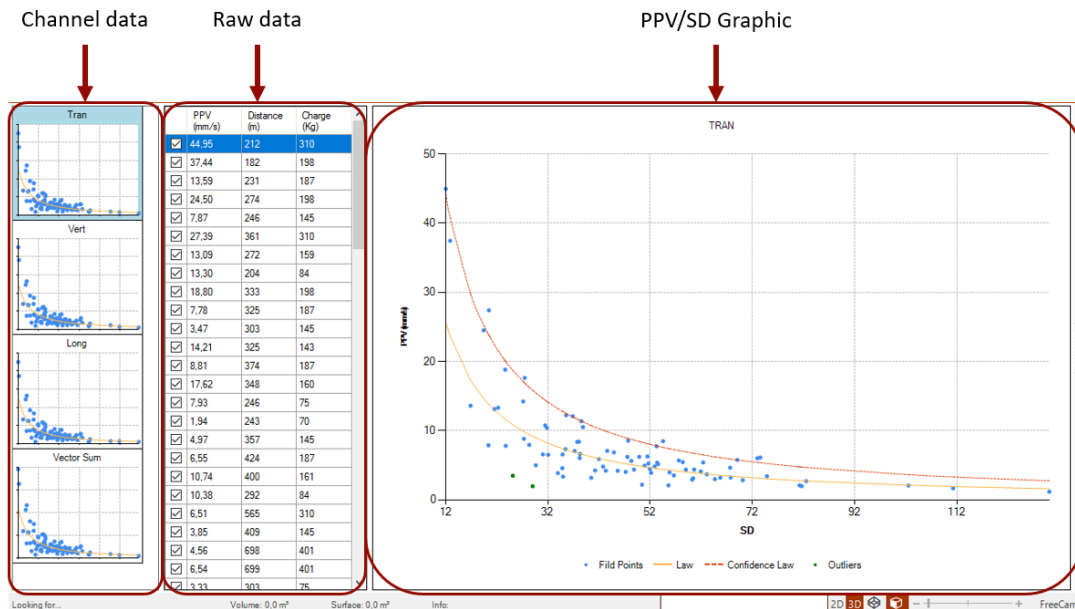


Fig. 268 – A: Channel data; B: Raw data; C: PPV/SD Graphic



15.1.2. Regression/Scaled Distance

At this point the user can define the best way to represent their field information. The operator has four options: using the Least Square or Least Residue; using the Square root to Scaled Distance or Cubic root.

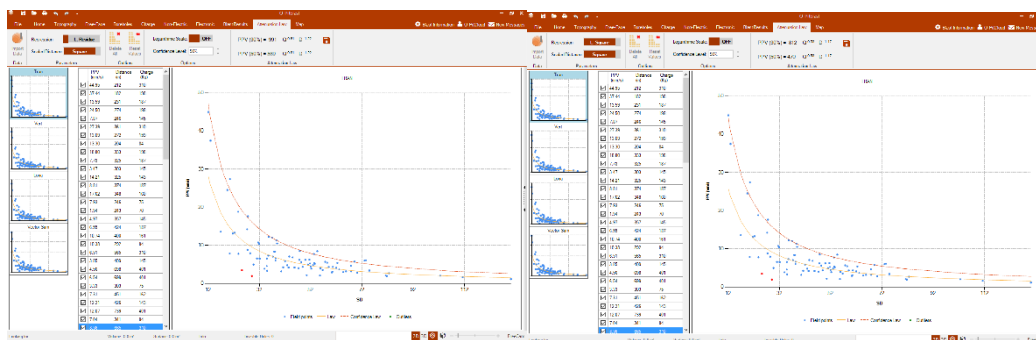


Fig. 269 – Left (A): Regression with L. Residue and Square Scaled Distance; Right (B): Regression with L. Square and Square Scaled Distance

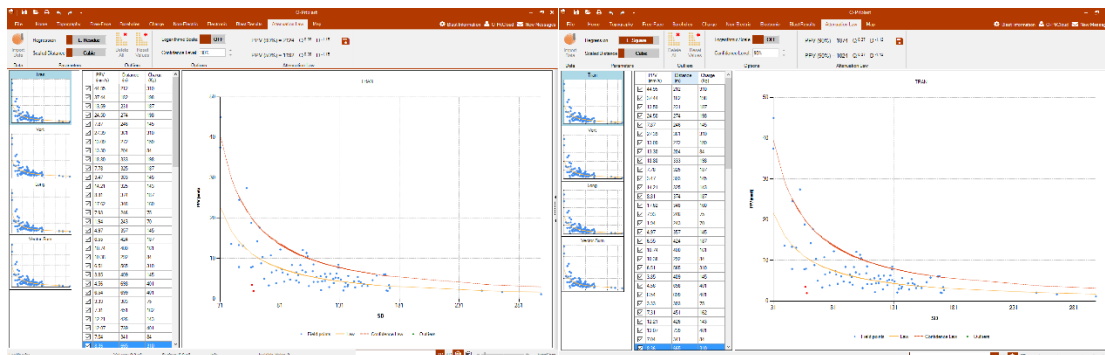


Fig. 270 – Left (A): Regression with L. Residue and Cube Scaled Distance; Right (B): Regression with L. Square and Cube Scaled Distance



15.1.3. Logarithmic Scale and Confidence level

The user can press the button **Logarithmic Scale** to visualize the graphic at a logarithmic scale. The button will say ON when the logarithmic scale is appearing. The user can also change the confidence level up to 99% - this modification will change the confidence level and the attenuation law curve.



Fig. 271 – Logarithmic Scale and Confidence level tabs

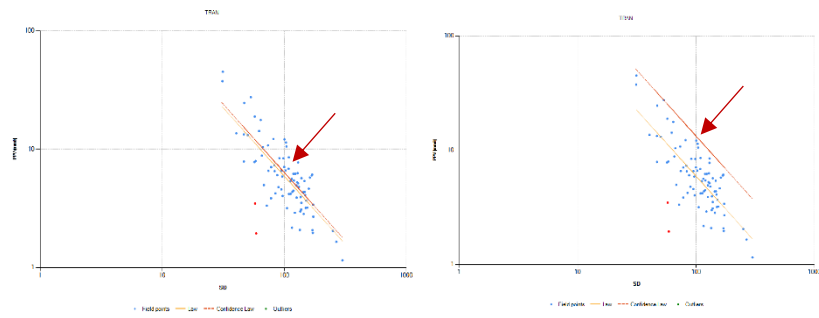




Fig. 272 – Left (A): Confidence level 55%; Right (B): Confidence level 99%

15.1.4. Outliers

Also in Attenuation Law module exist outliers (9.1) and the user can delete them by clicking on the **Delete All** button . If the user wants to recover the outlier's information he has to click on the **Reset Values** button .

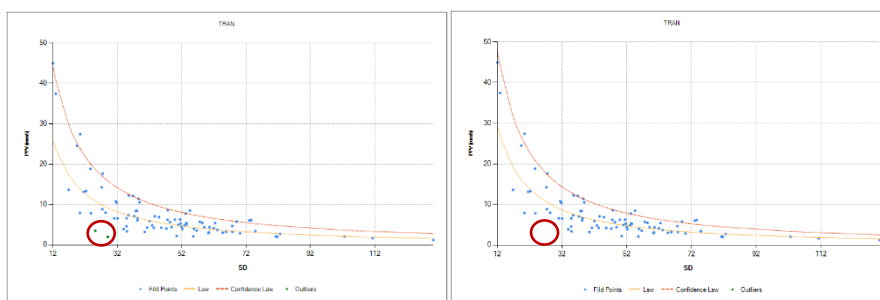



Fig. 273 – Left (A): PPV/SD Graphic with outliers; Right (B): PPV/SD Graphic without outliers



15.1.5. Attenuation law

On this tab the user can see the attenuation law that he defined (confidence level: chapter 130) and if the user wants he can save the attenuation law as a new one by clicking in the add button  and put the Name/Description of that law Fig. 274. The yellow line correspond to the attenuation law at 50% level of confidence and it never changes; the red line corresponds to the level of confidence that the user choose.

