



User Manual



Intelligent Water Loss Management

NELOW USER MANUAL



Introduction of NELOW

“ **NELOW (Never Lose Water)** Intelligent Water Loss Management System ”



Sonic GL

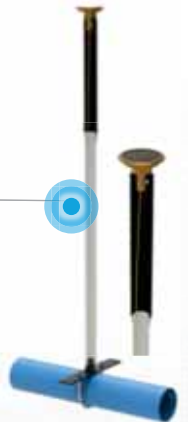
- ✓ ARM MCU, 16 bit codec, Bluetooth 5.0
- ✓ Rechargeable Lithium Polymer Battery
- ✓ 16G Micro SD memory
- ✓ 3 Days usage with 100% charged



NELOW Mobile & Web

Sonic T1

- ✓ Sound Transmitter
- ✓ Easy to install



Sonic M2

- ✓ ARM MCU, 16 bit codec
- ✓ Bluetooth 5.0
- ✓ Non-rechargeable High Capacity Battery
- ✓ LTE, CAT M1, GSM Modem
- ✓ IP 67, 16G Micro SD memory
- ✓ 4 year battery is guaranteed



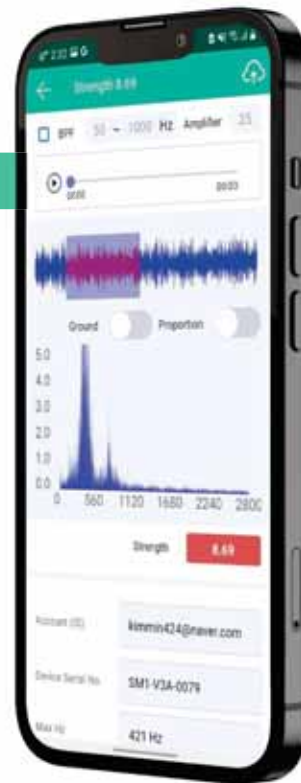
Introduction of NELOW

“ NELOW's cloud-based software will help to **manage water loss for not only managers but also engineers** ”

NELOW | App Android 8.0

General Function

- ✓ GIS management
- ✓ Water leak management
- ✓ Water pressure management
- ✓ Maintenance management
- ✓ DMA monitoring



NELOW | Web JAVA Script Node.js Open Layers

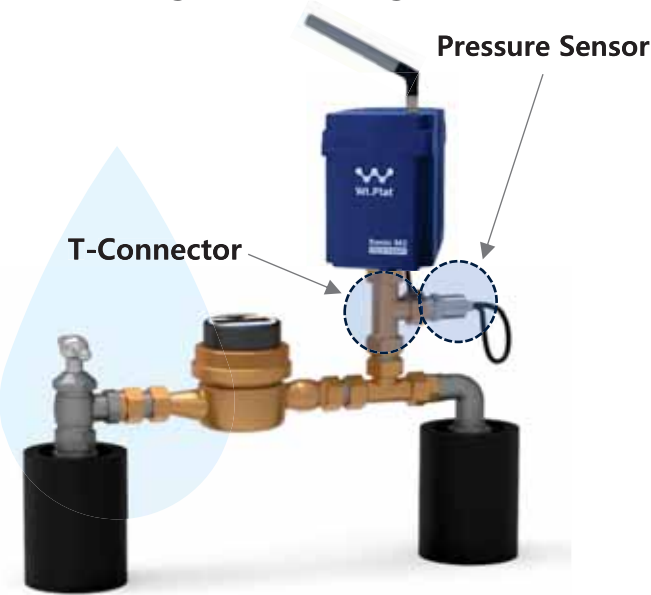


Sonic M2 for Pressure Monitoring

“ **Sonic M2** monitors abnormal condition of pipe network, Pressure can be measured every 0.1 second ”

Leak Monitoring

Monitoring Maximum Night Pressure



Pressure Monitoring



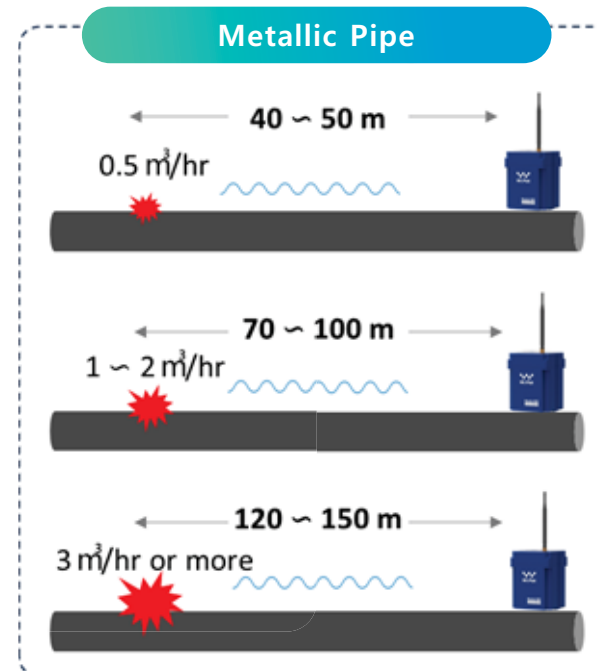
Maximum Night Pressure analysis

Sonic M2 for Water Leak Monitoring

“ **Sonic M2** monitors water leaks in real time, Metallic pipe can be detected up to 150m, Non-metallic pipe up to 50m ”

Leak Monitoring

Monitoring Water Leak Sound

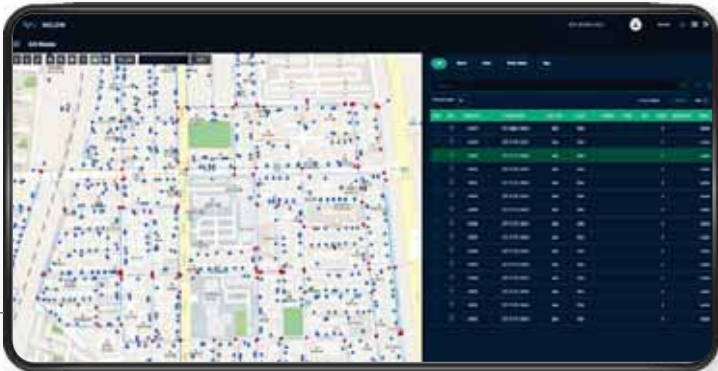


NELOW Software

// **NELOW Software** provide Integrated functions for water loss management //

GIS management, flow monitoring, water pressure monitoring, leak recovery history management etc.

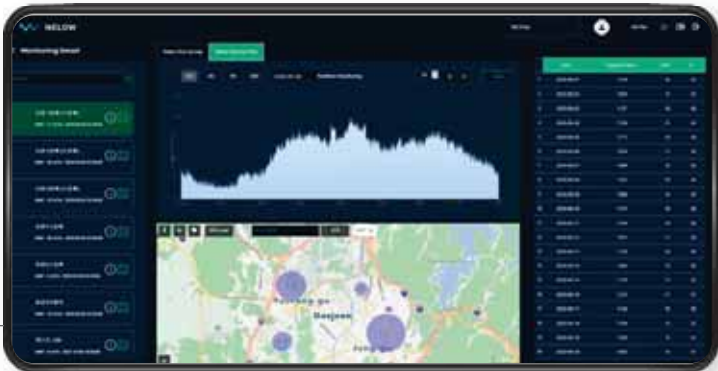
GIS Management
Leak Management



Flow Monitoring



Pressure Monitoring



Leak Recovery
History Management



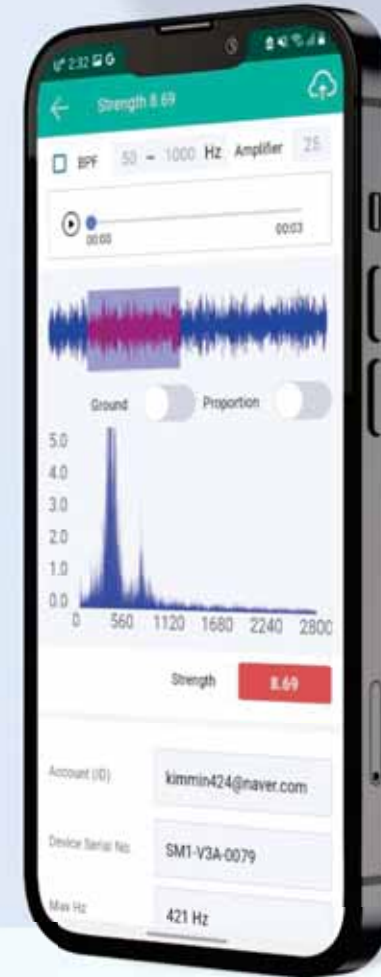


Water Leak Data Collection

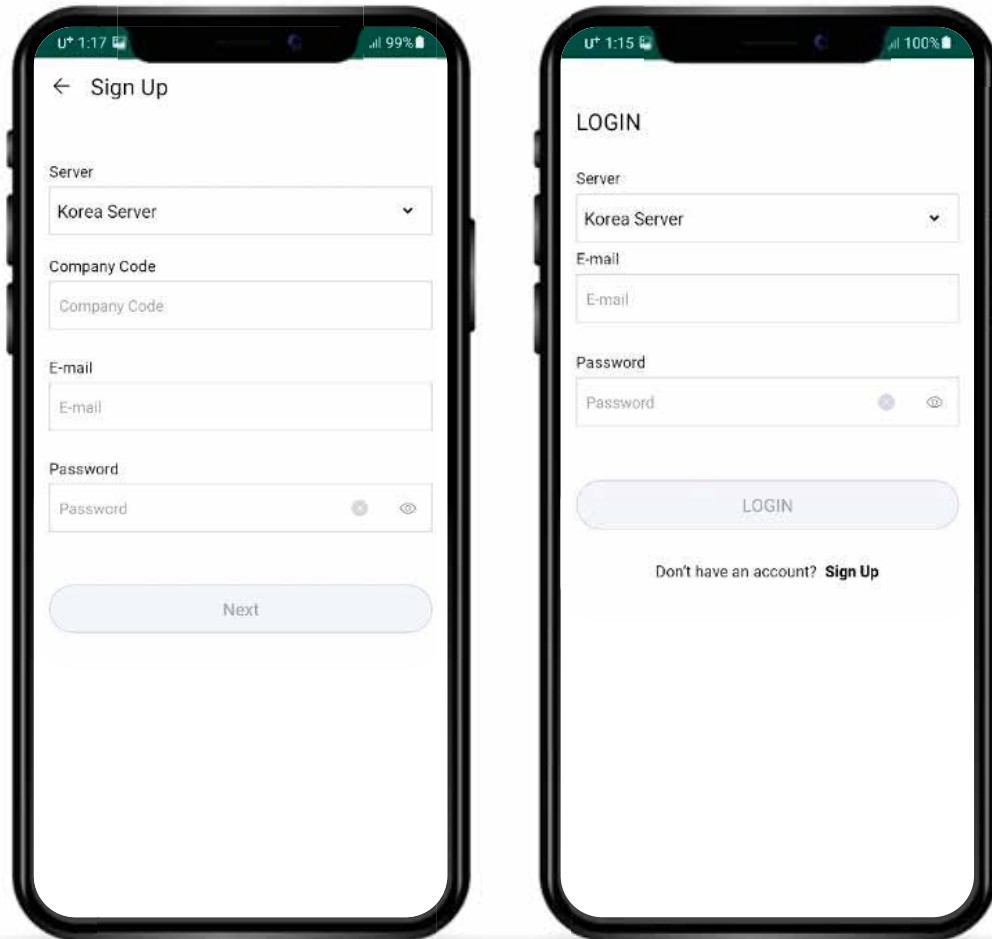
- Sign up
- Leak Inspection using Sonic GL - F
- Leak Detection using Sonic GL - G
- Leak sound data logging using Sonic GL
- Important Notes

I Water Leak Data Collection

Sign up for NELOW



Sign up for NELOW



The image displays two smartphone screens side-by-side. The left screen is the 'Sign Up' page, featuring a back arrow, a 'Server' dropdown menu set to 'Korea Server', a 'Company Code' input field, an 'E-mail' input field, and a 'Password' input field with a toggle for visibility. A 'Next' button is at the bottom. The right screen is the 'LOGIN' page, featuring a 'Server' dropdown menu set to 'Korea Server', an 'E-mail' input field, a 'Password' input field with a toggle, a 'LOGIN' button, and a link that says 'Don't have an account? Sign Up'.



