



# iQuarius™

Mobile Leak Detection Device

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## Web Interfaces User Guide

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## Table of Contents

1.	Overview – General functionality and performance.....	3
2.	iQuarius Web Desktop .....	4
3.	iQuarius Main screen .....	5
	Task window .....	5
	Samples window.....	6
	Sample Data Strip .....	7
	Map window .....	10
4.	Management screen.....	14
	Users Window .....	14
	Map window .....	15
	User Details window .....	15
	To display the complete history of user logins to the system:.....	16
5.	Creating Customers .....	16

## 1. Overview – General functionality and performance

iQuarius is a smart-phone based mobile leak detection device for maintenance crews to listen in the field to any spot along the pipes and pinpoint the exact location of leaks with last-meter accuracy. iQuarius uses of mobile sensors attached to a smart-phone. A Web-based app connects iQuarius with the main system at the command and control server, to which it can upload sample data in real time. Although iQuarius is integrated into the Leak-Manger, it can also function as a stand-alone leak detection unit.

The iQuarius unit performs three functions: (a) **Survey**, which consists of a set of measurements of the intensity of sound along the pipe; (b) **Listen**, enabling experts to diagnose the condition of the pipes by listening to the sounds, while conducting a survey or independently of it; and (c) **Correlation**, consists of two simultaneous measurements, from two different locations along the same pipe, aimed at pinpointing the precise location of a leak. All three types of data produced by the iQuarius unit are be saved on the smart-phone and automatically uploaded to the AQS-SYS server, to complement the data collected by the fixed sensors.

The iQuarius tab on the AQS-SYS website enables users to display the data collected by the mobile units on the project map, alongside the data collected by the fixed sensors, view the mobile data, and analyze it.

Unlike the acoustic data collected routinely by the fixed sensors, iQuarius data is organized into tasks; a task may comprise any number of associated samples, correlations, or both. As a result, the screen of the iQuarius function is organized slightly differently than the Alerts and Sensors screens.



## 2. iQuarius Web Desktop

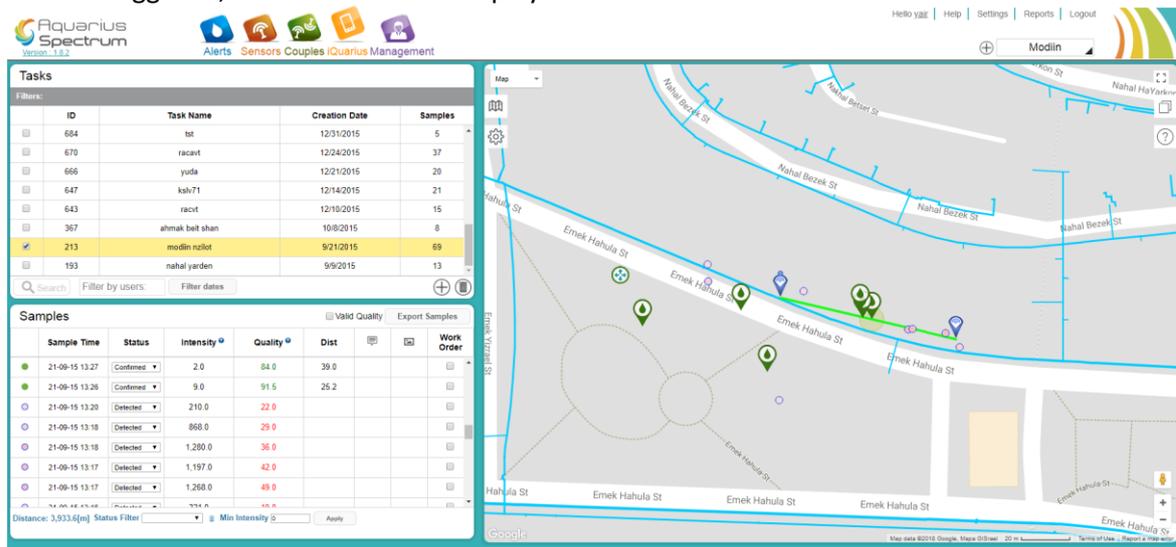
All the data collected with iQuarius can be viewed on the iQuarius web desktop.

To log into the iQuarius web desktop:

- ▶ Access the iQuarius homepage at <http://www.iquarius.com> and enter login details (the same details as for the iQuarius app).