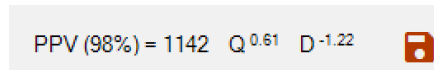


Fig. 274 – Attenuation law to the selected information

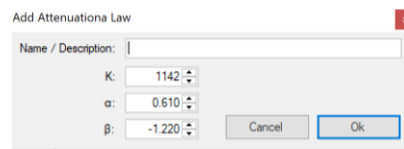


Fig. 275 – Add a new attenuation Law

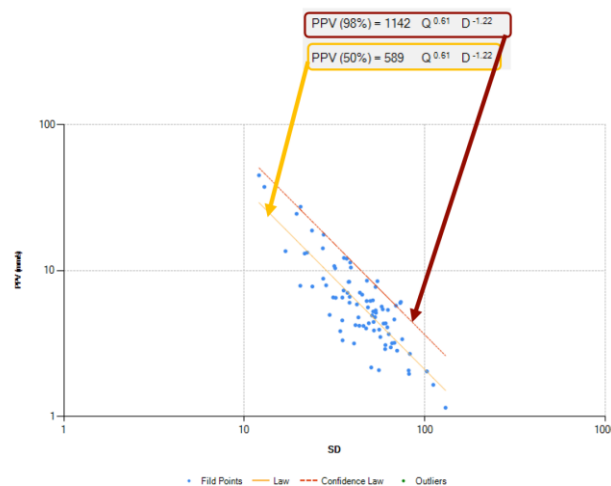


Fig. 276 – Curves/lines and their respective attenuation law

16. Map

The Map tab presents all the tools and applications to visualize your blast in Google Maps and register critical structures around your site.



Fig. 277 – Map Module



16.1. Hemisphere and UTM Zone

To use this tool, the user must have coordinates information about the terrain in the data that was imported. Then he has to define the Hemisphere that he's working and the UTM Zone – as shown in Fig. 278 – Hemispheres and UTM zones.

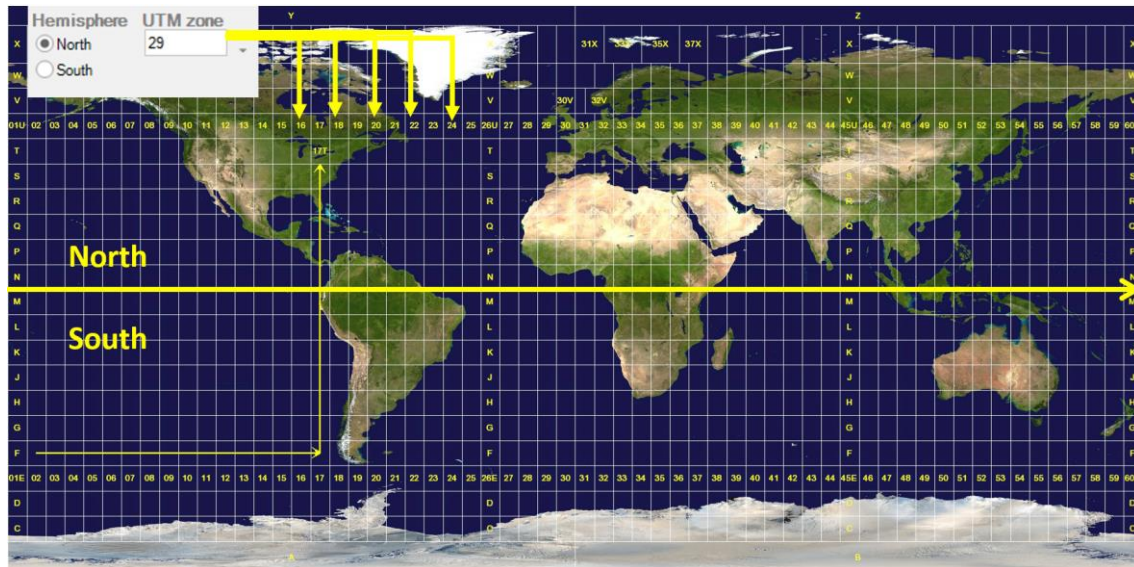


Fig. 278 – Hemispheres and UTM zones.

The user can also change the local coordinates to UTM coordinates by using the tools of **UTM correction**. When it's on the user can change the X and Y of those coordinates.

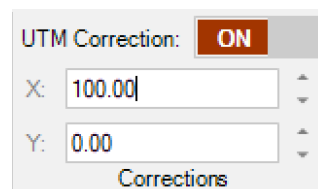


Fig. 279 – UTM Correction window

16.2. Import map

The user can import a map from any zone that he wants. But first it will be necessary to get and API Key.

16.2.1. API Key

An API key is used by a lot of Web API to provide a form of access control. To create one the user must click on the **Create API Key** icon (Fig. 280) and it will be redirected to a browser to create or put he's gmail account (Fig. 281). Then chooses the option API Key (Fig. 282) and it will pop up a window with a key (Fig. 283) that should be written in the window that appeared on the software (Fig. 284).

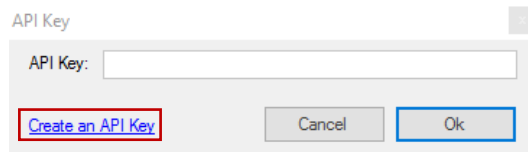


Fig. 280 – Create an API Key window

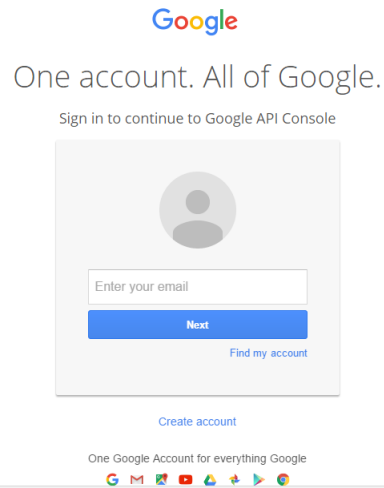


Fig. 281 – Create/sign in with a google account

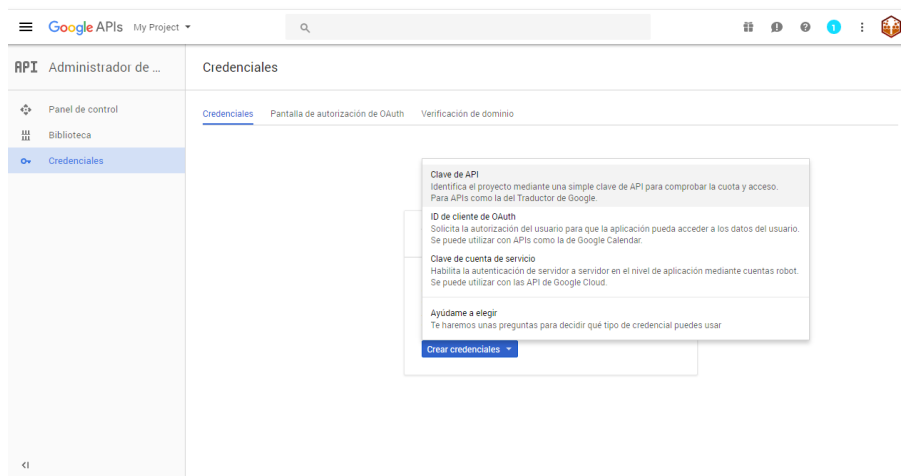


Fig. 282 – API Key choice window

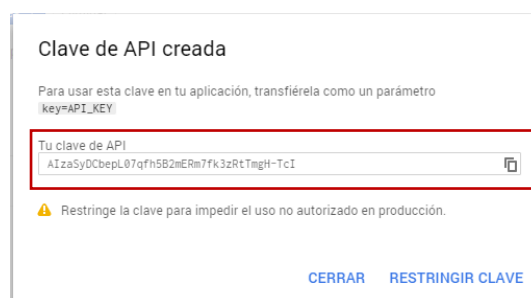


Fig. 283 – API Key created

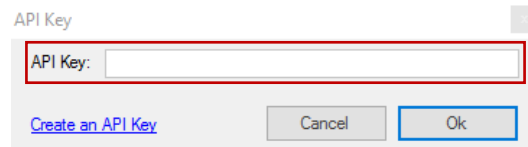


Fig. 284 – Introduce the API Key window

16.2.2. Import map

Now that the API Key is working the user can import the map. First the user must choose the place he wants to import/find the location (Fig. 285).