Sign up & Log in

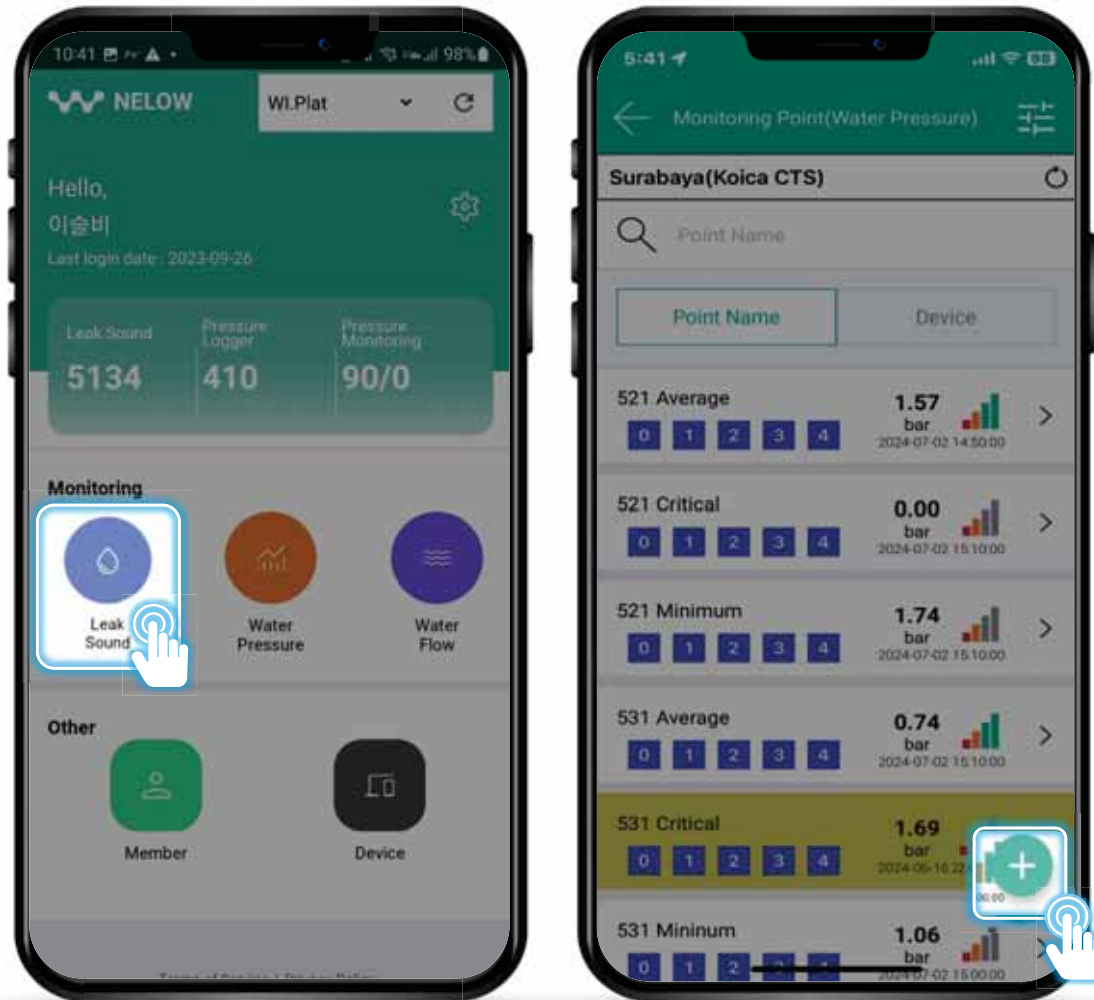
- 1 Install the NELOW app from the Google Play Store and Open the app
- 2 Tab 'Sign up' button
- 3 Select the country server
- 4 Enter the customer code provided by the WI.Plant
- 5 Enter email address, password, name and contact information
- 6 Check the agreement to the terms of service and privacy policy
- 7 Upon approval of account by a manager(or WI.Plant), the account will be activated.

Water Leak Data Collection

Leak monitoring Sonic M2 - Leak



Installation & Setting-up Sonic M2 for Leak Monitoring

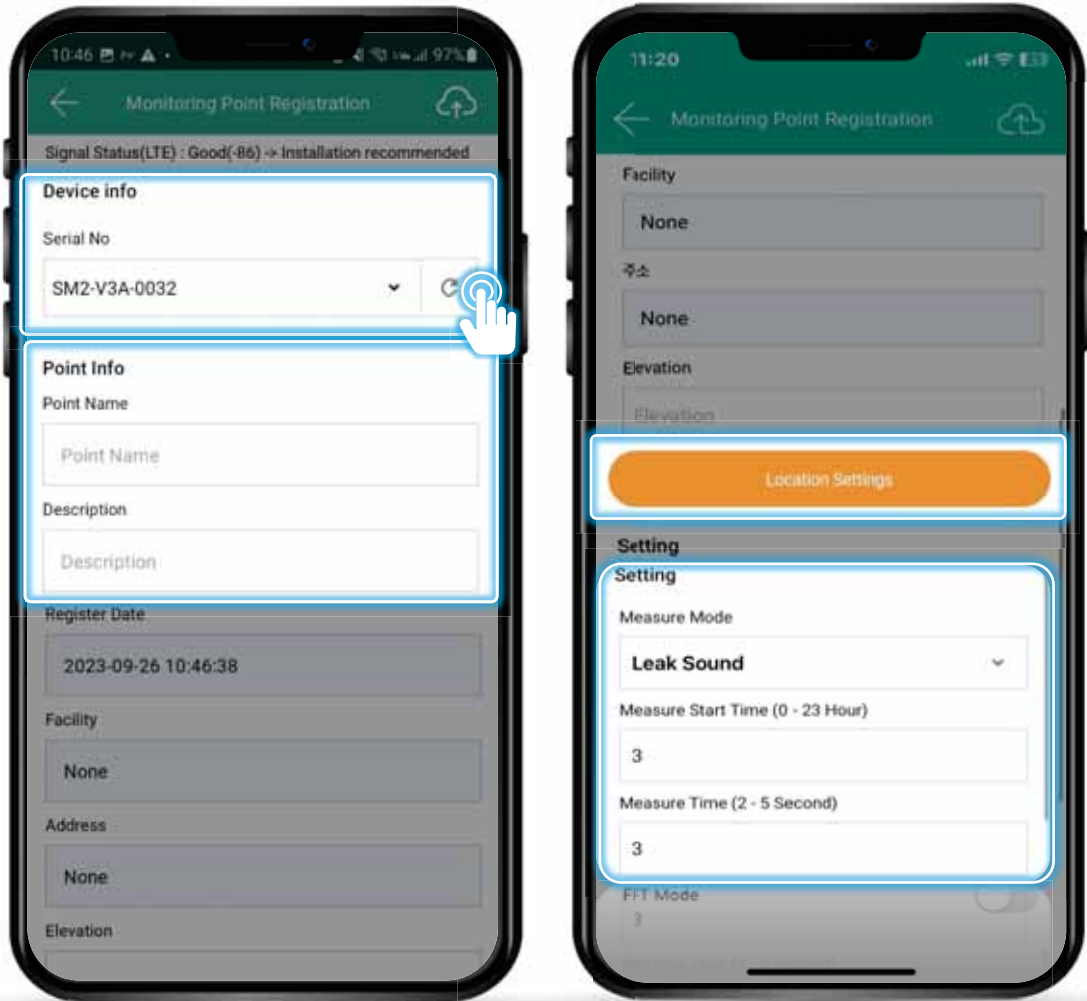


Registering the installation point

- 1 Open NELOW → Monitoring → Leak sound
- 2 Tab  icon (point registration) on the bottom right

[Go to the next page](#)

Installation & Setting-up Sonic M2 for Leak Monitoring



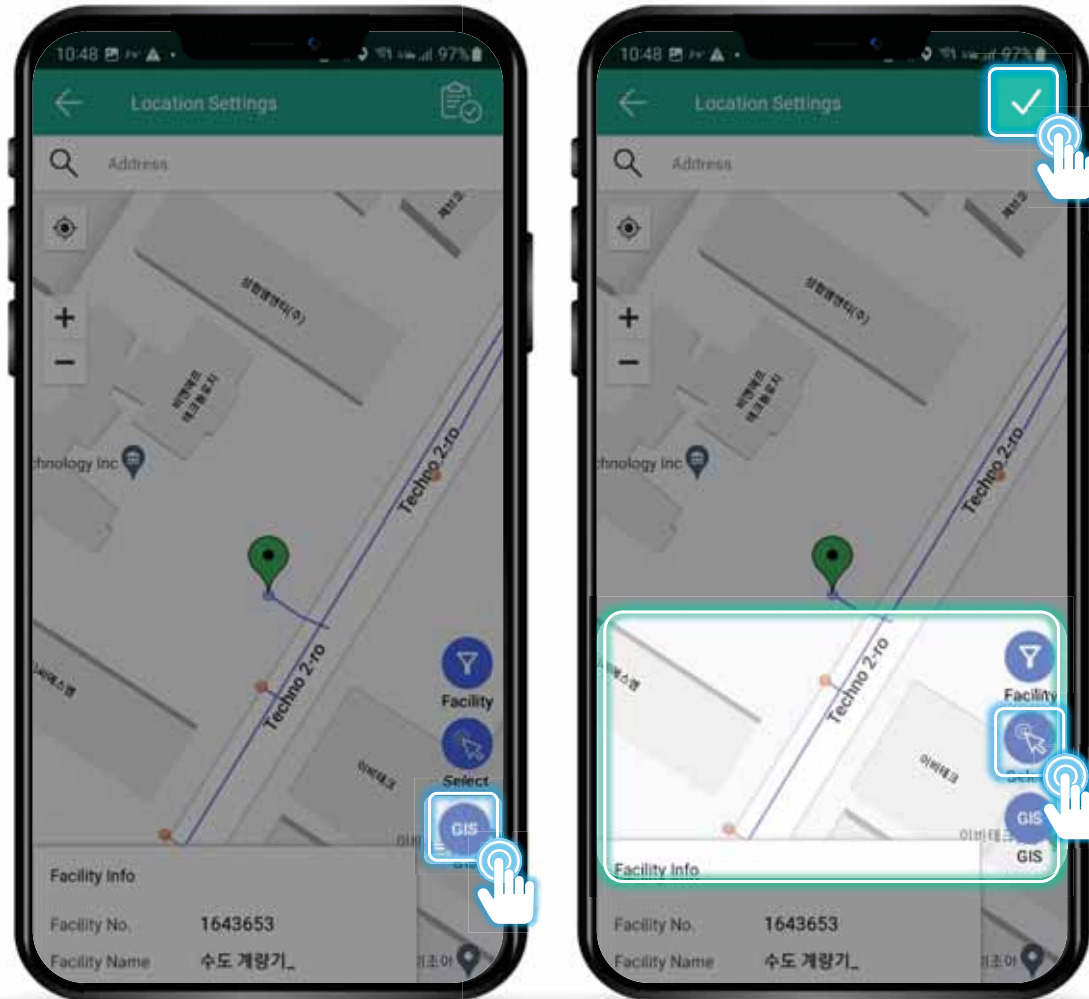
Registering the installation point

- 3 Device info: Select the same serial number as the Sonic M2 that will be installed
- 4 Point info: Input the address of the installation point in the name column
- 5 Set the measurement time. We recommend not to change default setting in the beginning. It can be change according to the user's need later.
- 6

[Go to the next page](#)

Tab "Location Settings"

Installation & Setting-up Sonic M2 for Leak Monitoring

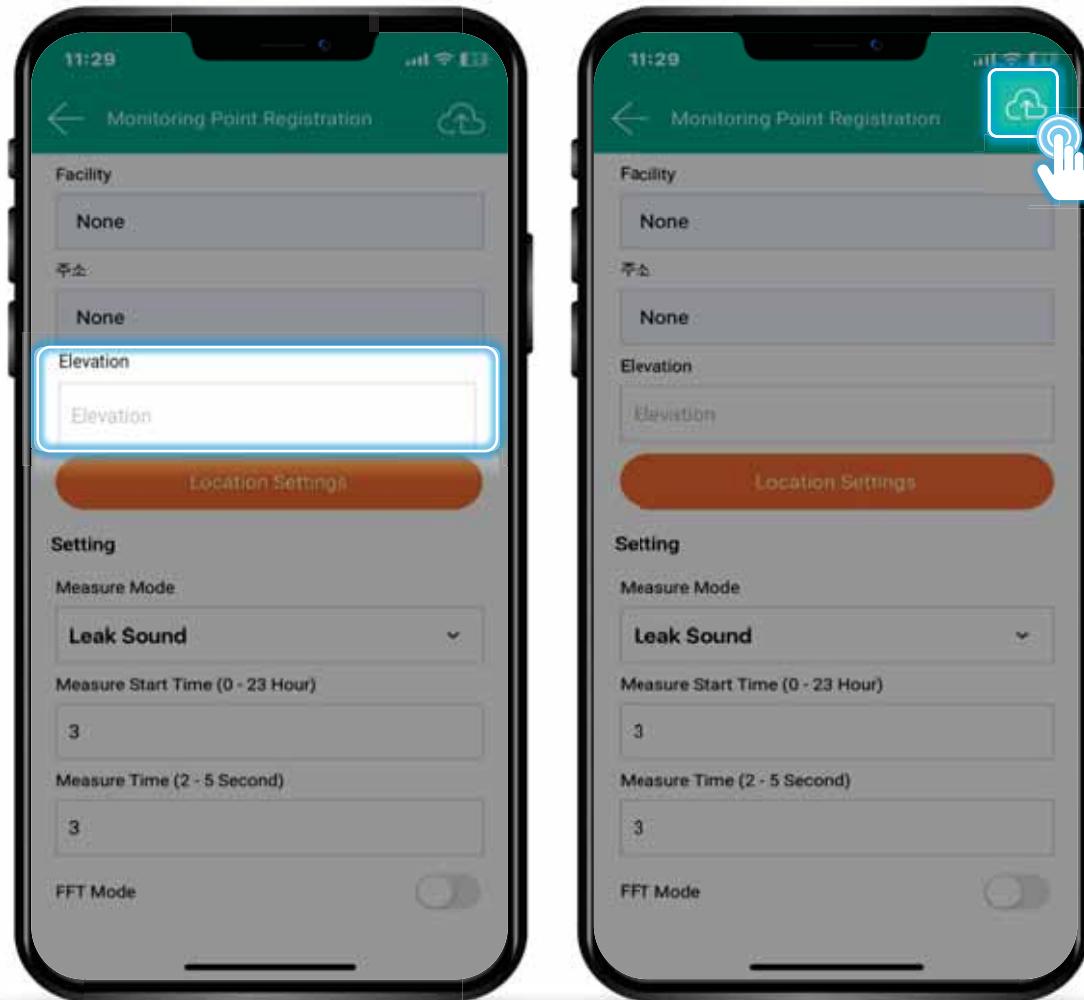


Registering the installation point

- 7 Press the GIS icon to check the facility location on the map
- 8 Change to  <F mode> to align the green pin  with the installed facility by moving it
- 9 Press the  icon to save (Point registration)