- ▶ Once logged in, the main screen is displayed:



ID	Task Name	Creation Date	Samples
684	tst	12/31/2015	5
670	racvt	12/24/2015	37
666	yuda	12/21/2015	20
647	kshv71	12/14/2015	21
643	racvt	12/10/2015	15
367	ahmak belt shan	10/8/2015	8
213	modin nzlot	9/21/2015	69
153	nahal yarden	9/9/2015	13

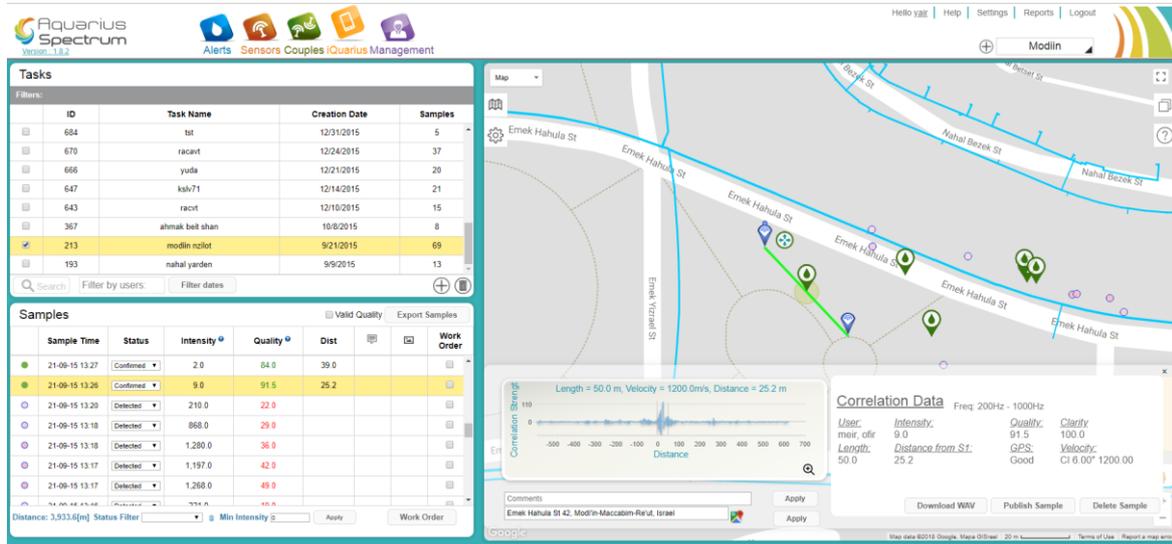
Sample Time	Status	Intensity	Quality	Dist	Work Order
21-09-15 13:27	Confirmed	2.0	84.0	39.0	
21-09-15 13:28	Confirmed	9.0	91.5	25.2	
21-09-15 13:20	Detected	210.0	22.0		
21-09-15 13:18	Detected	868.0	29.0		
21-09-15 13:18	Detected	1,280.0	36.0		
21-09-15 13:17	Detected	1,197.0	42.0		
21-09-15 13:17	Detected	1,268.0	49.0		

- ▶ iQuarius has two main pages:
  1. iQuarius: the main screen displayed after login;
  2. Management screen to perform all administrative functions: managing users, monitoring, etc.

### 3. iQuarius Main screen

The screen is divided into four functional windows: Tasks, Samples, Sample's Data, and Map. The content displayed in the windows depends on the sampling readings that you or other users in your company performed and on the criteria selected.

Below is an example of the main screen after data samples have been collected:



#### Task window

The sampling data you collect in iQuarius is grouped into logical groups called "tasks." Tasks are defined by you or other users in your company. It is recommended to assign descriptive names to tasks, for example based on project, region, date, customer name, etc.

There are four columns in the task window:

1. **Tasks Checkbox:** Checked tasks samples will be displayed in the data table and on the map.
2. **ID:** Numeric task id assigned by iQuarius
3. **Task Name** assigned by the user
4. **Creation Date**
5. **Samples:** the number of samples in the task

ID	Task Name	Creation Date	Samples
684	tst	12/31/2015	5
670	racavt	12/24/2015	37
666	yuda	12/21/2015	20
647	kskv71	12/14/2015	21
643	racvt	12/10/2015	15
367	ahmak belt shan	10/8/2015	8
213	modin nziilot	9/21/2015	69
193	nahal yarden	9/9/2015	13

**Sorting tasks.** To sort the tasks by any field in ascending or descending order:

- Click on the column name. Click a second time to reverse the sort order.

**Creating tasks.** To create a new task:

- Click on "+" icon to **Create New Task** and provide a task name.

**Deleting tasks** Note: You must have administrator privileges to delete tasks.

- Select a task in the list, then click "trash icon" to **Delete Task**.

**Searching for a task** User can search for older tasks in the task list.

- Enter the task name in the **Search** field at the bottom of the list and press Enter.

**Filter Tasks by Users** Enables site operator to filter tasks by selected users.

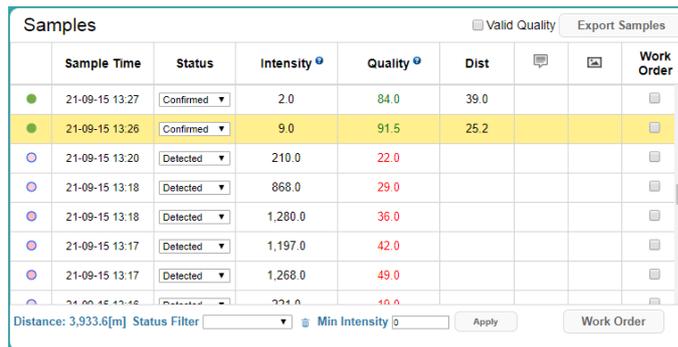
► Click on **filter users**, then chose the users to be viewed by a drop-down list with user’s names and checkboxes for selection\*.