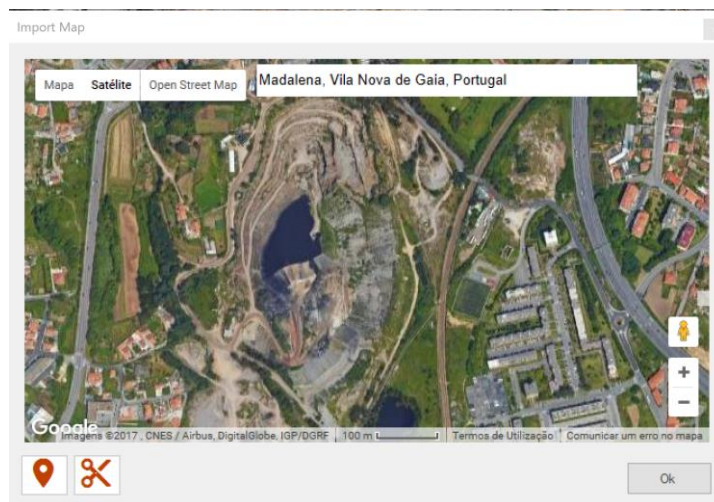


Fig. 285 – Import map window



Then, by clicking in  icon select the area that wants to import (Fig. 286).



Fig. 286 – Select area window

Finally click on the scissor icon  to cut the terrain. The user will see a preview of the terrain and then just click on the check button if the terrain is fine (Fig. 287).

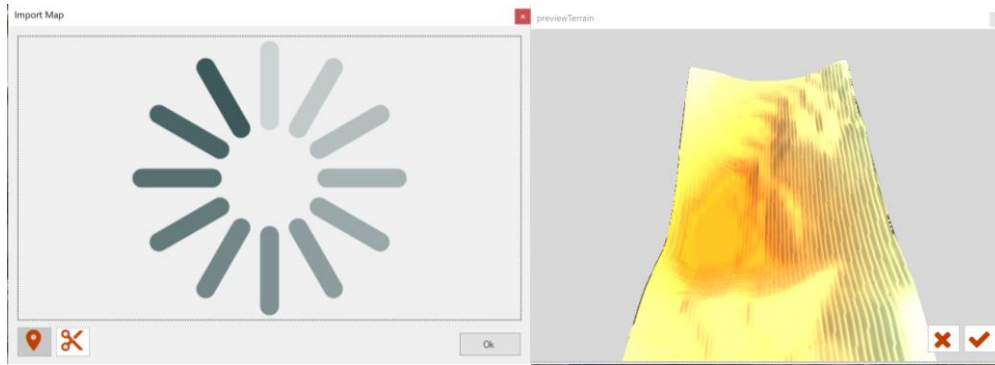


Fig. 287 – Terrain preview.

16.3. Views

There are three types of views: Map (Fig. 288 – Map view), Satellite (Fig. 289) and Open Street Map (Fig. 290).

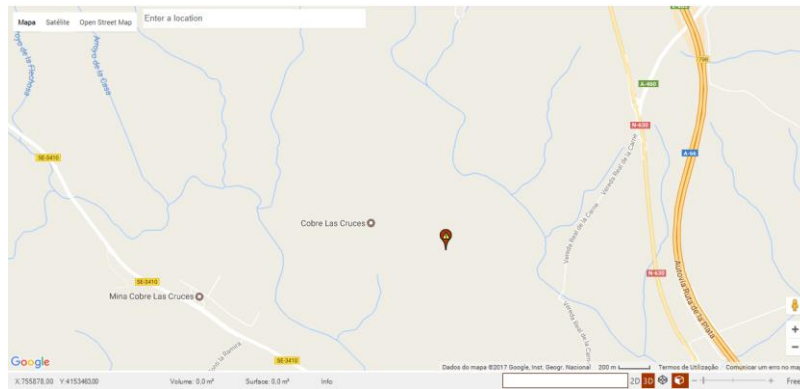


Fig. 288 – Map view



Fig. 289 – Satellite view

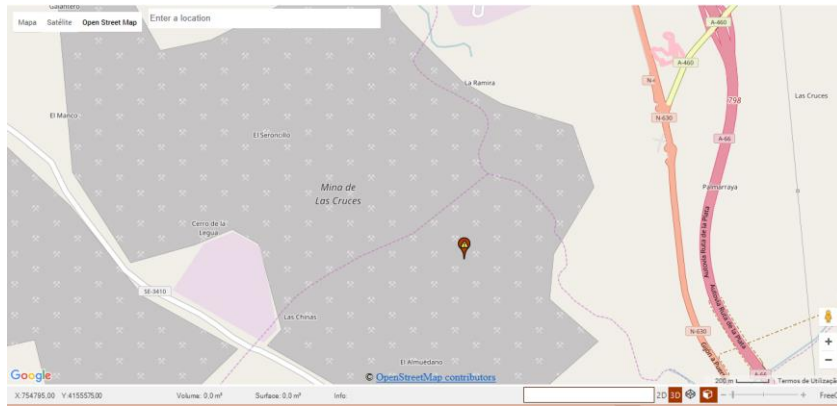


Fig. 290 – Open Street Map view

16.4. PPV countour lines

If the box **PPV Prediction** is checked it will appear in the map some circular lines that defines the isolines to diferents distances and PPV (Fig. 292).

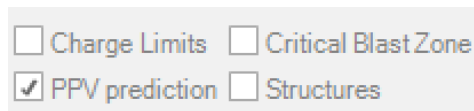


Fig. 291 – PPV prediction box

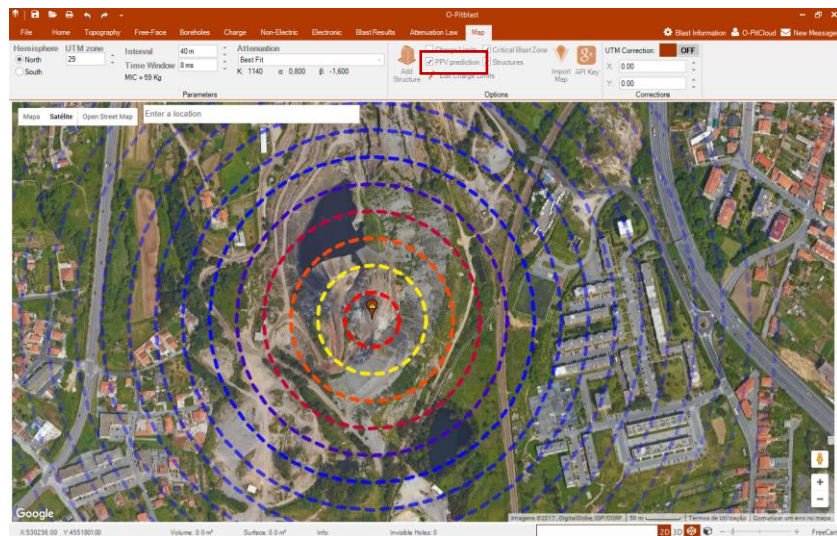


Fig. 292 - PPV isolines

If the user passes the mouse over one of the isolines it will show the PPV at that distance and the respective distance (Fig. 293).

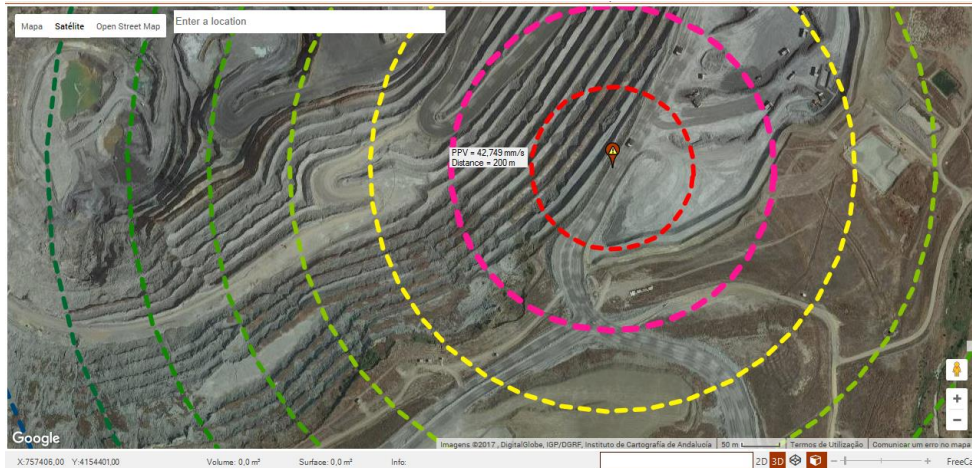


Fig. 293 – Information of the isolines

To change the number of isolines the user must define how many meters they must be separated of each other in the tab **Interval** (Fig. 294).