[Go to the next page](#)

Installation & Setting-up Sonic M2 for Leak Monitoring

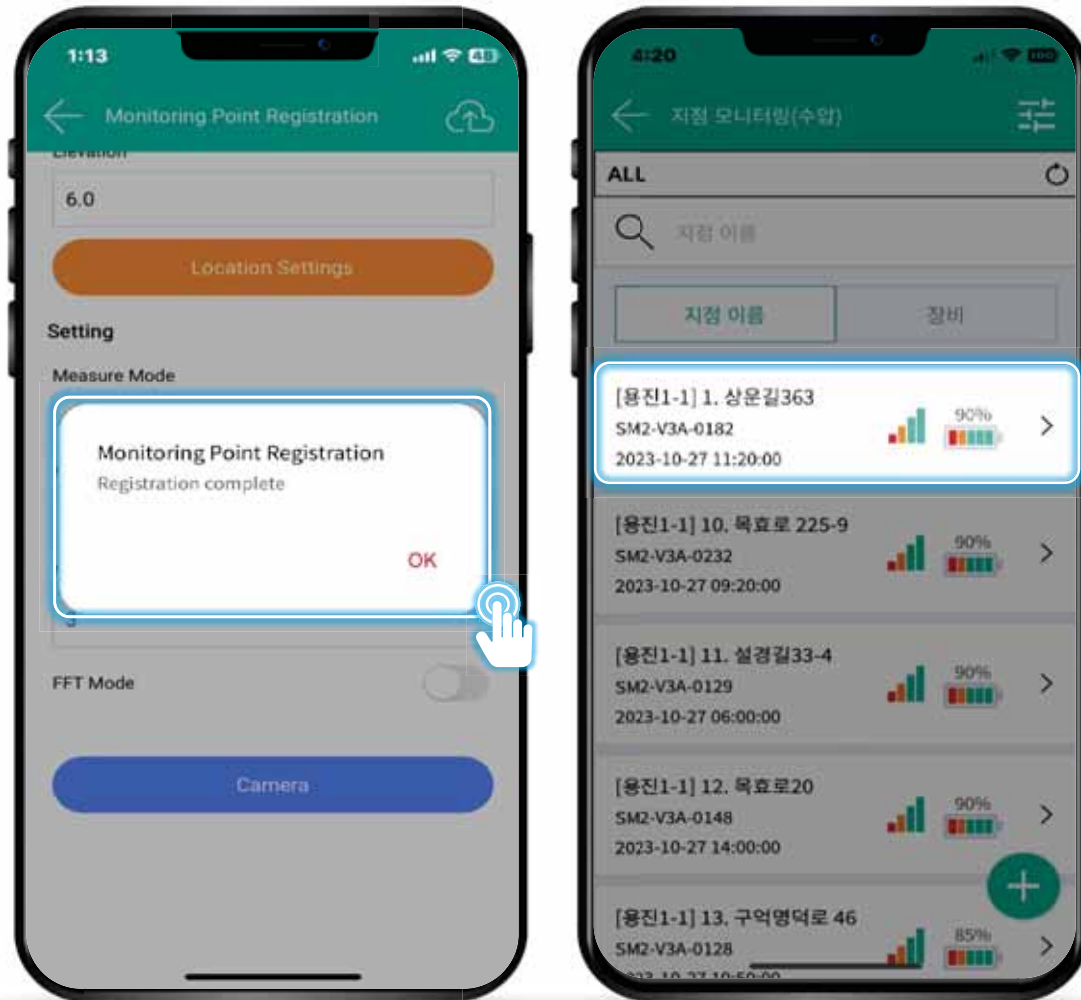


Registering the installation point

- 10 Elevation value will **automatically** appear once the Location setting is complete
- 11 Tab "Save" to complete "Point Registration"

[Go to the next page](#)

Installation & Setting-up Sonic M2 for Leak Monitoring



Registering the installation point

12 Branch registration completed → Click the OK button

13 The registered point will be appear to the list of points

14   Check communication status between Sonic M2 and
NELOW (Comm.X) (Comm. O)

※If Sonic M2 does not connected to the NELOW server, please try re connect water leak sound sensor a few times more

Installation & Setting-up Sonic M2 for Leak Monitoring



Tools that need for Installation

- ✓ Sonic M2 set for leak monitoring
- ✓ Tools that can open installation facilities (Valve chamber)

Installation & Setting-up Sonic M2 for Leak Monitoring



Tools that need for Installation

- ✓ Try avoid facilities full of water or other elements that could affect installation work, choose different site in such cases
- ✓ The installation work may be change according to the situation of the site, please contact the manager(or WI.Plat) if such incident happens

Installation & Setting-up Sonic M2 for Leak Monitoring

Installing Sonic M2

- 1 Return the water meter to the initial state before and after installation
- 2 Follow the reverse order of installation to release the installed product



- 1 Open the facility lid



- 2 Inside the facility, identify the location of the valve where the water leak sensor will be placed



- 3 Please finish "**Monitoring point registration**" process **than** connect water leak sensor and equipment

Installation & Setting-up Sonic M2 for Leak Monitoring

Installing Sonic M2

- 1 Return the water meter to the initial state before and after installation
- 2 Follow the reverse order of installation to release the installed product



- 4 Place the sensor on the valve where you want to collect drinking water inside the facility.



- 5 To prevent the product from falling, attach a support bar to the eye bolt and secure it to the side of the receiver

※ After installing M2, be sure to restore all conditions inside the facility (Water gate valve/stop valve, etc.) to their original state



- 6 Place the antenna to appropriate side and close the lid

Installation & Setting-up Sonic M2 for Leak Monitoring



Precaution

- ✓ Please wear safety gear when working onsite
- ✓ Always pay attention and control environment for safety working in pairs



Water Pressure Data Collection

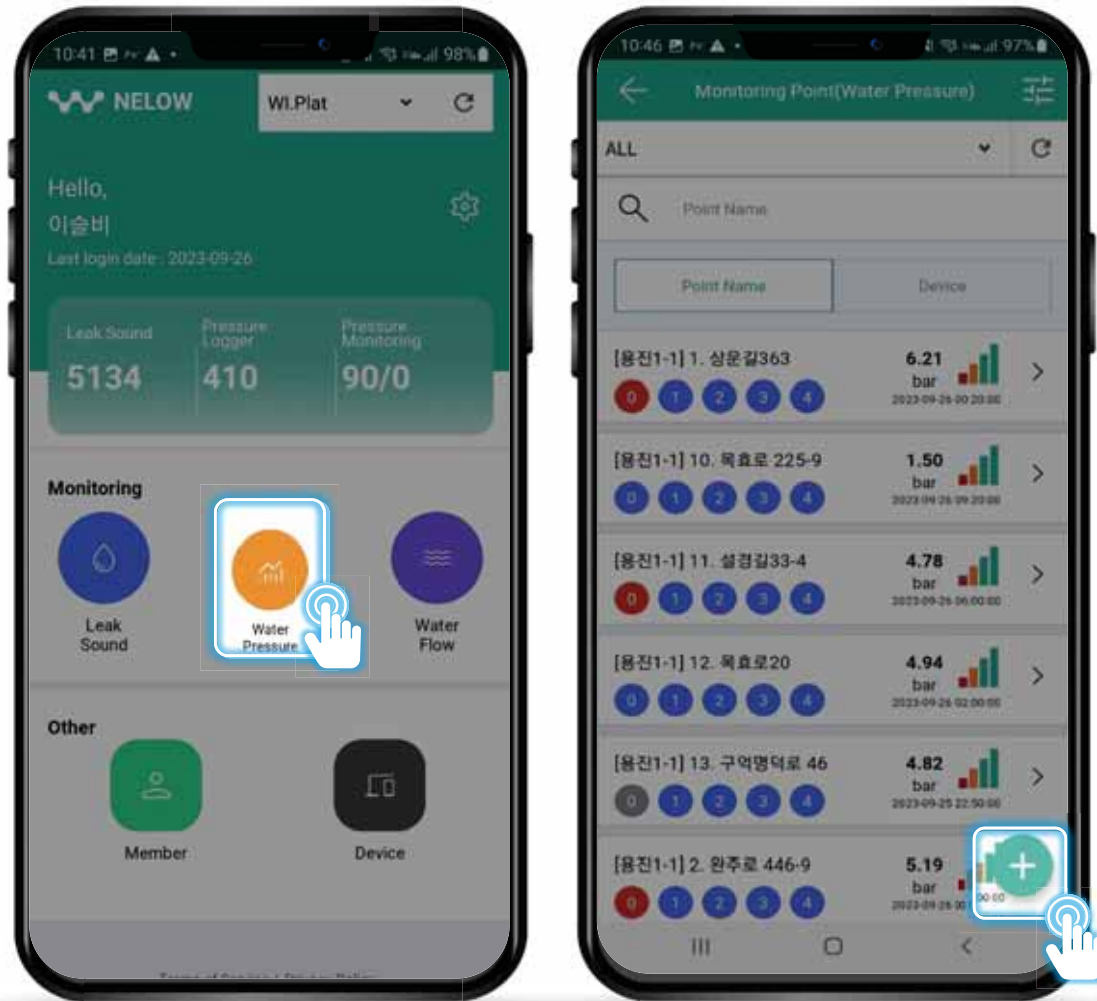
- Installation & Setting-up Sonic M2
- Data Collection of Sonic M2
- i-Logger usages

Water Pressure Data Collection

Installation & Setting - up Sonic M2 - Pressure



Installation & Setting-up Sonic M2 for Water Pressure

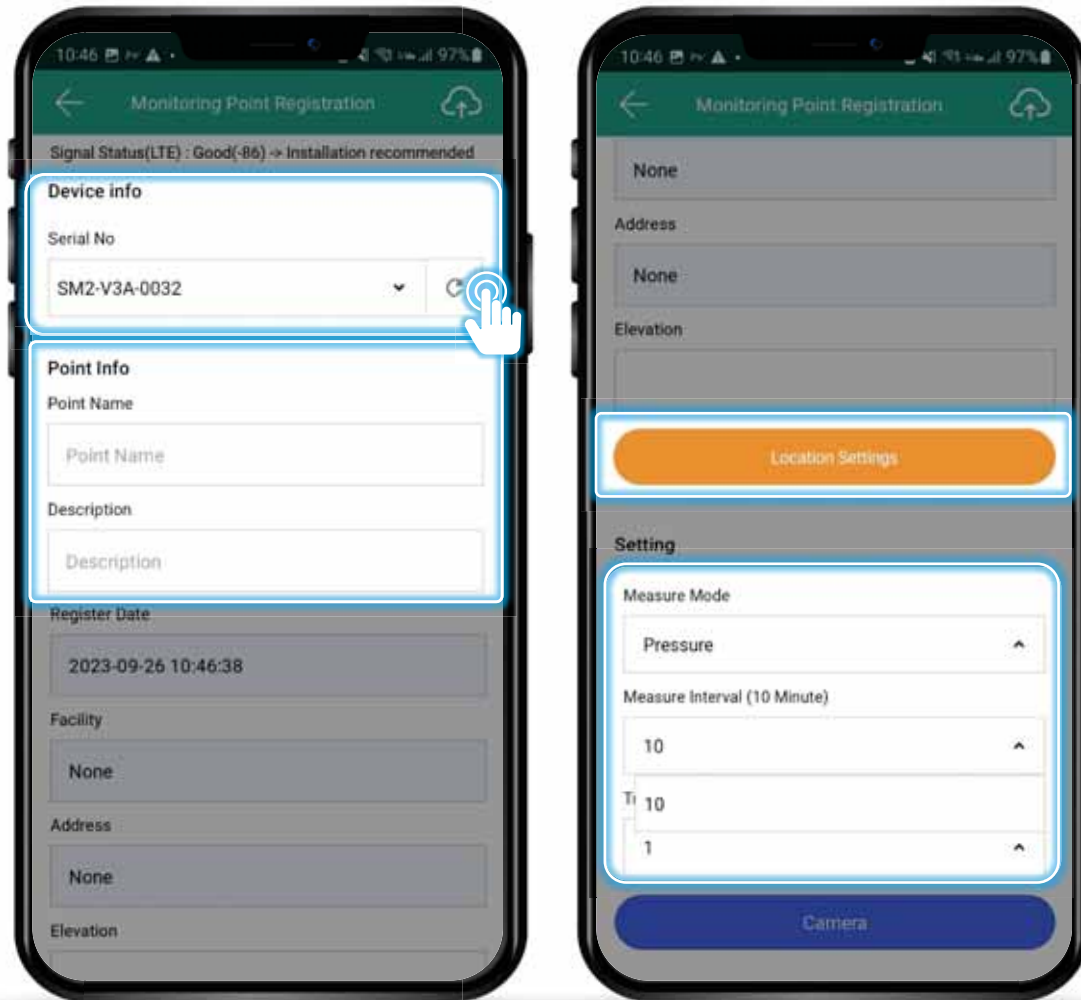


Registering the installation point

- 1 Open NELOW→ Monitoring → Water Pressure
- 2 Press the '+' icon (point registration) on the bottom right +