**Filter Tasks by Dates** Enables site operator to filter task by selected dates.

► Click on **filter dates**, once required dates are selected in the panel and "Apply" button is pressed, the tasks list will be filtered and the dates definitions will be displayed in the filter strip\*.

\*Remove filters by clicking [x] icon Next to the filter name in the filters strip.

## Samples window



Sample Time	Status	Intensity	Quality	Dist	Work Order
21-09-15 13:27	Confirmed	2.0	84.0	39.0	
21-09-15 13:26	Confirmed	9.0	91.5	25.2	
21-09-15 13:20	Detected	210.0	22.0		
21-09-15 13:18	Detected	868.0	29.0		
21-09-15 13:18	Detected	1,280.0	36.0		
21-09-15 13:17	Detected	1,197.0	42.0		
21-09-15 13:17	Detected	1,268.0	49.0		

The Samples window provides information about all the samples taken under a specified task.

► Select the desired task by clicking on it in the Tasks window. After a task is selected, the Samples window is populated with samples taken under the selected task.

The following information is displayed in each line, representing a single sample:

Item	Description
Type of Sample	Mode of operation used when taking the sample, indicated by the color of the circle. In the case of survey mode, the color is pink-red (the redder the color, the higher the intensity).  Pipe Listener  Survey  Correlation
Sample Time	Time in which the sample was taken
Status	Changed manually, according to the current situation. Options are: <b>Detected:</b> There is a leak <b>Suspected:</b> There is a suspected leak that still has not been confirmed <b>Confirmed:</b> The suspected leak was confirmed <b>No Leak:</b> The suspected leak was found not to be one <b>Interference:</b> The sample is not sufficiently “clean” because of environmental interferences such as roadwork <b>Need Assistance:</b> Need assistance to determining whether there is a leak
Intensity	Noise level of the recoded audio data
Quality	Signifies the audio data tone stability (scaled from 0 to 100). Below <b>60</b> the Quality value will be colored automatically in Red
Distance	Distance from the user to the leak, applies only to correlation samples. A negative number means that the leak is behind the user (and not between the user and the partner), and in this case a new measurement must be

Item	Description
	taken with a different position of the sensor in order to enclose the suspected leak.
	Comments about the sample, to provide additional information such as the exact location, environmental conditions in which the sample was taken, etc.
Photo	If a photo for a specific sample was uploaded to illustrate the findings, an icon is displayed. To view the image, click on the icon.
Work Order	Provided a checkbox work order column. Once desired work order sample(s) are selected, click on the work order button issues a work order

Clicking on a sample in the sample window highlights it on the map (see [The Map window](#)).

### Exporting samples

Samples can be exported into an Excel file:

- ▶ Select the desired samples in the Samples window and click **Export Samples**.

### Deleting samples

Note: You must have administrator privileges to delete samples.

- ▶ Click on a task in the list, then click **Delete Sample**.

### Publishing samples

You can publish the sample to the AQS-SYS portal.

- ▶ Click on a task in the list, then click **Publish Sample**.

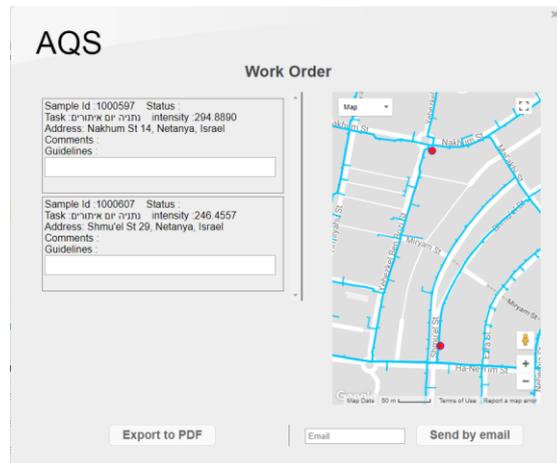
### Work Order

You can issue the sample or multiple samples to Work Order.

- ▶ Check desired sample on a samples list, then click **Work Order**.

### Min Intensity Threshold

▶ Min Intensity Threshold is designed to enable filtering of samples where their intensity value is less than a user defined threshold. Enter the Min Intensity value in the designated Combo Box and press "Apply" Button. All samples under the provided threshold will be filtered.



### Sample Data Strip

When a certain sample is selected in the samples table, the sample strip is populated with the sample data. Samples Data Strip includes 3 sections: (i) Sample's information and operations available with respect to the samples, (ii) In case of correlation sampling, the correlation analysis graph, and (iii) Sample's address information and user comment.



### Sample Information and Available Operations

Under the correlation/Sample data, three options are available :

Button	Functionality
<b>Download WAV</b>	Download sample audio file. In case of correlation sampling the operation will download all audio files relating to the sampling.
<b>Publish Sample</b>	You can publish the sample to the AQS-SYS portal. Click on a task in the list, then click <b>Publish Sample</b> .
<b>Delete Sample</b>	Note: You must have administrator privileges to delete samples. Click on a task in the list, then click <b>Delete Sample</b> .