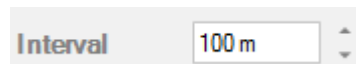


Fig. 294 – Interval tab

Finally the user can choose one of their attenuation law. In this case there's **Best Fit** law that comes as a default but the user can add a new one at any moment (6.3.5.7).

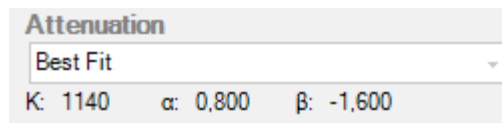


Fig. 295 – Attenuation Law: Best Fit

16.5. Time Window

On this tab the user can change the time window, in better words, this option allows you to define a time interval and calculate the number of holes blasting inside that range. This factor will change the MIC constantly.

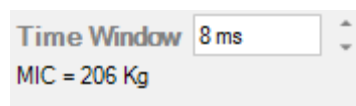


Fig. 296 – Time Window Tab

16.6. Structure

16.6.1. Add Structure

The user can add any structure we wants by clicking in **Add Structure** icon. There are some inputs that must be defined such as **PPV Limit**, **UTM X**, **UTM Y**, **Latitude**, **Longitude** and **Color**.

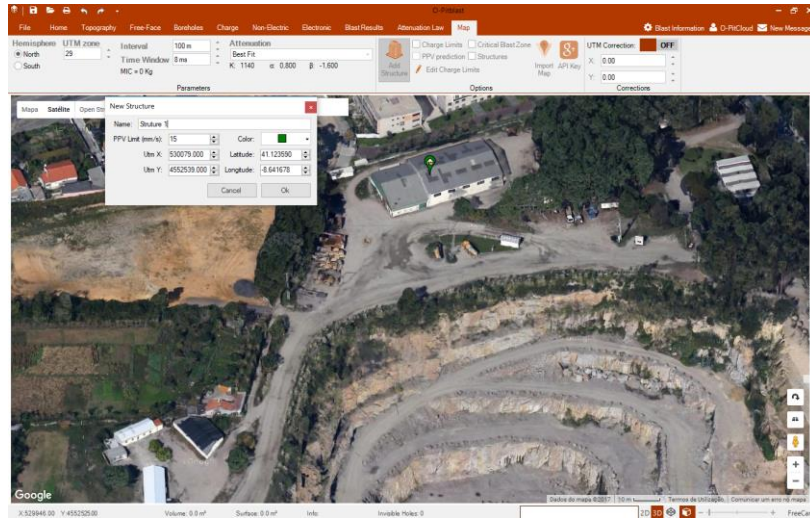


Fig. 297 – Add structure window

To see them, the user must check the Structures box.

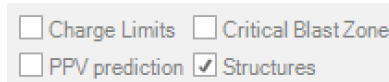


Fig. 298 – Structures box

16.6.1.1. Charge limits

By checking the box **Charge Limits** the user can see the isoline that defines the charge limit of the structure selected. If the user passes the mouse over it will see the Kg of charge applied to a specific isoline.

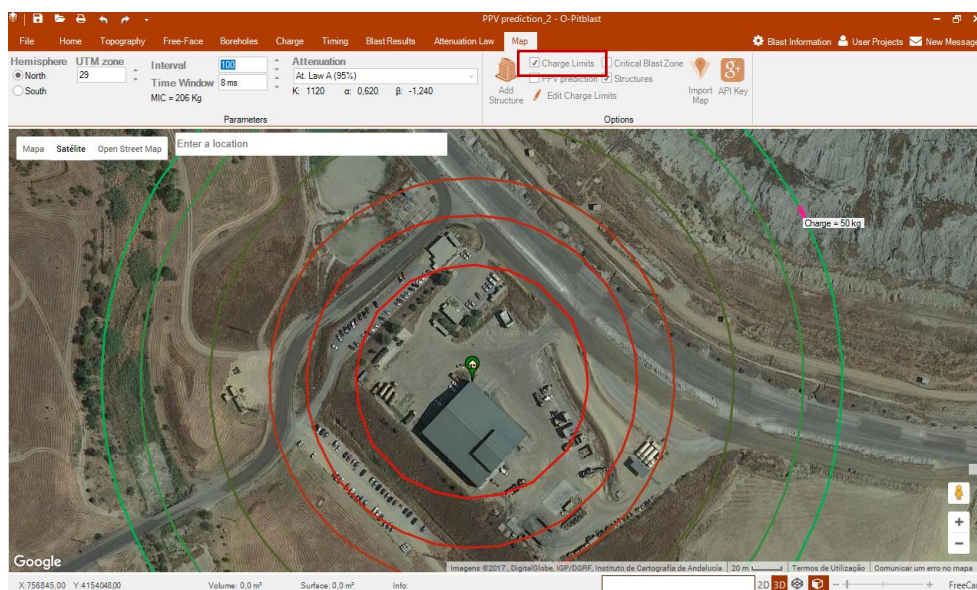


Fig. 299 – Charge limits area



16.6.1.1.1. Edit charge limits

The user have the possibility to change the Charge (Kg) of the isolines and the color associated to them. To validate their changes the user must click on Merge (Fig. 300).

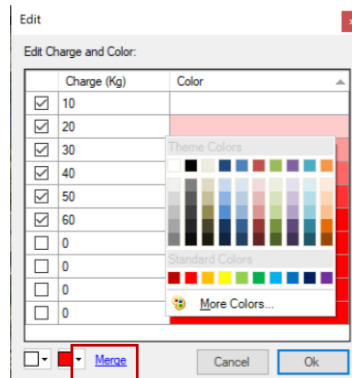


Fig. 300 – Edit Charge and Color window

16.6.2. Critical Blast Zone

If the user as the **Critical Blast Zone** box checked, it will appear a black countour that shows the critical zone. For example, the user can analyse if the blast will make some damage to the near structures.

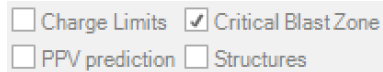


Fig. 301 – Critical Blast Zone box



Fig. 302 – Critical Blast area




By clicking on the **Search (Chapter 14.5)** button the user can look for problems with the blast and with the structures.



Fig. 303 – Detection of problems with the structures.

17. Blast information

In this area the user can save information of the blast. It will appear lots of information to write in like **Site Name, Country, Location, Shotfirer, DB Responsible, Date, Type of rock** and **Comments**. To save the information the user must click on the **Save** button .

The user can also reload previews information and put some pre-loaded comments by clicking on the button signaled in (Fig. 304).



Blast Information

Site Name:

Country:

Location:

Shotfirer:

DB Responsible:

Date:

Type:

Comments:

Pre-loaded comments Reload previews information

Fig. 304 – Blast information area

18. O-PitCloud

O-PitCloud is the area where the user can, for example, send blast reports to other users, upload new blasts and invite new people for a project.

The user has some information about their account and below he has the projects and blasts that their account is associated with.

Account

O-Pitblast version: 1.1.10.0 - 2016
 Name: Francisco Sena Leite
 Login: flete@o-pitblast.com
 Expiry Date: 17/04/2017

Projects

Blast

— User Account

— User Projects

— User Blast

18.1.1. Projects area

In this area the user can Reload Projects Lists, Check Details from some project, invite O-Pitblast users and Create or delete a project, as shown on the picture below.