Go to the next page

Installation & Setting-up Sonic M2 for Water Pressure

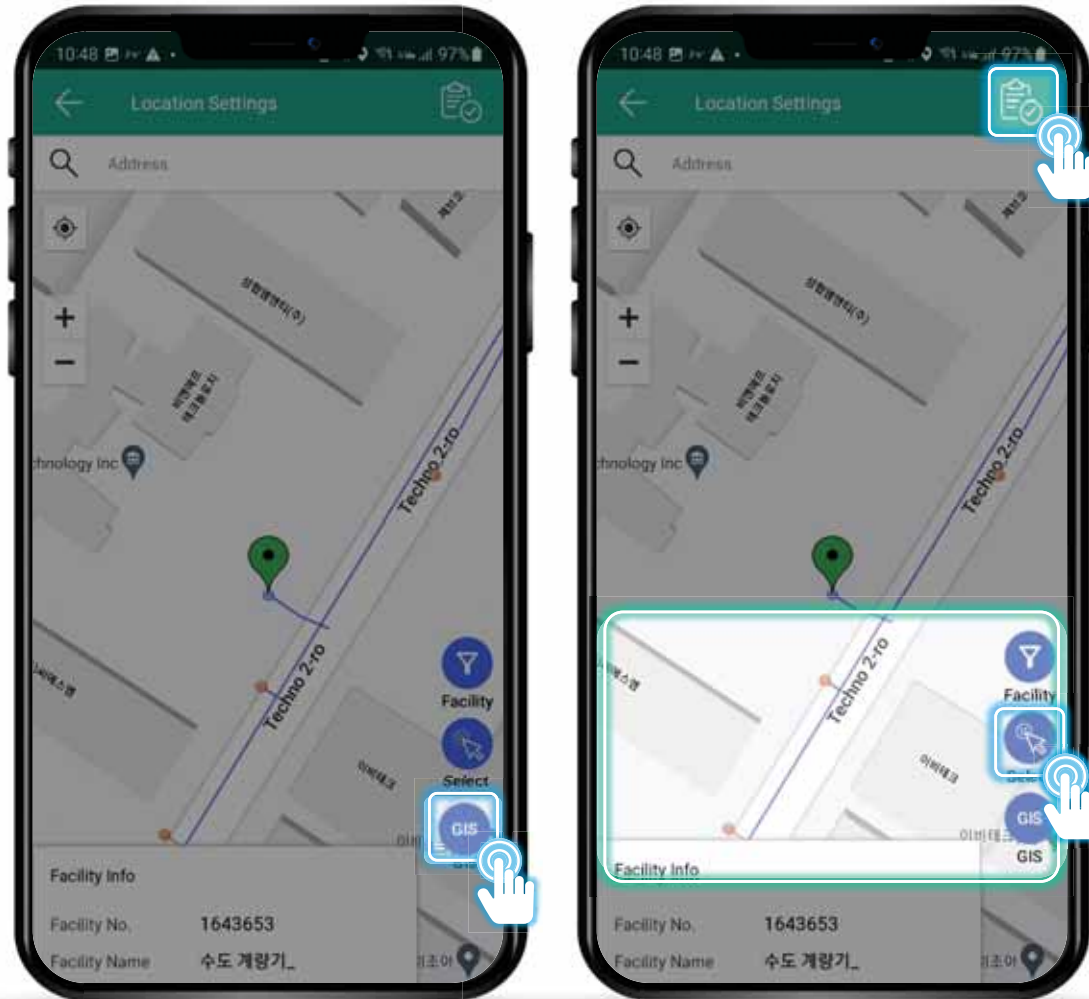


Registering the installation point

- 3 Device info: Select the same serial number as the Sonic M2 that will be installed
- 4 Point info: Enter the address of the installation point in the name column
- 5 Set the measuring/transferring frequency
- 6

Tab "Location Settings"
Go to the next page

Installation & Setting-up Sonic M2 for Water Pressure

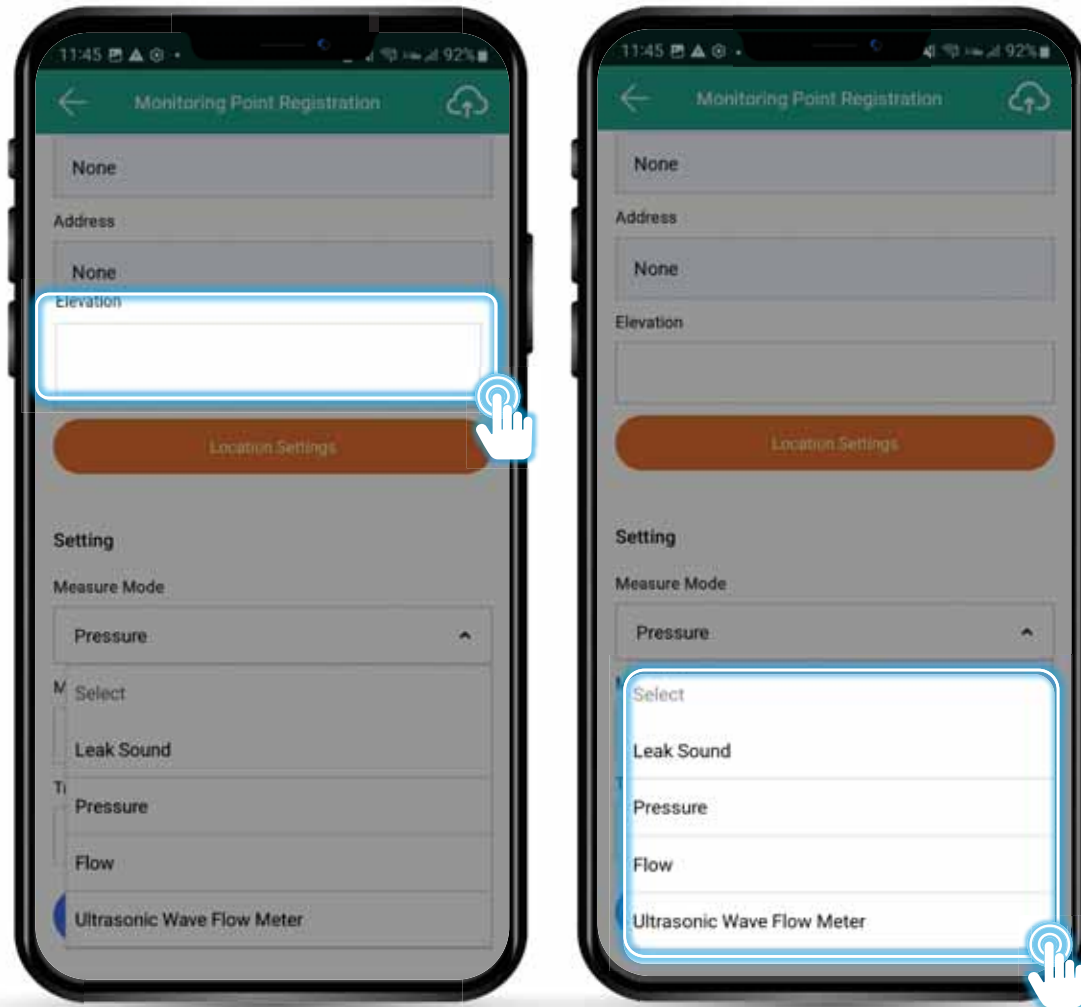


Registering the installation point

- 7 Press the GIS icon to check the facility location on the map
- 8 Change to  <F mode> to align the green pin  with the installed facility by moving it
- 9 Press the  icon to save (Point registration)

[Go to the next page](#)

Installation & Setting-up Sonic M2 for Water Pressure

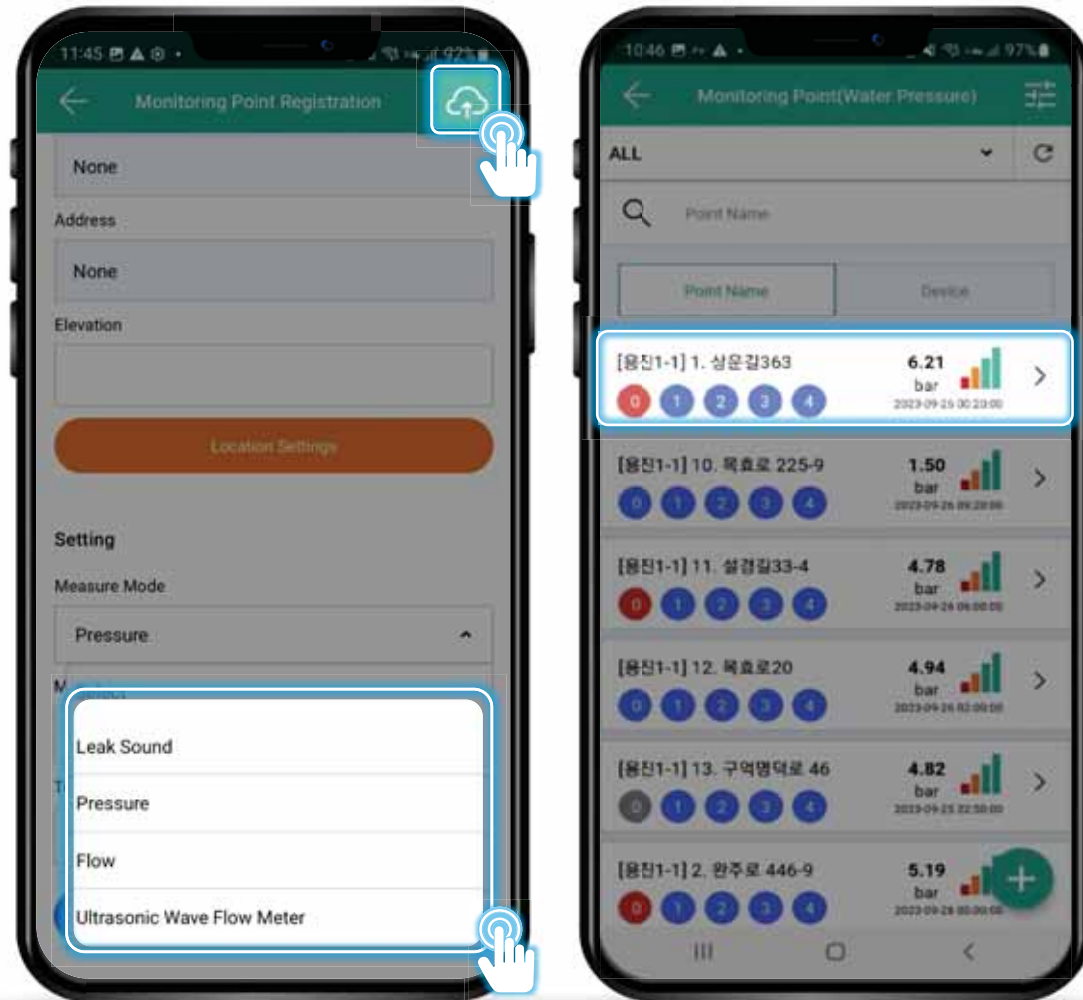


Registering the installation point

- 10 Input the hydraulic head* value in the column of "Elevation" [Refer to page 51](#)
*The value measured and calculated with GPS Antenna
- 11 Measure mode: Select 'water pressure' from the list of leakage sound/water pressure/flow/ultrasonic flowmeter

[Go to the next page](#)

Installation & Setting-up Sonic M2 for Water Pressure



Registering the installation point

- 12 Set the measuring/transferring frequency (10 min./1 hr. recommended)
- 13 Press the save  icon to finish point registration
- 14 Communication, battery status of the installed Sonic M2

Installation of Sonic M2

Measuring&calculating the hydraulic head

✓ **Hydraulic Head** | A measure of water pressure and speed flowing in a waterway, expressed as the elevation of the water

GPS antenna



Antenna holder



GPS receiver



Cable



Installation of Sonic M2

Measuring the hydraulic head before installing the pressure sensor

- 1 Assembling the antenna
- 2 Connecting and Setting Smartphone Bluetooth Device
- 3 Measuring the hydraulic head



Assemble the antenna and the holder



Connect the ends of the cable to the antenna and the receiver



Press the red power button
Check the power light

Installation of Sonic M2

Measuring the hydraulic head before installing the pressure sensor

- 1 Assembling the antenna
- 2 Connecting and Setting Smartphone Bluetooth Device
- 3 Measuring the hydraulic head



Turn on Bluetooth and find the product number on the receiver marked beside Com1: Bluetooth



Run Gnssviewer v1.19 and press Bluetooth



Select the Bluetooth device and press "Connect"

Installation of Sonic M2

Measuring the hydraulic head before installing the pressure sensor

- 1 Assembling the antenna
- 2 Connecting and Setting Smartphone Bluetooth Device
- 3 Measuring the hydraulic head



Place the antenna beside the Sonic M2 installed facility



Tab the  button on the top menu and select VRS_V32 in the mount point list to connect



Connecting and setting are complete once the above screen appears

Installation of Sonic M2

Measuring the hydraulic head before installing the pressure sensor

- 1 Assembling the antenna
- 2 Connecting and Setting Smartphone Bluetooth Device
- 3 Measuring the hydraulic head

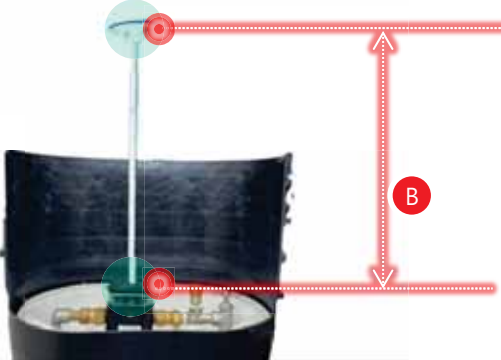


*Measure the hydraulic head value at each Sonic M2 or i-logger installation point and entering the corresponding value during “point registration”

- 1 Check until value 4 appears in the brackets beside RTK
- 2 Check the H value when the RTK becomes 4



$A \text{ value} - B \text{ value} = \text{Hydraulic head value}$



- 3 Measure the elevation from the M2 pressure sensor to the top of the antenna.
- 4 Enter the measured value in “Elevation” when registering the Sonic M2 (or I-logger) point later [Refer to page 54](#)

Installation & Setting-up Sonic M2 for Water Pressure

Tools that need for Installation

※ Please start physical installation process after "Monitoring point registration"



T-typed pipe
(Including rubber packer)



Spanner, jaw lock vise, Sealing Tape
and etc.