Information relating to survey samples includes the user name, and intensity, quality and clarity values, as follows:

Symbol	Explanation
<b>Intensity</b>	Noise level of the recorded audio data
<b>Quality</b>	Audio data tone stability (in correlation the actual quality of signature matching)
<b>Clarity</b>	Level of interference in the recorded audio data. Clear stable audio data yields a high score.

Correlation samples includes additional information, as follows:

Symbol	Explanation
<b>Length</b>	The length of pipe between the 2 users taking the sample.
<b>User</b>	Users which have performed the correlation
<b>Distance from S1</b>	Distance to the leak from S1
<b>GPS</b>	Quality of the GPS signal used for the audio data synchronization
<b>Velocity</b>	Velocity used to determine the leak location (based on pipe material & diameter, or as determined by the user in cases where custom velocity is used)

### Correlation Analysis Chart

Correlation chart appears in the left part of the window. The following information:

Symbol	Explanation
<b>Length</b>	The length of piping between the 2 users taking the sample.
<b>Velocity</b>	The velocity of the water inside the pipe.
<b>Distance</b>	The distance from one of the sensors to the leak. A negative number

	means that the leak is "behind" the sensor, and not between the two sensors. Each user will receive a distance representing the distance of the leak from his position.
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To toggle the unit of measurement (meters/feet):

- ▶ Click on the **Settings** icon at the top of the screen.

To zoom in on the diagram:

- ▶ Click on the magnifying glass icon in the lower right corner below the chart.

The following correlation data is displayed in the right part of the window:

**Samples Address and Comment**

The sample address can be queried both in the mobile application (manually or automatically), and from iQuarius site. In the site once a user select a sample in the table, the address will be automatically queried

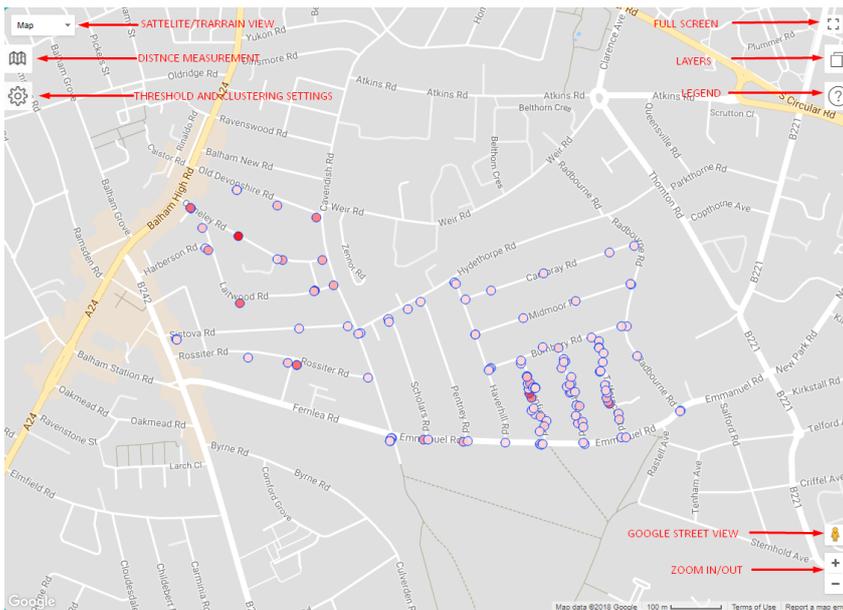


using Google API according to the sample's coordinates. The exception being that if the address already exists we do not change it, unless explicitly the "query button" is pressed (colored button next to the field). That way, if the sample was already queried by the mobile application, or the user has changed the address manually, we will not overwrite it. If the user changes the address manually he will need to press the "Apply" button in order to maintain the data. The user can also add a comment related to sample and press the "Apply" button in order to maintain the data.

## Map window

The Map window displays the locations of all the samples taken under selected task(s), to illustrate the spread of leaks in a certain area. Samples are marked with circles, which are color-coded according to the nature of the reading taken and the result.

1. Click on the desired task in the Tasks window.
2. Click on a specific sample in the sample window to place its location in the center of the Map window. Clicking on a sample on the map highlights the corresponding line in the Samples window.



The color of the circle indicates the mode of operation used for taking the sample: for survey mode, the higher the intensity of the pink-red color, the higher the intensity of the leak.

**Layers Manager** To add or remove layers :

- ▶ Click on (  ) button in top right corner of the map.