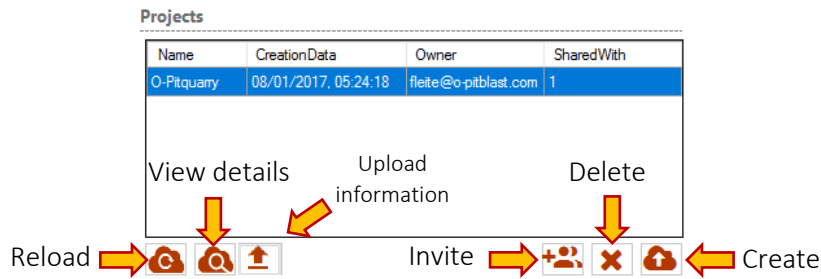



Fig. 305 – Projects menu

18.1.1.1. Create a new project

To create a new project the user must click on the button **Create**  a new project and create a new name for the project.

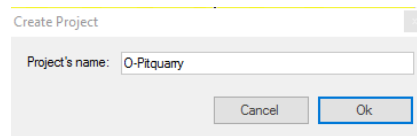



Fig. 306 – Create a new project window

18.1.1.2. Invite users

The user can invite a new user by clicking in te button **Invite**  . It will pop up a window that requires the e-mail of the new user.

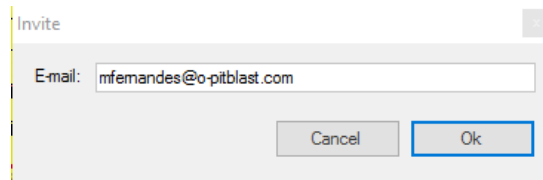


Fig. 307 – E-mail invitation window

The new user will receive a message saying “You have new invitation”.

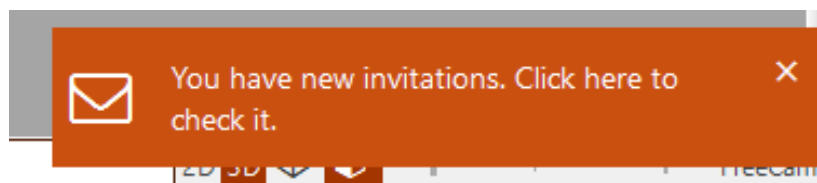


Fig. 308 – Message received by the new user

When the new user accepts the invitation, the user will received a message saying “(...) accepted your invitation”.

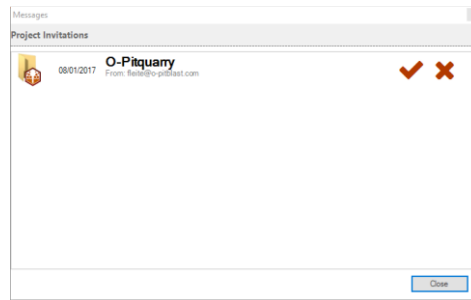


Fig. 309 – Project to accept

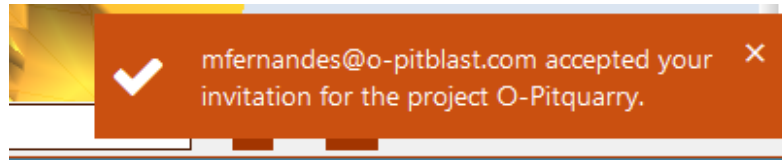


Fig. 310 – Message received when the new user accepts the invitation

18.1.1.3. Views details

At this point the user can check for the details of any selected project, by clicking in **View Details** button.

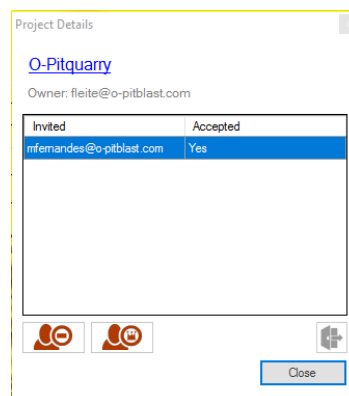


Fig. 311 – Project details window

18.1.1.4. Upload information

In this bottom the user can upload different tipe of information to O-PitCloud.

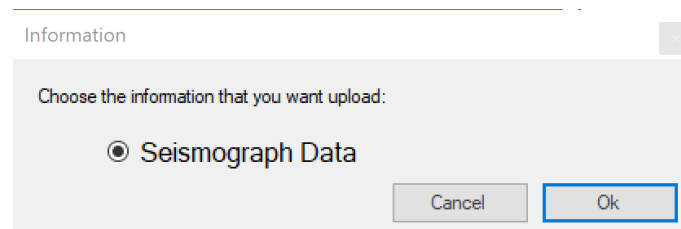


Fig. 312 – Upload information window



18.1.1.4.1. Seismographic Data

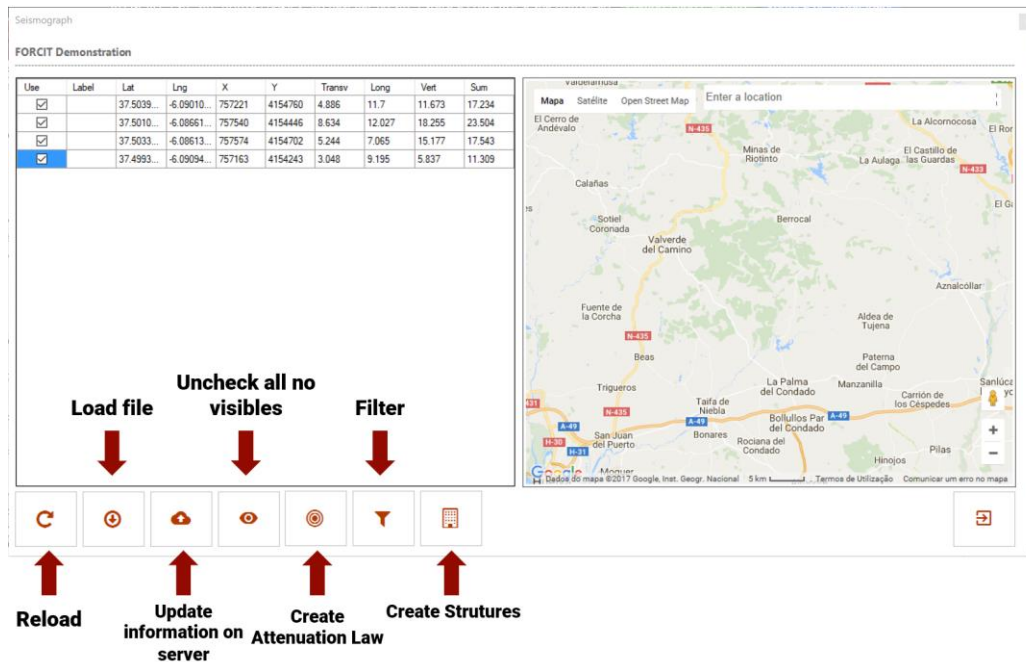


Fig. 313 – Seismograph (data) window

On this window - Fig. 313 –the user can **Load** a new file (it supports .xls, CSV .txt) that contains seismographic data and **Update** that information to the server (O-PitCloud). Also, the user can **Create** a new attenuation law, **Filter** the data and **Create** Structures.

Load file

On this icon the user can import the file with all the seismographic data. It will pop up a window to fill with all the information per column (like shown on Fig. 314). The columns that belong to the coordinates (X, Y) and to the seismographic information (Transversal, Vertical, Longitudinal, Sum), Charge and Distance (shown in Fig. 314) must be rightly fill up to be possible to export.

Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13	Column14	Column15
NAME/LA...	X	Y	TRANSV	VERT	LONG	SUM	color	valid	Rk	V1	ACCELER...	FREQUE...	CHARGE...	DISTANCE...
name	x	y	tran	vert	long	sum	color	valid	fk	v1	ace	freq	charge	NAME/LABEL
Talude	757221	4154760	4.8856435560...	11.67250811...	11.699568107...	17.23359662...	31073125	1	1	2	200	5	80	X
	757540	4154446	8.6335569270...	18.25542872...	12.027396653...	23.50440923...	15036062	1	1.75	1	200	5	80	Y
	757574	4154702	5.2440701039...	15.17695794...	7.0652825058...	17.54304821...	25500000	1	1.75	1	200	5	80	LONGITUDE
	757163	4154243	3.0475176152...	5.836642156...	9.1951185770...	11.30946333...	128000	1	1.75	1	200	5	80	VERT
														TRANSV
														LONG
														SUM
														DISTANCE(m)
														CHARGE(Kg)
														ACCELERATION
														FREQUENCY(Hz)
														Rk
														V1

Fig. 314 - Export data window



Once the user exports the data, all the seismographs will be placed on the map. If the markers are yellow that means that the data is NOT on the server yet.