Sonic M2 Set
(Main body, pressure sensor, device case)

Installation & Setting-up Sonic M2 for Water Pressure

Installing Sonic M2

- 1 Return the water meter to the initial state before and after installation
- 2 Follow the reverse order of installation to release the installed product



- 1 Open the water meter



- 2 Close the water meter valve before installing the product



- 3 Separate the straight pipe with a driver

Installation & Setting-up Sonic M2 for Water Pressure

Installing Sonic M2

- 3 Return the water meter to the initial state before and after installation
- 4 Follow the reverse order of installation to release the installed product



- 4 Join the T-shape pipe tightly



- 5 Connect the pressure sensor to the top of the T-shape pipe



- 6 Open the T-shape pipe to check whether the pressure sensor leaks

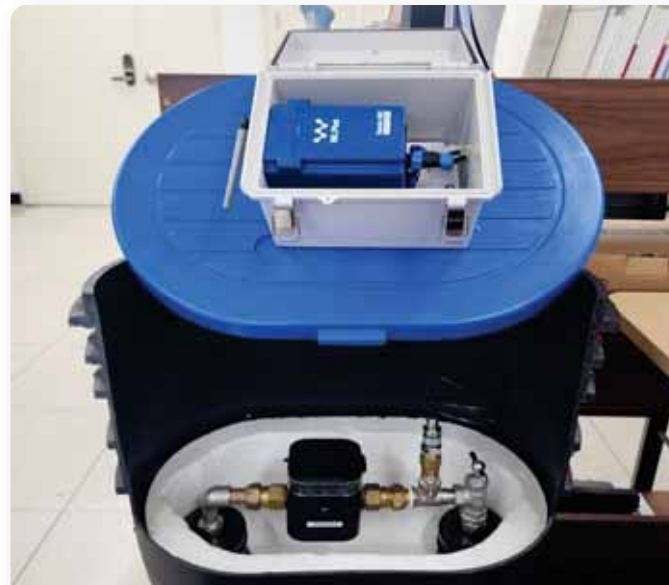
Installation & Setting-up Sonic M2 for Water Pressure

Installing Sonic M2

- 5 Return the water meter to the initial state before and after installation
- 6 Follow the reverse order of installation to uninstalled product



- 7 Connect the pressure sensor to the device (M2/i-Logger) (M2 power switches on automatically)



- 8 Place the device in the remaining space of the facility



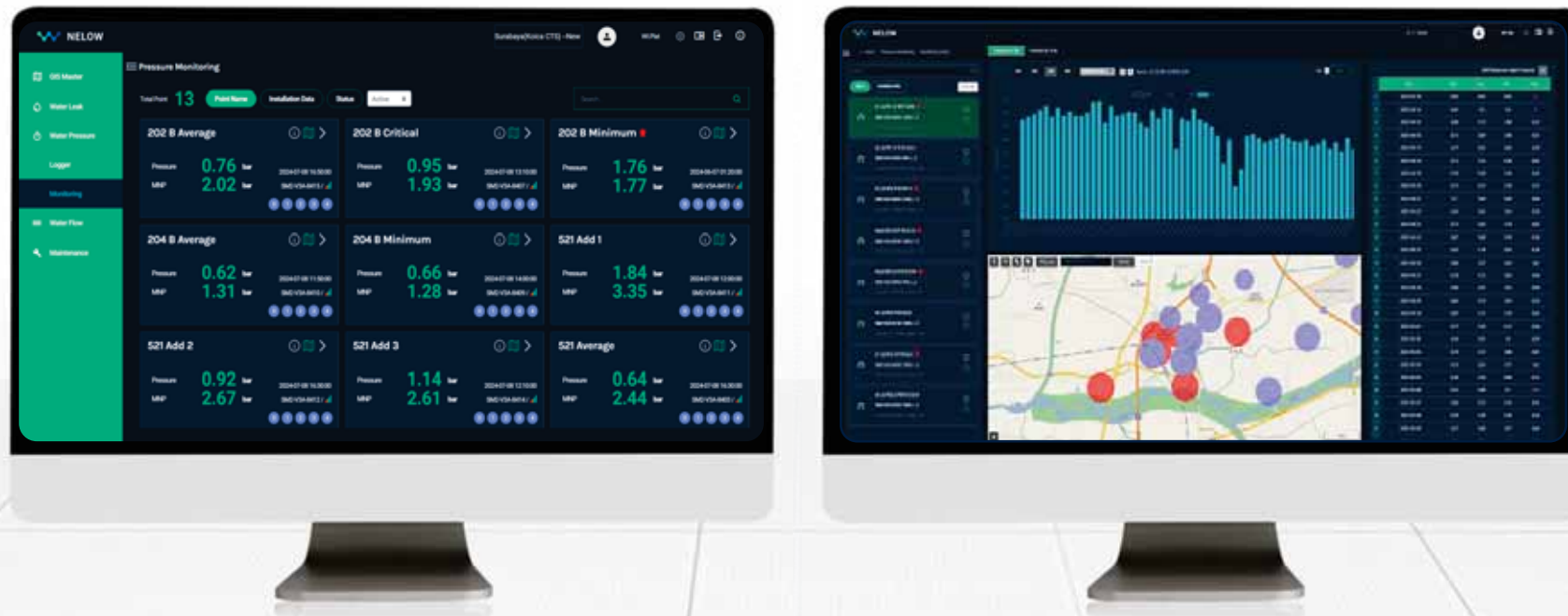
- 9 Close the water meter

※ After installing M2, be sure to restore all conditions inside the facility (Water gate valve/stop valve, etc.) to their original state.

Data collection of Sonic M2

Data monitoring after installation

- ✓ Once the Sonic M2 installation is complete, they will appear on the NELOW server start collecting data from the facilities. The collected data will be shown upon the time setting of the users when to transmit data to the server.



IV

System Analysis

- NELOW Web Setting
- Leak Data Analysis
- Water Pressure Data Analysis

IV System Analysis

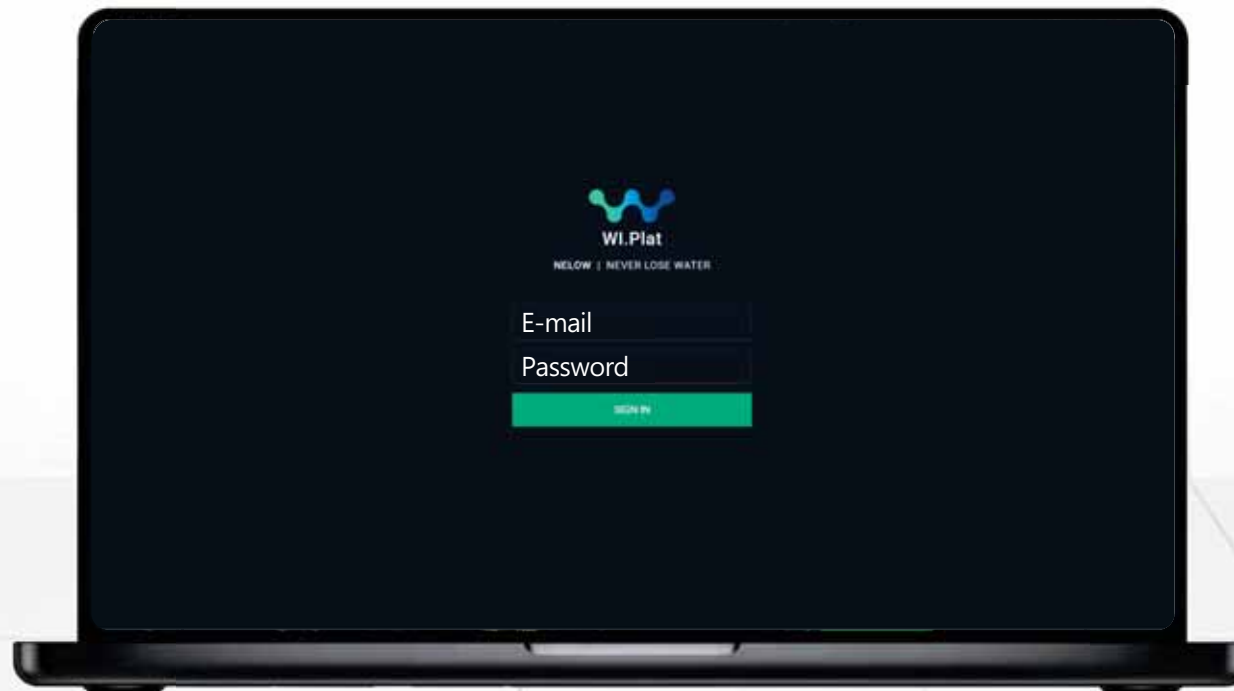
NELOW Web Setting



NELOW Web Setting

Log in

- 1 Once the account is activated, users can log-in to mobile app and web software.
- 2 Go to 'id.neverlosewater.com'



NELOW Web Setting

Setting before use

- 1 Click 'Setting' on the top-right side of the browser.



NELOW Web Setting

Setting before use

1

Choose 'Bing' for background map and 'Standard' for Map type.



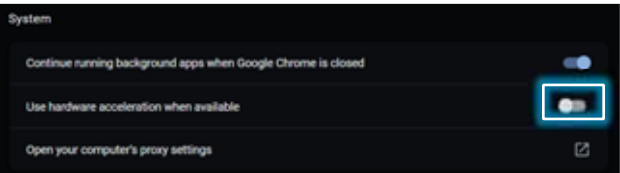
2

The 'Layer' menu is to select GIS layers the user would like to see particularly.



3

For stable traffic of the internet while using NELOW software, go to setting of the internet browser and turn off function ' Use hardware acceleration when available'.