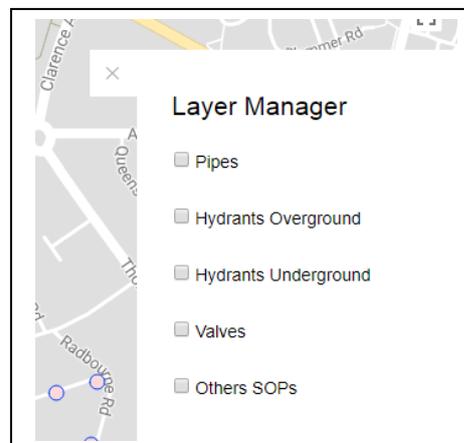
**Pipes:** Present all the pipes on the map based on location of current project.

**Hydrants Over ground:** Present all the hydrants that are located above the ground.

**Hydrants Underground:** Present all the hydrants that are located under the ground.

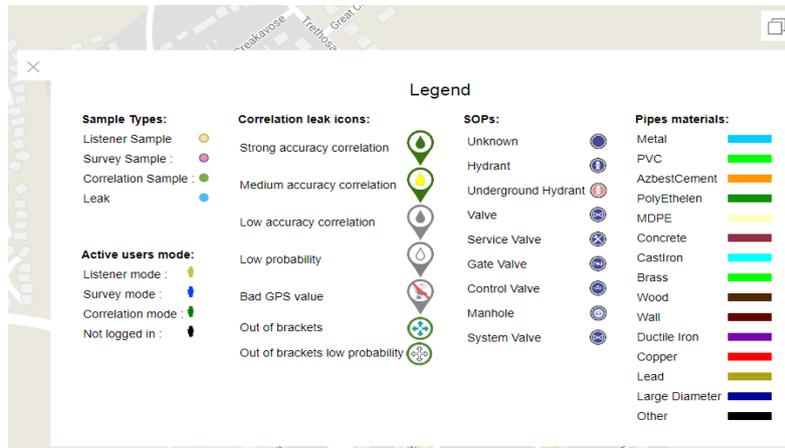
**Valves:** Present all the valves.

**Other SOP's:** Present other SOP's.



**Legend View.** To view the legend:

- ▶ Click on the ? icon in the top right corner of the map.



**Full Screen.** To enable map in full screen mode:

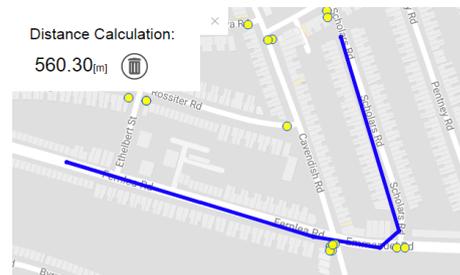
- ▶ click on (  ) button in the top right corner of the screen.

**Map Modes.** To switch between normal, satellite and terrain mode:

- ▶ Click on (  ) drop-down menu in upper left corner of the screen.

**Distance Calculation.** To do a distance calculation:

- ▶ Click on (  ) button in the top left corner of the map.
- ▶ Click on a map to create points in which between them the distance would be measured.
- ▶ To delete points click on (  ) button.

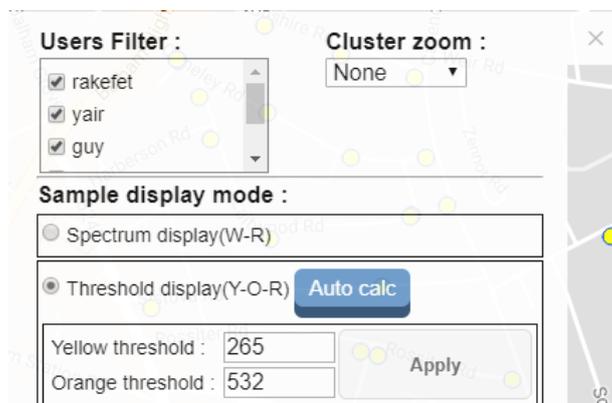


**Samples Clustering and Threshold display menu**

To enter sample clustering and threshold display menu:

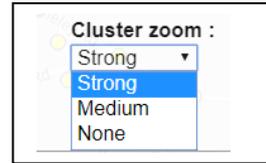
- ▶ Click on (  ) button.

This menu has two distinct functions,  
 (i) Set the Clustering Mode.  
 (ii) Set Display Mode: "Spectrum Display" versus "Thresholds Display".  
 Using the "Users Filter" the operator can choose for which users the samples will be displayed, thereby employing the Clustering and Display Mode on a **per user(s) basis**.