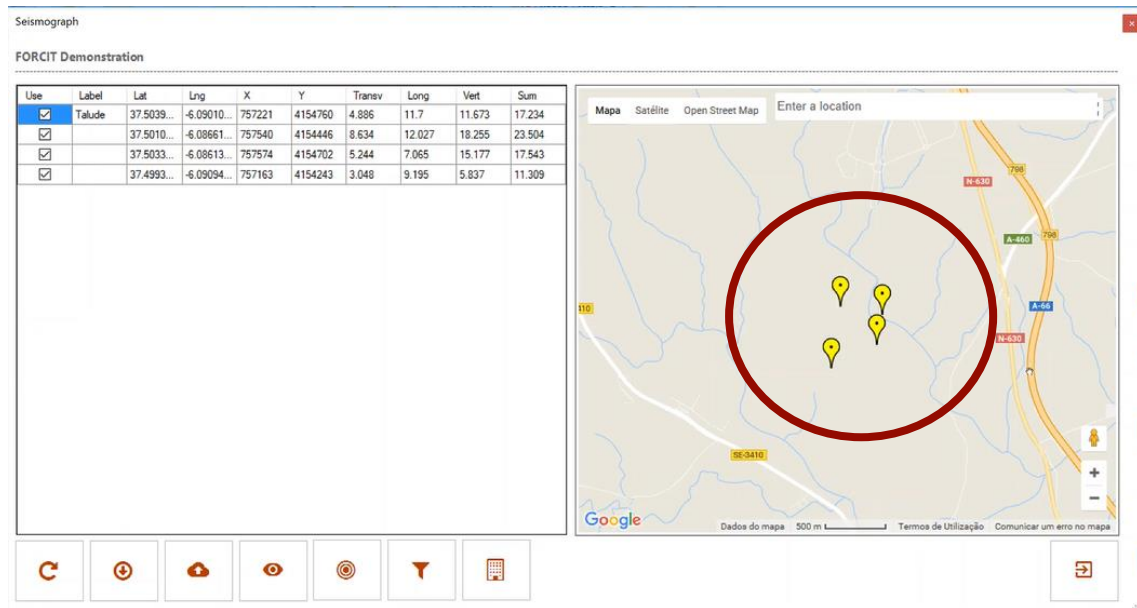


Fig. 315 – Seismographs placed on the map (yellow markers)

Upload to the server

After loading the information, the user can choose the data that we want and upload to the server.

When he unchecks the data, the yellow markers will pass to black (so the user can know what seismograph is not checked) like shown on Fig. 316.

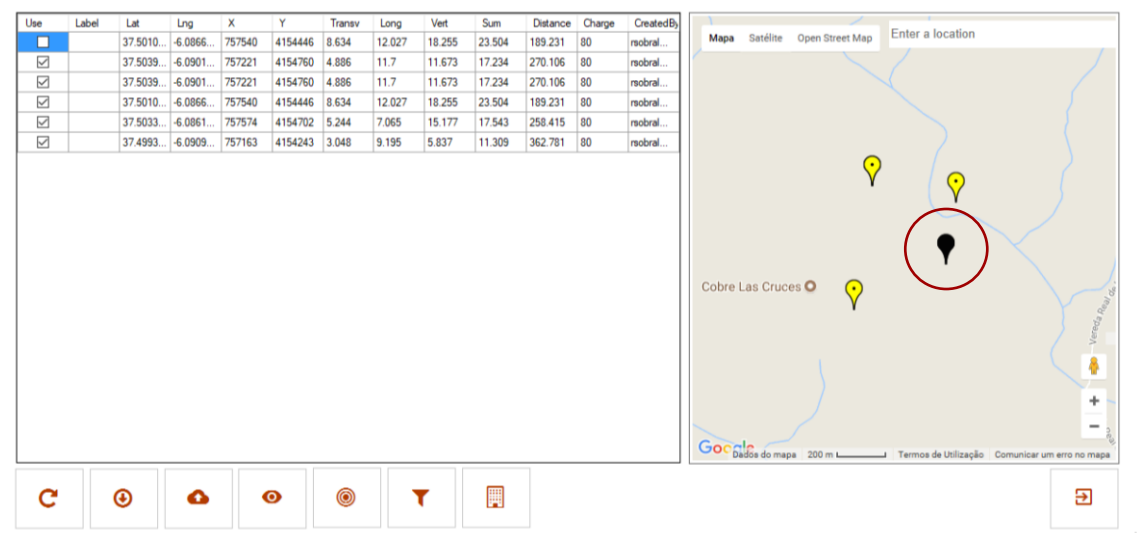


Fig. 316 – Check and uncheck the data to upload



After that selection the user clicks on the **Upload** bottom and all the markers will be pink. That means that the information is now on the server (Fig. 317).

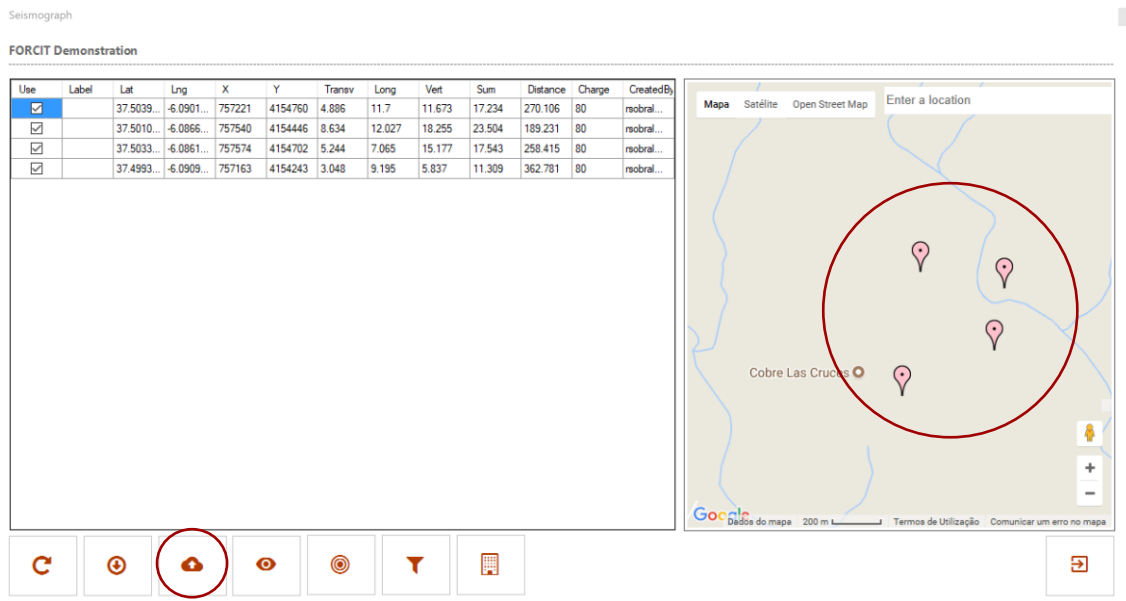
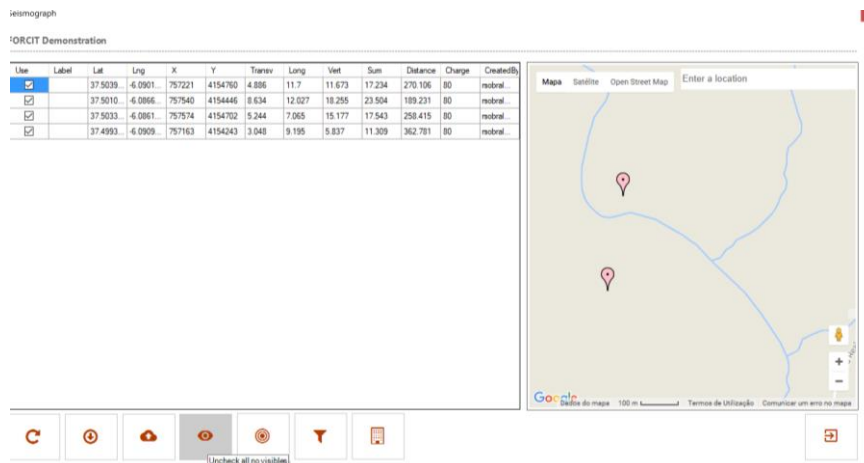


Fig. 317 - Seismograph data uploaded to the server (pink)

Uncheck all (no visible)

On this option the user can unselect all the data he wants by clicking on it. The only thing that is important to do is putting the data visible on the map. After that all the information that is no on sight will disappear (uncheck) – Fig. 318.