IV System Analysis

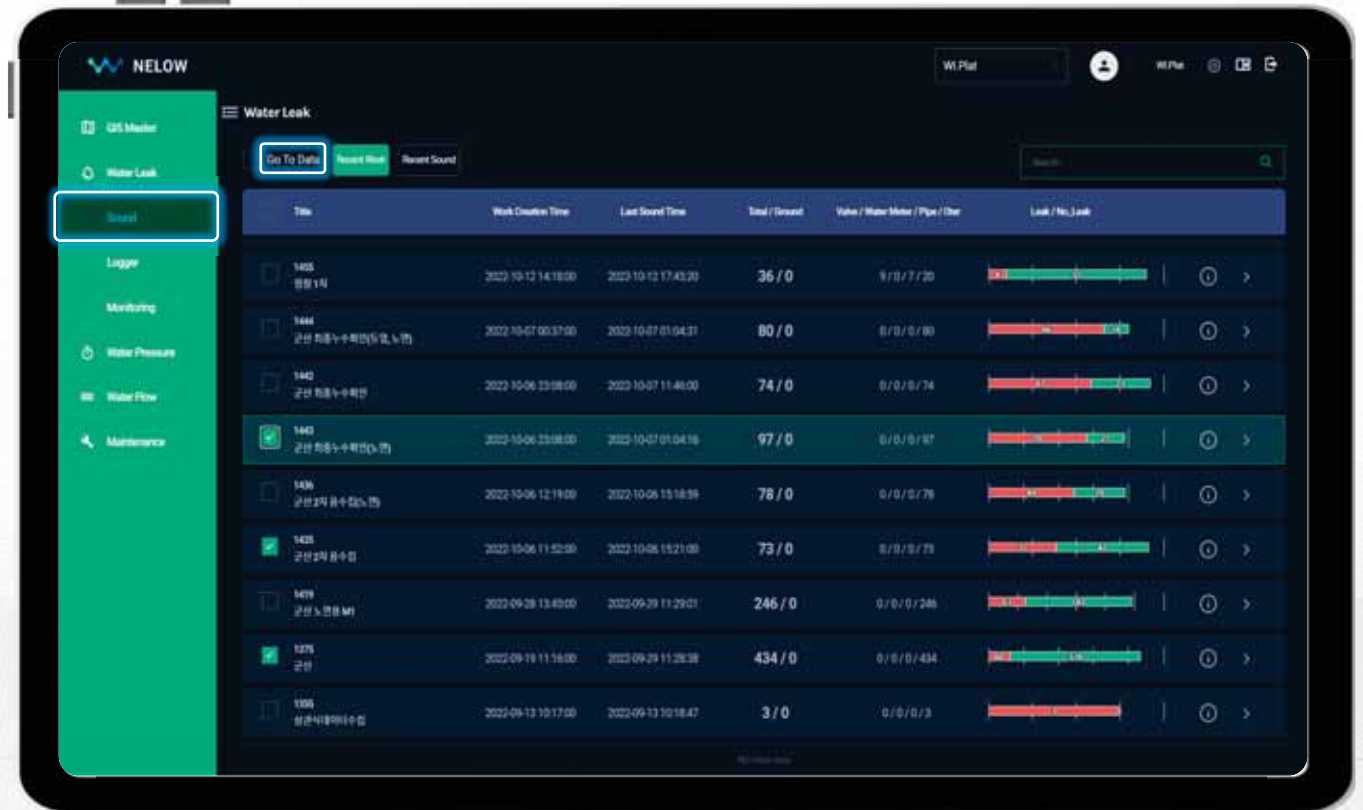
Leak Data Analysis



Leak Data Analysis

Access to the workspace

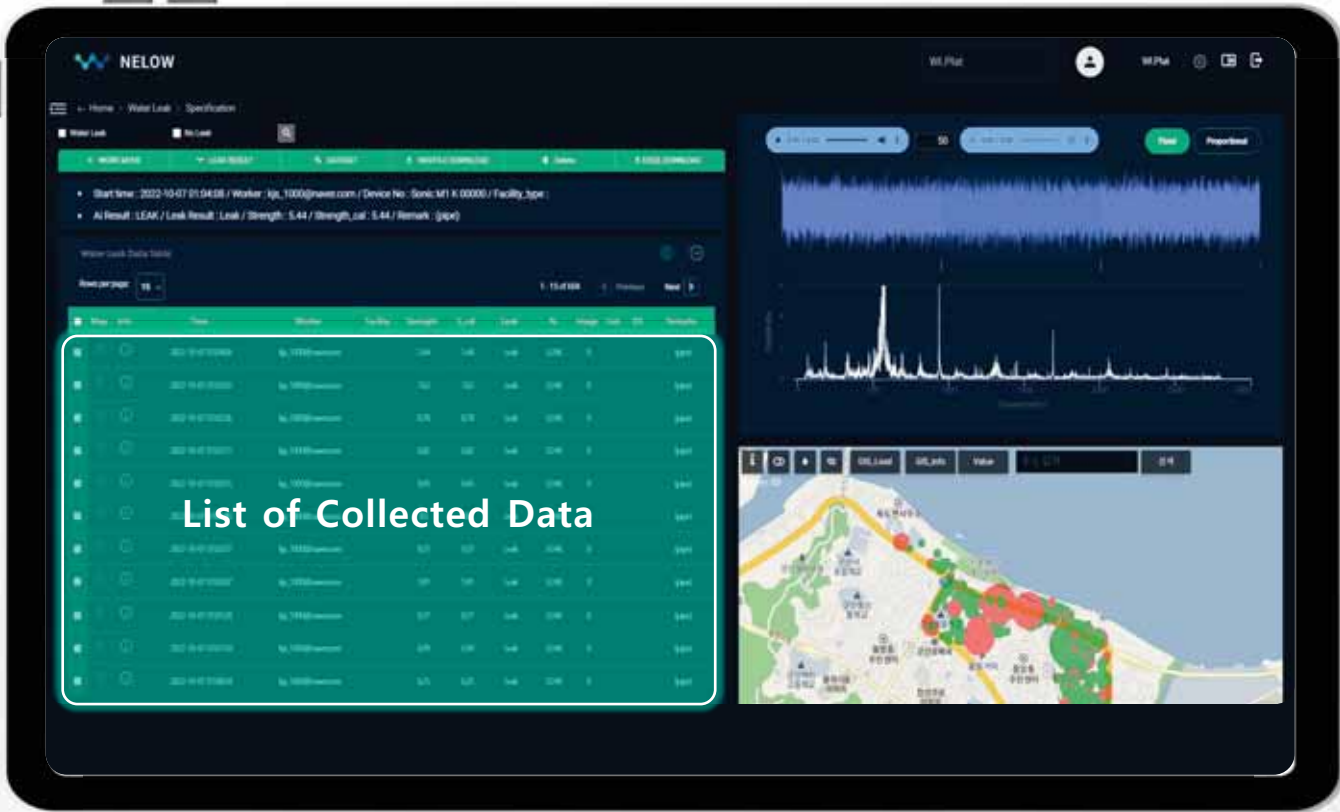
- 1 Go to 'Water Leak' > 'Sound' from the menu bar.
- 2 Choose the workspace for data analysis.
- 3 Click 'Go To Data' button.



Leak Data Analysis

Check the list of data

- 1 The table list of collected data can be seen in the left side.
- 2 The frequency chart and the map can be seen in the right side.



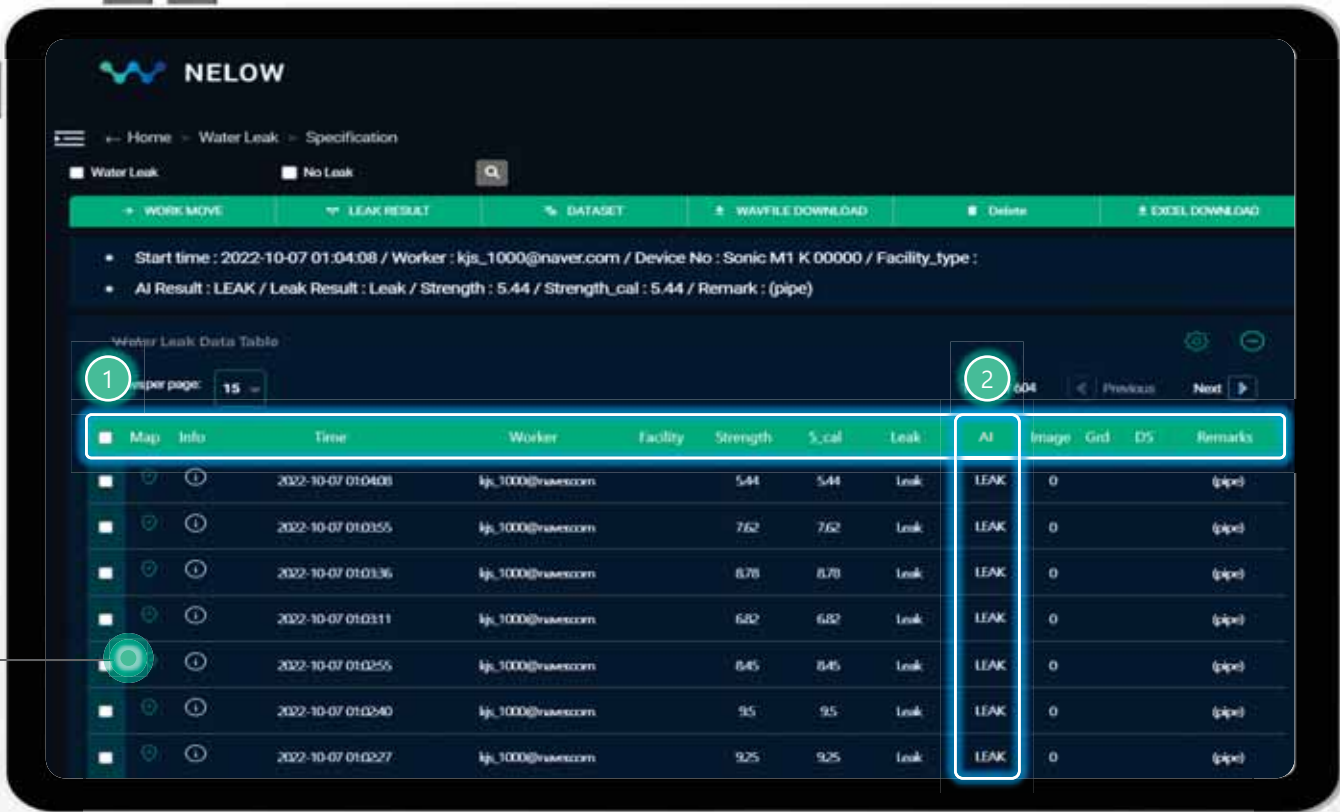
Leak Data Analysis

Access to the workspace

- 1 The data can be filtered of each criteria of the table.
- 2 The column heading 'AI' is the part the AI model of NELOW verify the leak data.



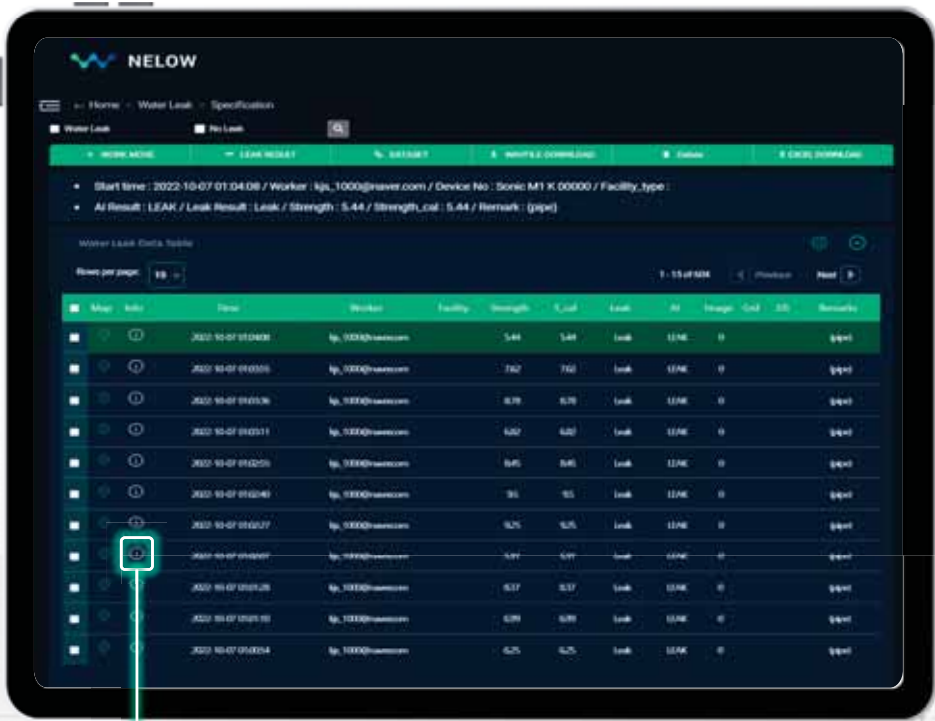
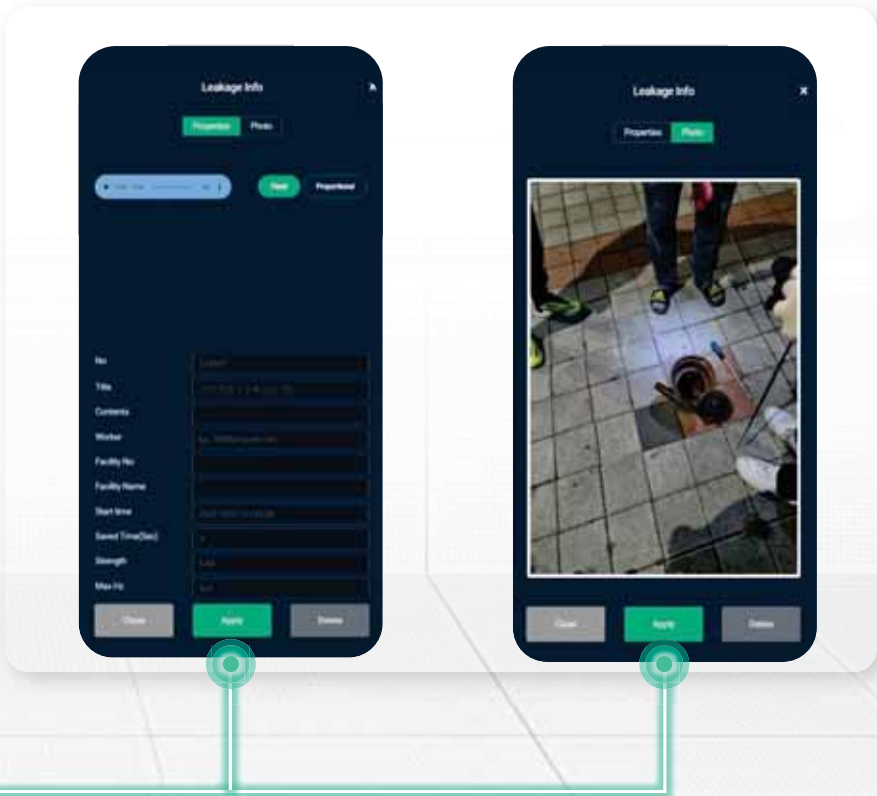
Click this button to locate the map to the spot of the collected data



Leak Data Analysis

Check the list of data

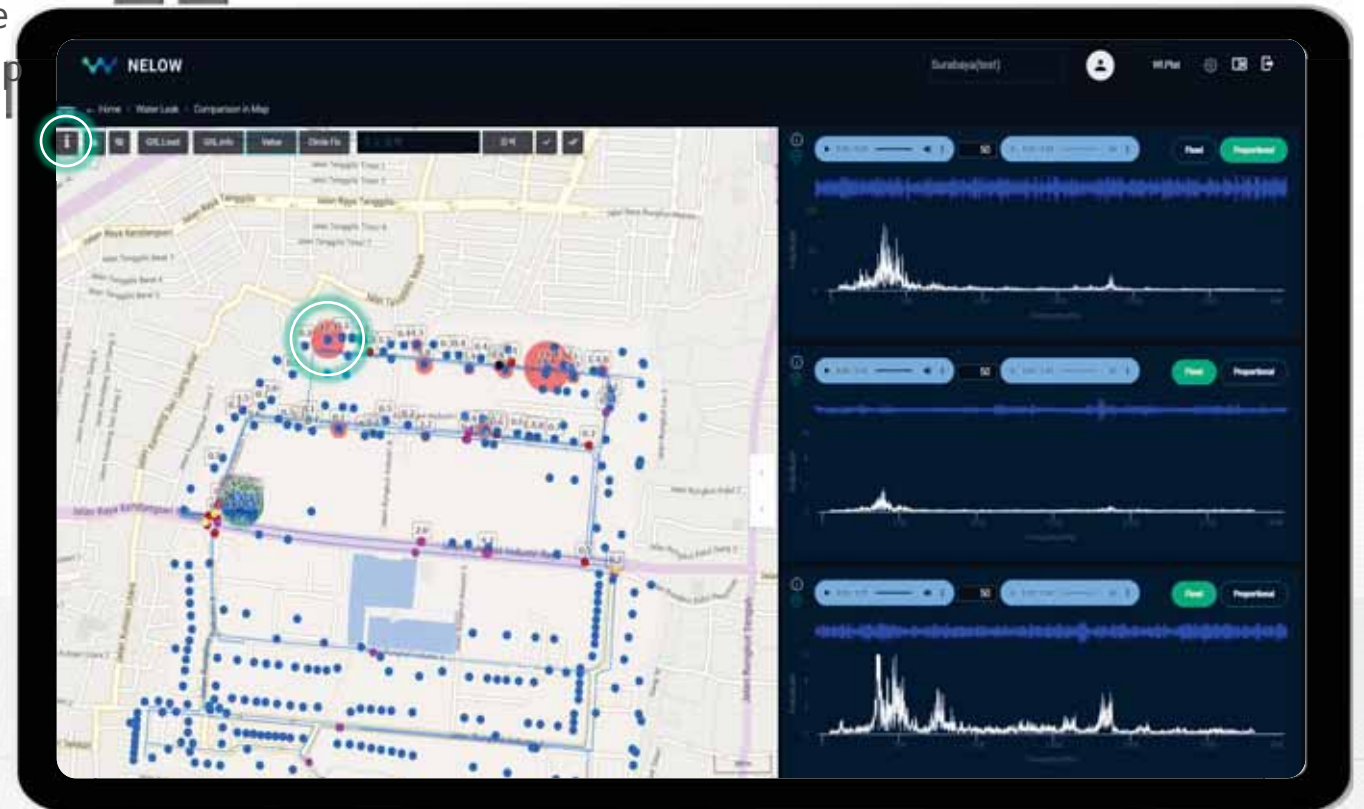
- ✓ For detailed information of the data-collected facility, click 'i' button.