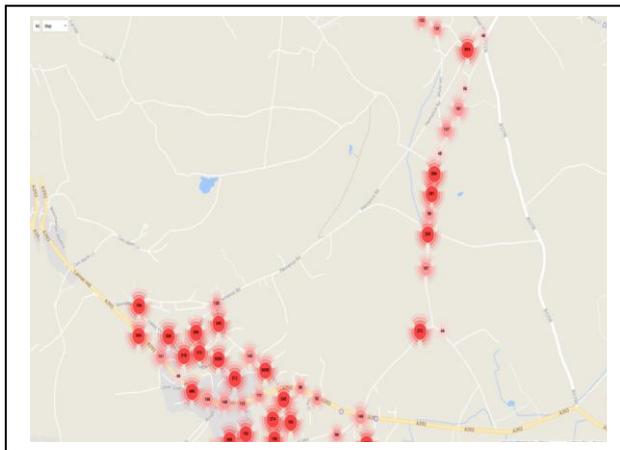


### Samples Clustering

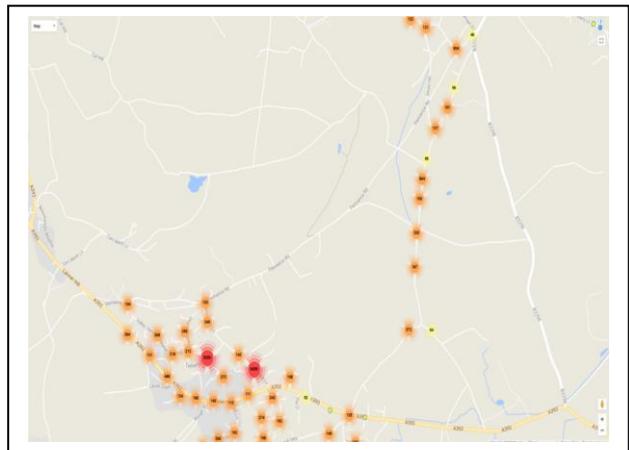
Samples Clustering enables working with tasks containing a vast number of samples and homing into areas of interest. In Samples Clustering we combine areas with high density of samples into one marker which breaks down into the singular samples as the users zooms into the area of the samples. The more the users zoom into the area the cluster will break down into more samples until no clusters exist anymore. The cluster value label will always display the intensity of the sample with the highest intensity value in the cluster. Its color will be in accordance with said sample color in Spectrum or Thresholds Display mode, in accordance with the user selected mode (see snapshots below).



Clustering in Spectrum Display Mode



Clustering in Threshold Display Mode



### Spectrum and Thresholds Display Modes

**In Spectrum display Mode** the samples color is displayed in red color of different brightness where the very bright red represents low intensity and very dark represents very high intensity.

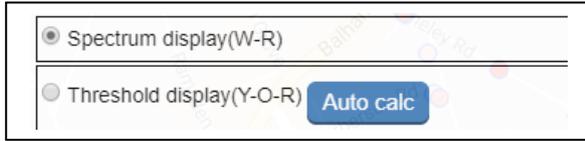
**In Thresholds Display Mode** the samples color is displayed in 3 distinct colors yellow/orange/red in accordance with threshold parameters that calculated automatically by the algorithm or set manually by the user. In manual mode the user has to set 2 parameters - max yellow threshold and max orange thresholds. In automatic mode all the user has to do is to click on "Auto calc" button and from now on the thresholds will be calculated automatically.

In addition to threshold display the user has an option to dissect samples by intensity for users that the operator wish to choose. This allows to use thresholds only on samples that were created by a particular user or users.

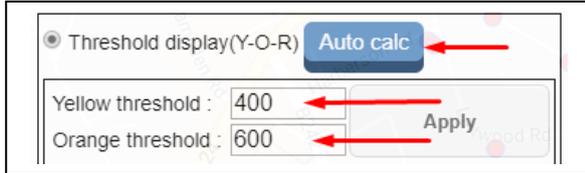
**Logic behind Threshold display.** In order to detect place of potential leak, the operator have to conduct many surveys across the pipe line. Threshold display allows user to look at the survey data in a more meaningful way, where the high intensity surveys will be visible to the eye (colored red) among other surveys with minimal intensity (colored yellow). It will allow the operator to see possible leak locations more easily.

### Spectrum and Thresholds Display Modes Operation

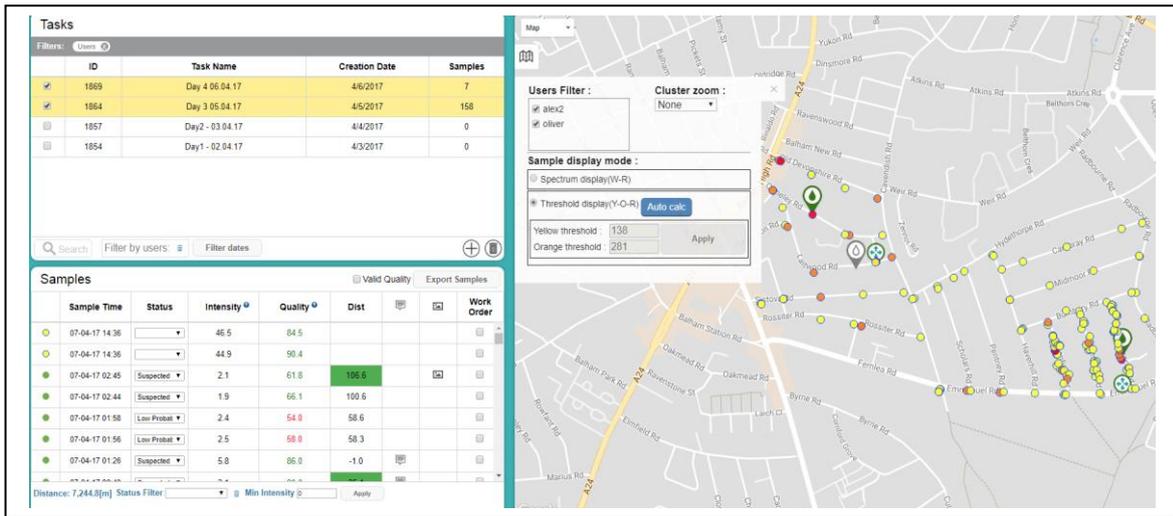
The user must select the display method by clicking on "Spectrum display" or "Threshold display" radio buttons