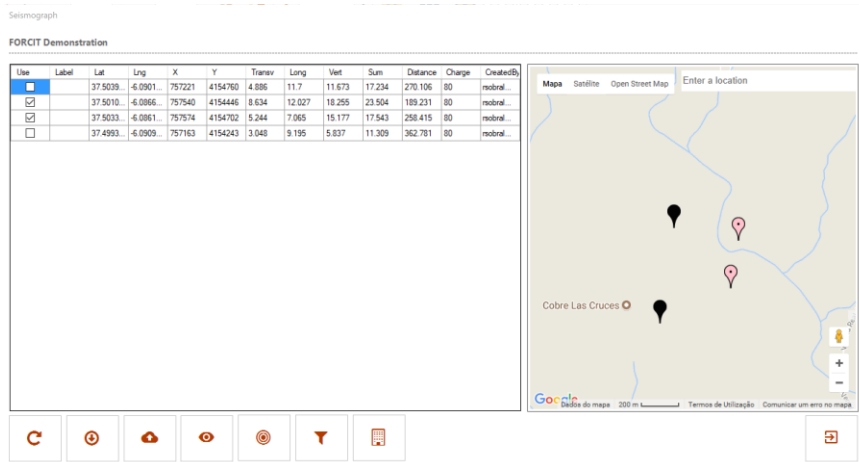



Fig. 318 – Uncheck all (no visible) seismographs

Create Attenuation Law

By clicking on this bottom, the user will create a new attenuation law with all the data that he selected. 

In case of having some previous information, will pop-up a window asking if we want to attached the information, or delete all the information and create a new attenuation law with the new values (data) - Fig. 319.

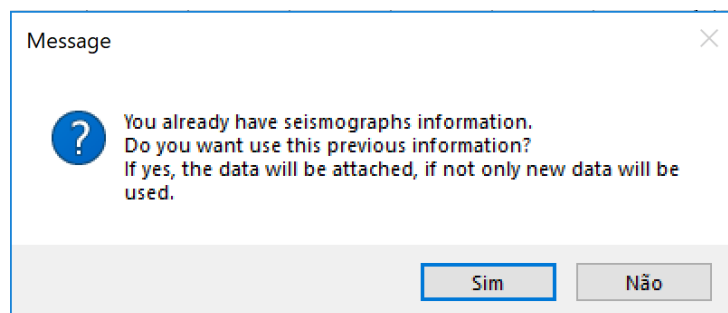


Fig. 319 – Overlap data tab

In the case of choosing “Sim” (yes), the data will be attached. In case on “No” (não), a new data will be used.

Filter data

In this option the user can filter the data that he wants by innumerous parameters like: Name, Latitude, Longitude, X, Y, Transversal, Longitudinal, Vertical and Sum. The user chooses the range of any parameter (or more than one) that he wants, and the filter will be applied, by clicking on the bottom “Apply” - Fig. 320.



Filter

Filter

Name / Label

≤ Latitude ≤

≤ Longitude ≤

≤ X ≤

≤ Y ≤

≤ Transv ≤

≤ Long ≤

≤ Vert ≤

≤ Sum ≤


Fig. 320 - Filter window

Create structure

Before you use this option is important to know that the PPV information is mandatory to fill (Fig. 321): Fk, V1, Acceleration and Frequency, to become possible to create the structures. If you start filling up the first column, you must fill out the four of them.

Column10	Column11	Column12	Column13
fk	v1	ace	freq
1	2	200	5
1.75	1	200	5
1.75	1	200	5
1.75	1	200	5

Fig. 321 – PPV information columns

After that if you have the PPV information, you can create structures by clicking on Create Structures bottom . This means that, in the place where the seismographs are placed, it will be added new structures on the map - Fig. 322.

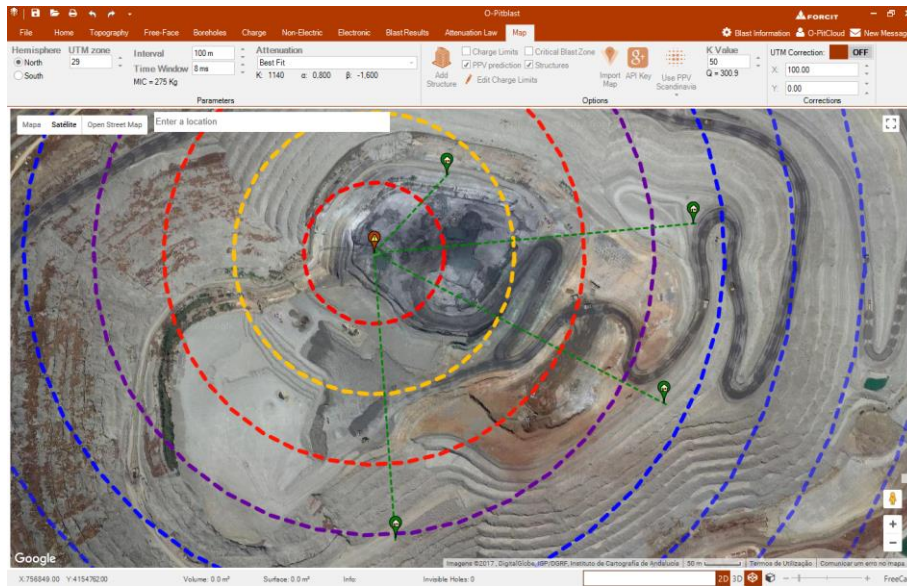


Fig. 322 – Creating new structures on the map

In case of overlap information, it will pop-up a window that allows the user to choose 3 options (Fig. 323):

- Replace the structure: will make a new structure on that exactly place;
- Change the position (by 10 meters): will create a new structure 10 meters aside of the other one - Fig. 324;
- Don't create: will not be add the new structure.

Also, the user as the option to “Repeat this option” that allows him to apply the decision to every “overlap” structure.