Leak Data Analysis

Check the list of data

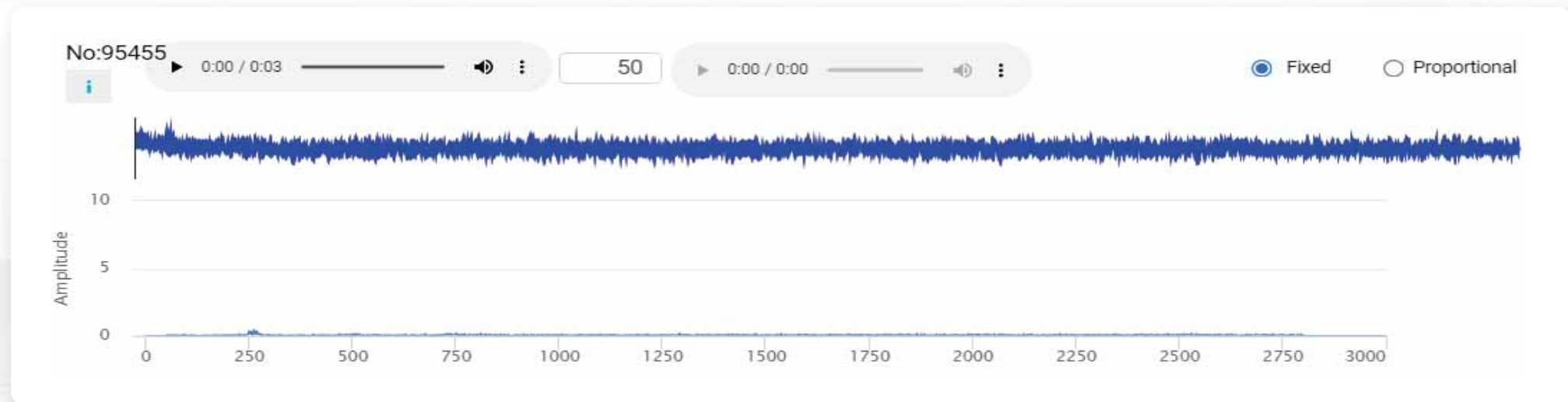
- 1 Enlarge map to check collected data by places and directly see frequency charts.
- 2 To check the frequency chart from the data on the map, click 'i' button on the top-left side of the map and click the collected data showing on the map.



Leak Data Analysis

Data without leaks

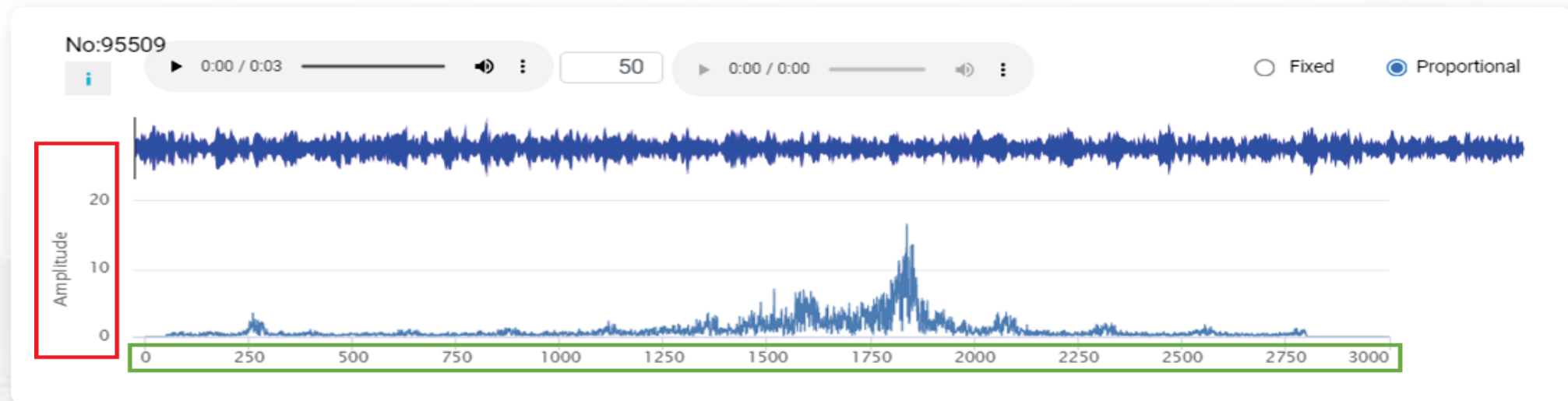
- 1 The sound pattern is consistent when there is no leaks, there is no specific characteristics in frequency chart.



Leak Data Analysis

Leak classification by pipe material

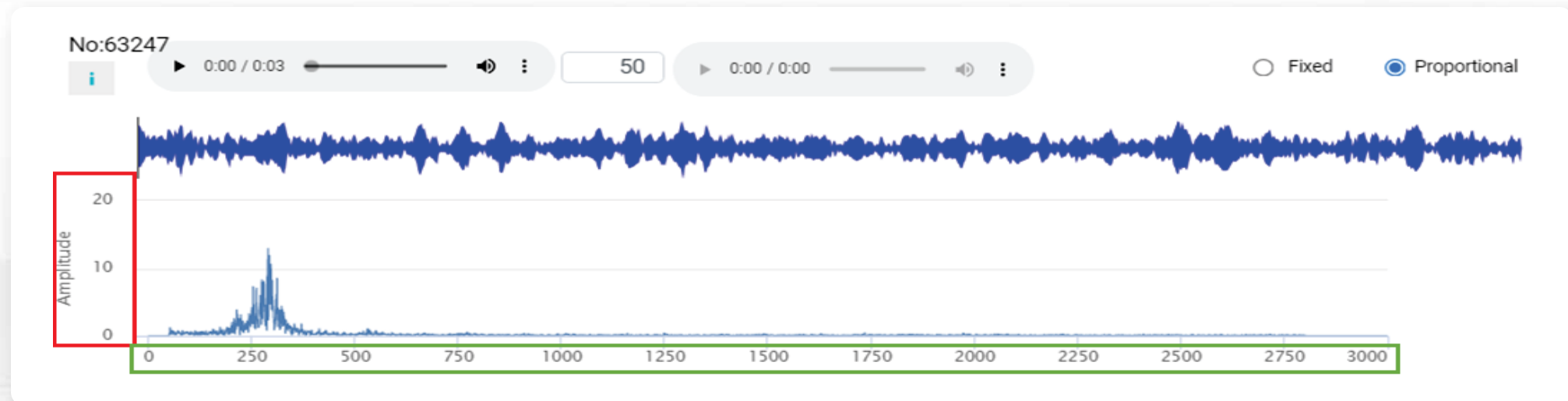
- 1 Metal pipe data pattern under 0.5ton/h
 - The Y-axis (amplitude) is 1.5 or more, and the X-axis (frequency band) is formed between 1800 Hz and 2000 Hz.
 - The usual strength should be over 0.7 to be verified as leak.



Leak Data Analysis

Leak classification by pipe material

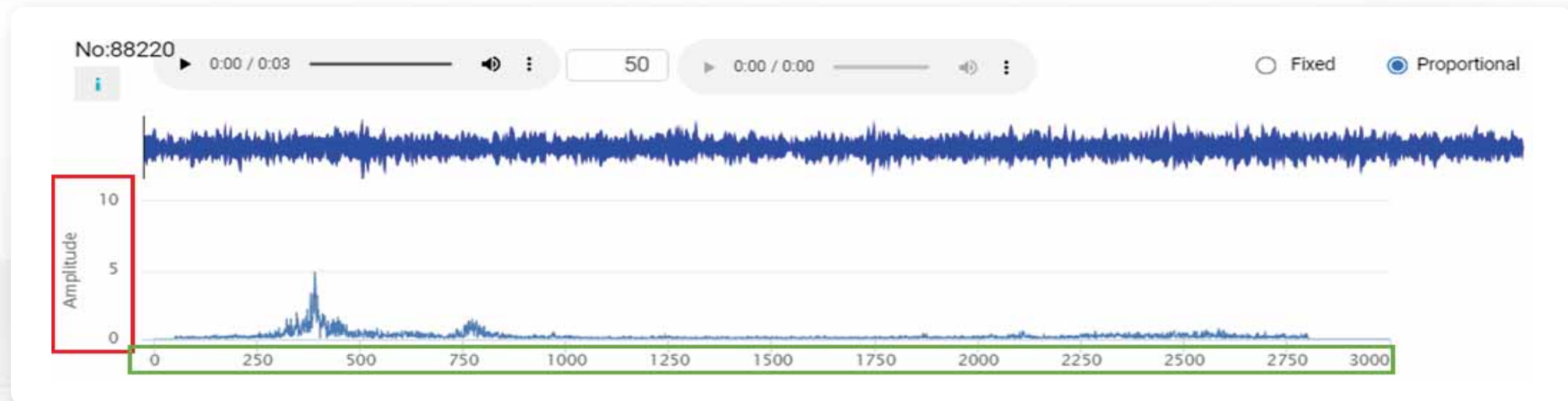
- 1 Metal pipe data pattern over or the same 0.5ton/h
 - The Y-axis (amplitude) is 1.5 or more, and the X-axis (frequency band) is formed between 200 Hz and 400 Hz.
 - The usual strength should be over 0.7 to be verified as leak.



Leak Data Analysis

Leak classification by pipe material

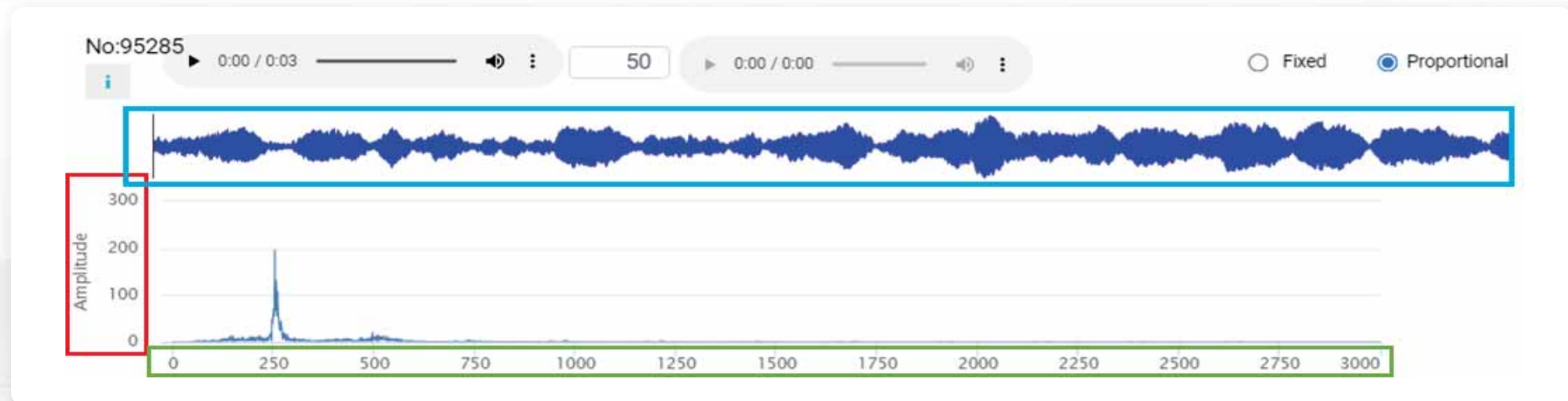
- 1 Non-metal pipe data pattern under 0.5ton/h
 - The Y-axis (amplitude) is 1.5 or more, and the X-axis (frequency band) is formed between 200 Hz and 500 Hz.
 - The usual strength should be over 0.7 to be verified as leak.