In the event "Thresholds display" is selected the user can use automatic threshold calculation by clicking "Auto calc" toggle button. In that case all thresholds will be calculated automatically for the user by the algorithm and presented "on the fly" in accordance with users and tasks selection/un-selection. For manual threshold display the user need to make sure that "Auto calc" toggle button is off. Then the user need to enter max threshold values for yellow and orange and press "apply" for the changes to take place.



Example: Threshold Display Mode for multiple users in multiple task. when a user/task is selected/un selected the thresholds will be automatically calculated and displayed



ID	Task Name	Creation Date	Samples
1869	Day 4 06.04.17	4/6/2017	7
1864	Day 3 05.04.17	4/5/2017	158
1857	Day2 - 03.04.17	4/4/2017	0
1854	Day1 - 02.04.17	4/3/2017	0

Sample Time	Status	Intensity	Quality	Dist	Work Order
07-04-17 14:36		46.5	84.5		
07-04-17 14:36		44.9	90.4		
07-04-17 02:45	Suspected	2.1	61.8	196.6	
07-04-17 02:44	Suspected	1.9	66.1	190.6	
07-04-17 01:58	Low Probab	2.4	54.9	58.6	
07-04-17 01:56	Low Probab	2.5	58.9	58.3	
07-04-17 01:26	Suspected	5.8	86.0	-1.0	

## 4. Management screen

Administrative functions are accessed through the Management screen. To display the Management screen:

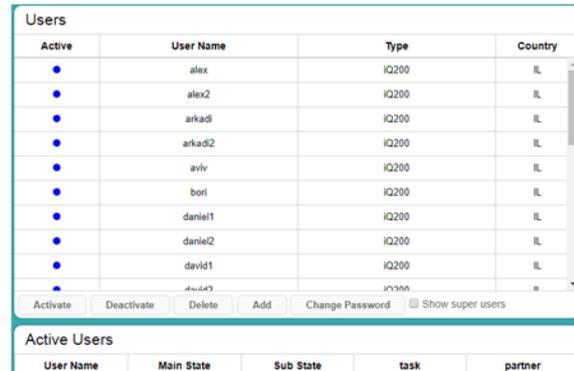
- ▶ Click on the management icon  at the top of the main screen. The Management screen is divided into two windows: Users and Active Users

### Users Window

The Users window lists all the defined users, including administrator activation status, name, and email address. The administrator activation status applies only to users who registered at the iQuarius website:

- (red circle) indicates that the administrator has not yet been activated
- (blue circle) indicates that the administrator has been activated.

- ▶ Click **Refresh** to refresh the contents of the window. To display only the users with the administrator status:
- ▶ Check the **show super users** box. Un-checking the box restores the display to include all user types.



Active	User Name	Type	Country
●	alex	IQ200	IL
●	alex2	IQ200	IL
●	arkad	IQ200	IL
●	arkad2	IQ200	IL
●	aviv	IQ200	IL
●	bori	IQ200	IL
●	daniel1	IQ200	IL
●	daniel2	IQ200	IL
●	david1	IQ200	IL
●	...	...	...

### Adding users

- To add a new user:
- ▶ Click **Add** at the bottom of the Users window. The **Create New User** prompt is displayed
  - ▶ Enter the name, password, and email address of



### Deleting users

- To delete a user from the system:
- ▶ Select the user in the Users window and click **Delete**. A confirmation prompt is displayed to complete or cancel the delete action.

### Changing passwords

- To change a user password:
- ▶ Select the user in the Users window and click **Change Password**. The Change Password prompt is displayed.
  - ▶ Enter the new password and click **Update Password**. A confirmation prompt is displayed to complete or cancel the password change action.

### Active Users window

The Active Users window lists users who have logged in to the iQuarius App. The Active Users window provides the following information about each active user:



User Name	Main State	Sub State	task	partner
yair	Idle	-	...	