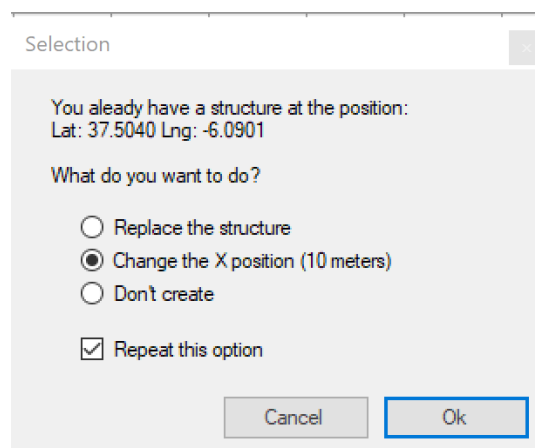


Fig. 323 – “Overlap” structures window

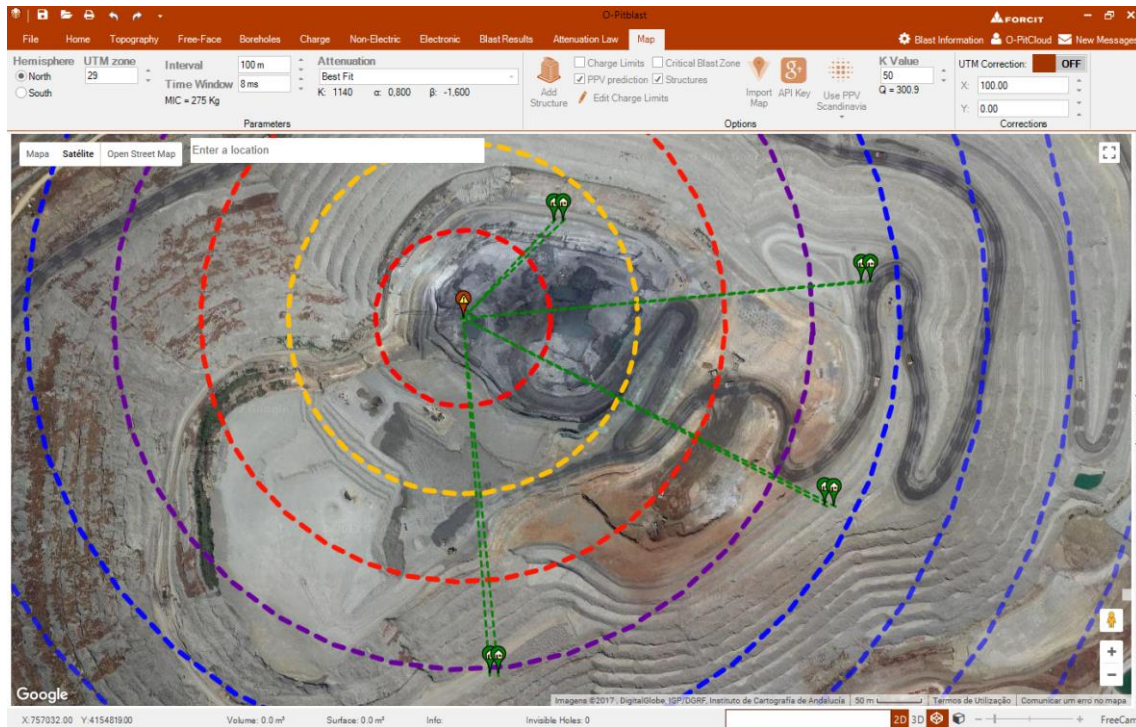


Fig. 324 – Creating new structures (10 meters aside)

18.1.2. Blast area

In the blast area the user can Download the selected blast, download the QAQC information, copy the selected blast to another project, plan and report by e-mail, update, delete or upload the selected blast.

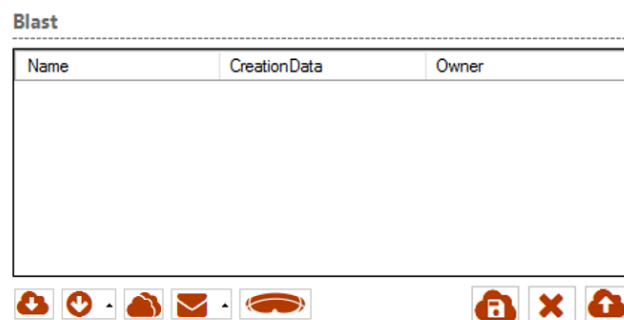


Fig. 325 – Blast area

18.1.2.1. Update, delete and upload blasts

To update or delete your blast just click on the button **Update/Delete** and the blast, that must be selected, will be updated/deleted.

To upload a blast the user just have to press the blast button and write the new blast name.

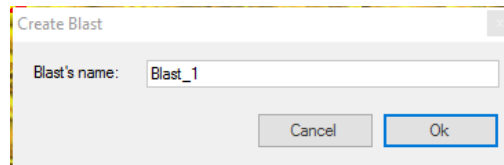


Fig. 326 – Create a new blast window

If you have a shared project with blasts, when you upload a new blast the other users will receive an alert message (e-mail) saying that the blast was uploaded and with an attachment of the new blast.



Hi,
Francisco Sena Leite (fleite@o-pitblast.com) uploaded a new blast (Blast_1) to the project named O-Pitquarry_2.
O-Pitblast team,
support@o-pitblast.com

www.o-pitblast.com

Fig. 327 – E-mail received by the other users

18.1.2.2. Download a blast

To download a blast the user must press the **Download** button after selected a blast. After the loading is completed the blast will appear in the software.

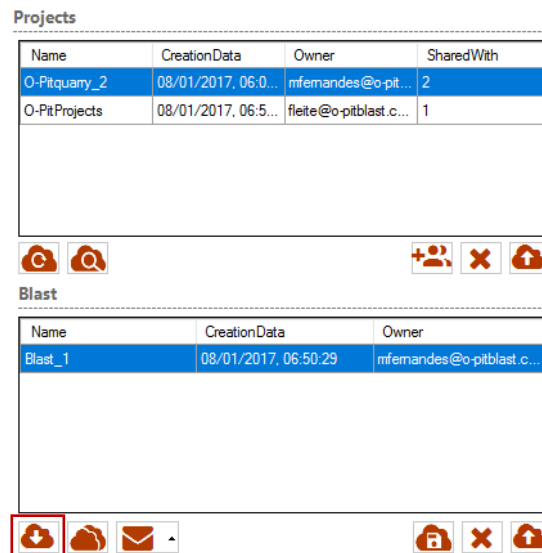


Fig. 328 – Download a select blast window

18.1.2.3. Download a QAQC information 📄

By clicking in this button the user can download the QAQC information to compare the theoretical values with the real values. The user can upload excel and CSV files.

18.1.2.4. Copy to another project 📄

By clicking in this button the user can make a copy of a blast to another existing project. It will appear a window with all the projects that that account is connected and the user must choose where he wants to copy the file.

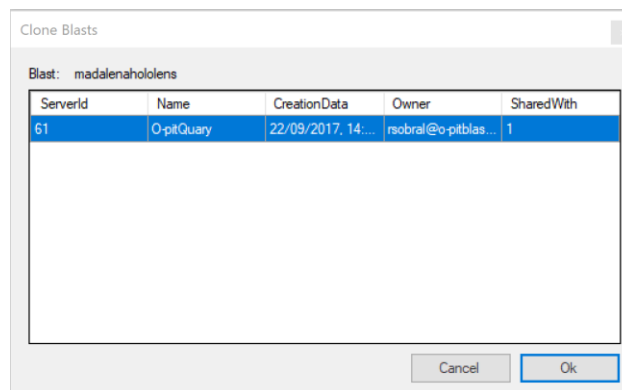


Fig. 329 – Copy the selected blast to another project window

18.1.2.5. Plan and report by e-mail 📧

The user must click on report symbol. At this point the user has two choices: send a blast report or send a blast plan. After making that choice it will pop up a window to confirm the decision and the e-mail will be sent.

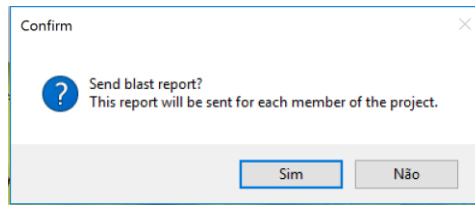


























Fig. 330 – Send a repport window

19. Short cuts

The following table presents the short cuts keys for each actions mentioned in this Manual.

Icon	Function	Shortcut
	Save	Ctrl+S
	Open	Ctrl+O
	Print	Ctrl+P
	Undo	Ctrl+Z
	Redo	Ctrl+Shift+Z
	Toolbox	Ctrl+W
	Lighting Control	L
	Terrain Control	C
	Change Transparency	Rigth-Click
	Background Color	S
	Bench Bottom Control	B
	Show/Hide Bench Bootom	Rigth-Click
	Hole Control	H
	Timing Control	T
	Centralize	Ctrl+1
	Import Terrain	Ctrl+T
	Import Layer	Ctrl+L
	Geo-Reference	Ctrl+G
	Cut Terrain	Ctrl+X
	Add Holes	Ctrl+H
	Edit Holes	Ctrl+E
	Delete Holes	Ctrl+Del
	Move Holes	Ctrl+M
	Edit Toe	Ctrl+Shift+T



	Select Holes	Ctrl+Q
	<i>Pattern Creation</i>	Ctrl+Shift+P
	Import Pattern	Ctrl+P
	Import Polygon	Ctrl+L
	Edit Rule	Ctrl+Alt+R
	Add Charge	Ctrl+Alt+C
	Discharge	Ctrl+Alt+Del
	Select	Ctrl+Alt+Q
	Add Connection	Ctrl+Shift+A
	Line Connection	Ctrl+Shift+L
	Edit Timing	Ctrl+Shift+E
	Initiation Hole	Ctrl+Shift+I
	Delete	Ctrl+Shift+D
	Select	Ctrl+Shift+Q
	Play	Space



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