Column	Explanation
<b>Main state</b>	One of the following: <b>Not logged in:</b> User was logged-in during the last hours but currently logged out. <b>Idle:</b> the user has not chosen a task <b>Pipe Listener:</b> in the pipe listener mode <b>Survey:</b> in the survey mode <b>Correlation:</b> in the correlation mode
<b>Sub-state</b>	One of the following: <b>No partner:</b> in correlation mode and no partner selected. <b>Partner not ready:</b> in correlation mode and waiting for the partner device to be ready for sampling. <b>Waiting for result:</b> the correlation sample has been recorded and the data is being processed. <b>Ready:</b> the user is ready to start sampling. <b>Wait to sample:</b> the user is setting up the sampling synchronization. <b>Sampling:</b> the user is sampling. <b>Submit sample:</b> samples are uploading to the server.
<b>Task</b>	The currently selected user task
<b>Partner</b>	The currently paired partner for correlation

## Map window

In the Map window of the Management screen the location of samples taken is shown together with the location of all active users. The users are color-coded on the map according to their status:

-  User in pipe listener mode
-  User in survey mode
-  User in correlation mode
-  User currently not logged in

Note: The list of users displayed is not connected to the list of tasks. When different tasks are selected in the Tasks window, their corresponding samples are displayed, but the display of users does not change.

The color coding used to represent the samples taken is the same as in the Map window on the main screen (see [Map window](#)).

To display additional user information:

- ▶ Move the cursor over a user or a sample in the map; user name, leak detection mode, and noise intensity are displayed.

## User Details window

To display full user details:

- ▶ Click on a user in the [Users window](#); the [User Details window](#) lists complete user information, including registration details and company information.

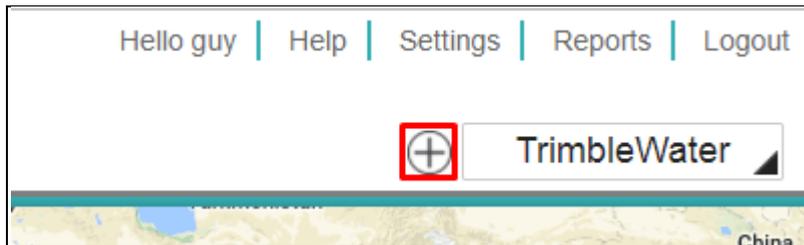
To display the complete history Of user logins to the system:

- ▶ Click on **Login Details** at the bottom of the window; the dates and times of every login are displayed.

## 5. Creating Customers

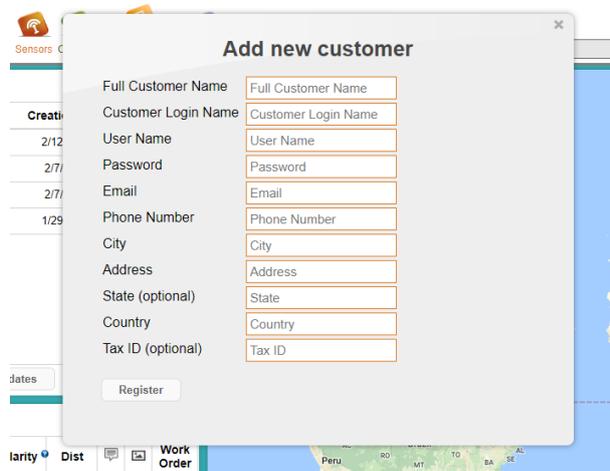
Aquarius Spectrum company administrators have the ability to create new customers for iQuarius mobile app and its web extension.

▶ In order to create new customers, click on "+" button on the top of the Screen as shown in the image below.

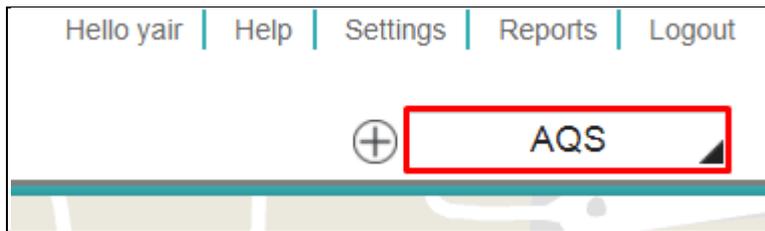


**Note:** Only Customer that has admin authorization will have the function to create new customers. Most customers won't have admin authorization and this option will not be available ("+" button won't be seen).

After clicking the "+" button registration form will open up as shown in the picture below.



It is necessary to fill the form completely . Only two fields are optional - State and Tax ID. Customer Login Name is the name that the user will use in the login screen each time he/she enters the iQuarius web extension, in addition this login name is also shown in customers menu to the left of the "+" button.



- ▶ After the user has been registered, refresh the main page. New customer should be available in the customer sliding menu as shown in the picture above.
- ▶ All new customers that were created will have first initial user that need to be activated.
- ▶ In order to activate the initial user go to **management tab** --> **Users window**.
- ▶ Click on the one initial user that was created with the creation of the customer and click on "**Activate**" button.
- ▶ Small window will open up asking you to choose the type of user.

The user has two types:

1. **iQ100** - Enables the user to conduct surveys and live listening of the acoustic sensor but it doesn't allow to conduct correlations.
2. **iQ200** - Enables the user to conduct surveys and live listening of the acoustic sensor as well as conducting correlations.

- ▶ Choose the type of user.
- ▶ Click on the "Send Email to user" checkbox if you wish to receive confirmation by email that the user has been activated.