Leak Data Analysis

Leak classification by pipe material

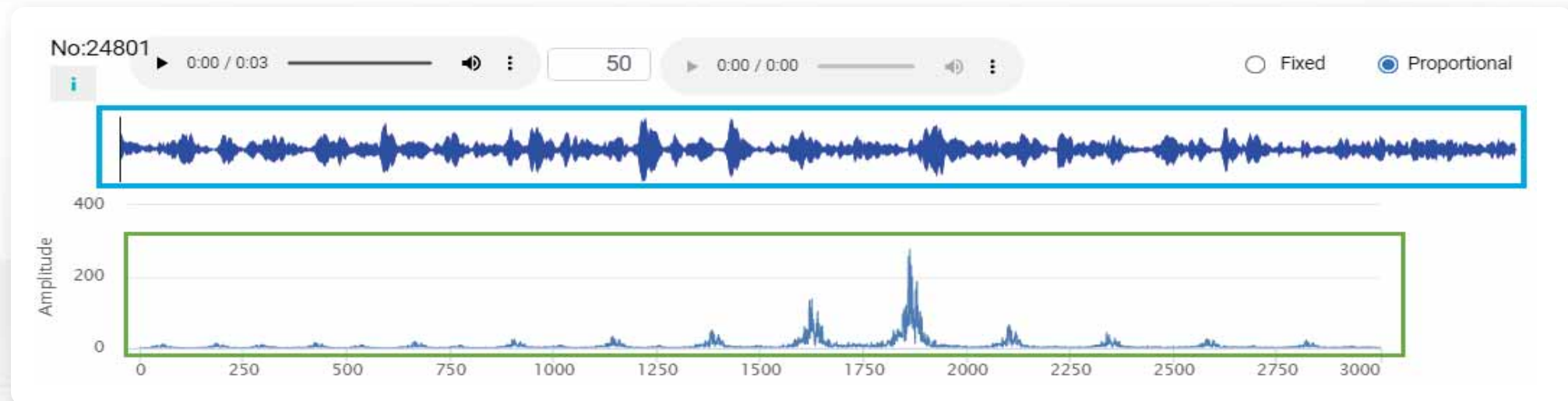
- 1 Non-metal pipe data pattern over or the same 0.5 ton/h
 - The Y-axis (amplitude) is 1.5 or more, and the X-axis (frequency band) is formed between 200 Hz and 400 Hz.
 - Non-metal pipe has a low molecular density so it cannot transmit the sound far away, approximately 20M is the limitation. In addition, as in blue square in the above picture, loosen formation of molecules makes the wave irregular.
 - The usual strength should be over 30 to be verified as leak with more than 0.5 ton/h.



Leak Data Analysis

Other patterns

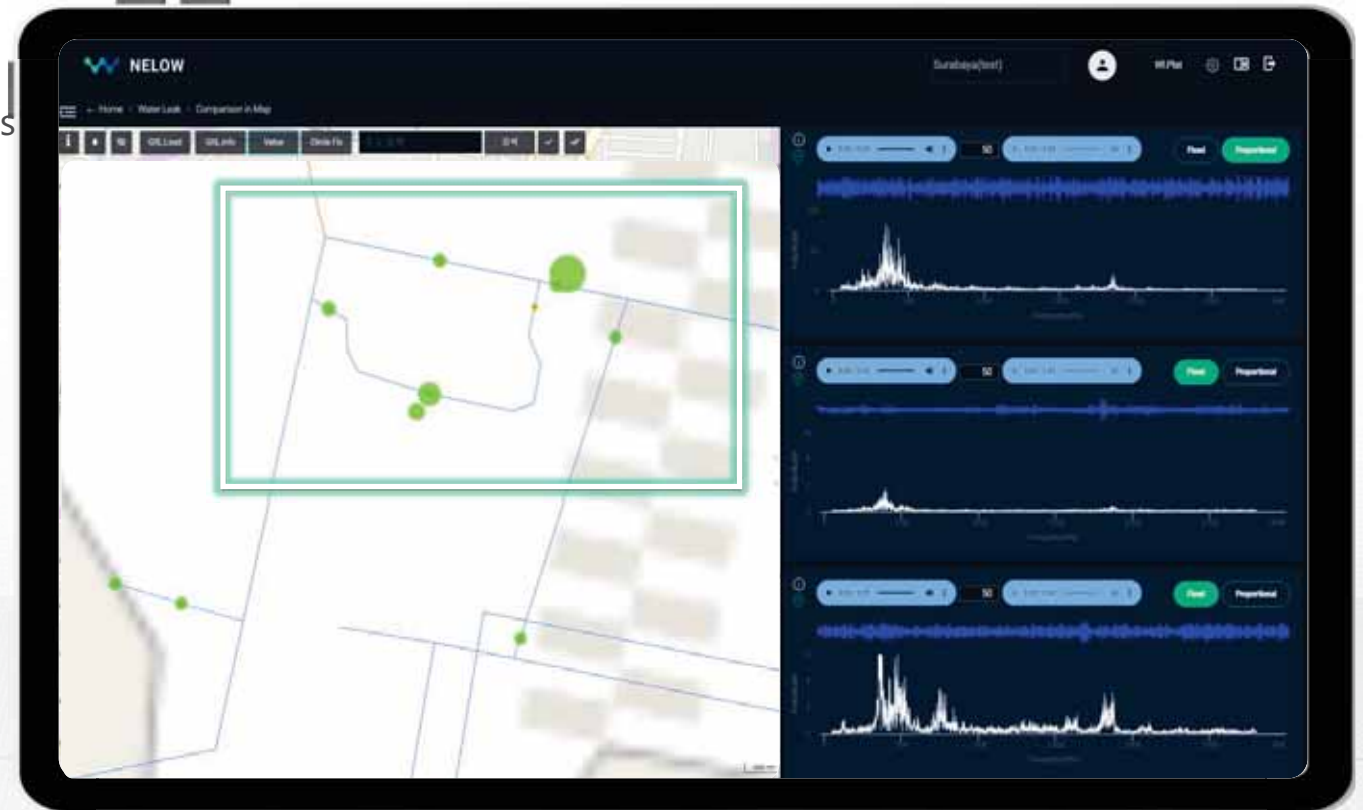
- 1 Pattern when the water meter is running.
 - When the water is being used while detecting, the strength value is very high.
 - The frequency looks like wave and it can be distinguished with the sound of running water meter.



Leak Data Analysis

Patterns near pump, decompression and the flow meter room facility

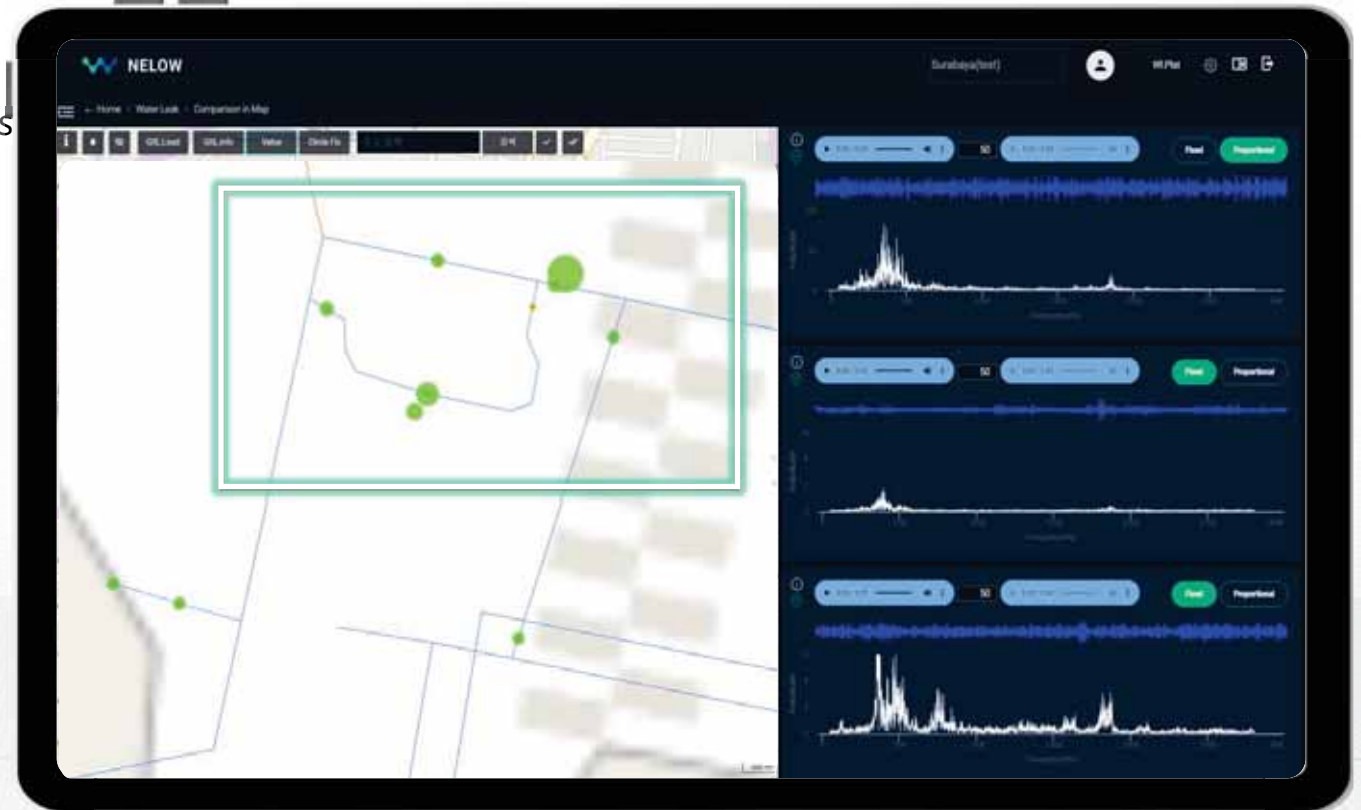
- 1 When there is a pump or decompression near facility, it is difficult to differentiate from the actual water leak sound by looking at the pattern.
- 2 The inspection of pipe GIS data or visiting onsite is inevitable in this case.



Leak Data Analysis

Patterns near pump, decompression and the water meter room facility

- 1 When there is a pump or decompression near facility, it is difficult to differentiate from the actual water leak sound by looking at the pattern.
- 2 The inspection of pipe GIS data or visiting onsite is inevitable in this case.



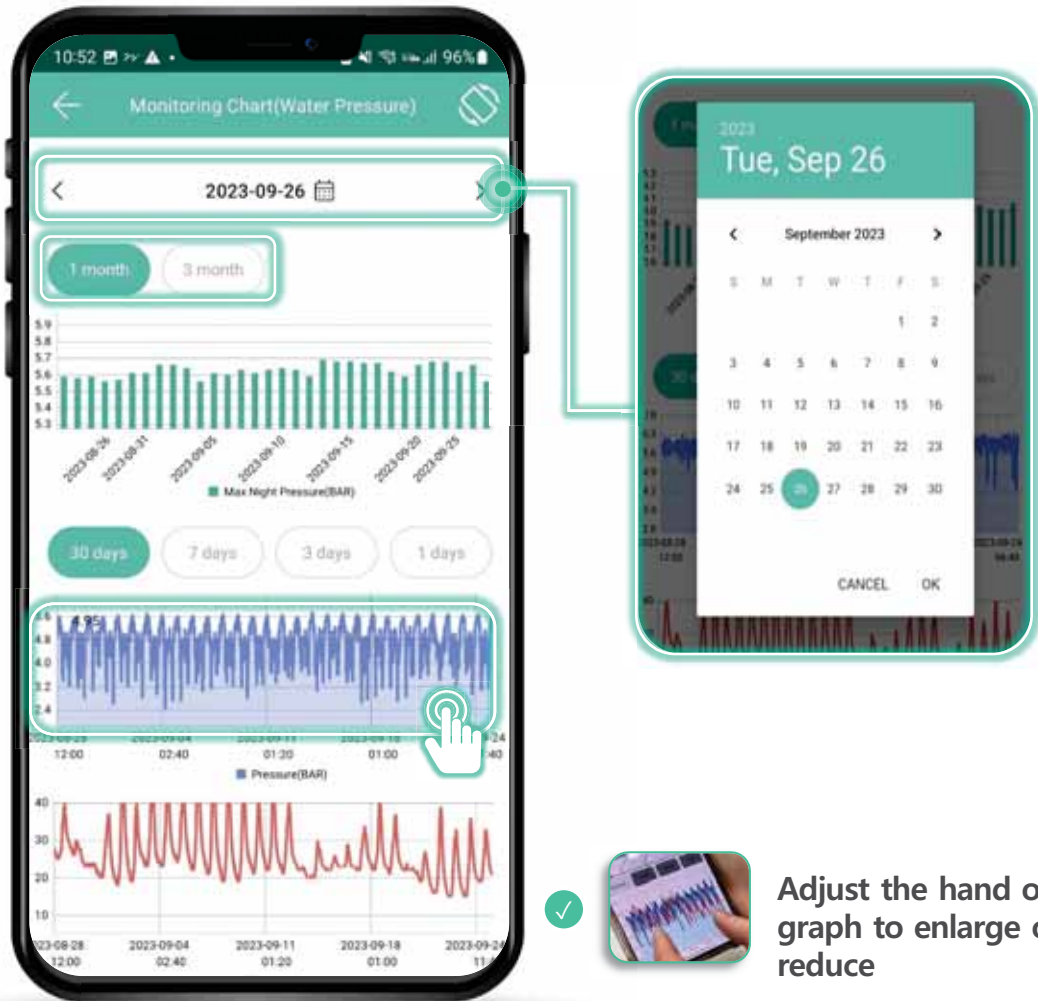
IV System Analysis

Water Pressure Data Analysis



Water Pressure Data Analysis

Checking the Water Pressure Data from the NELOW app



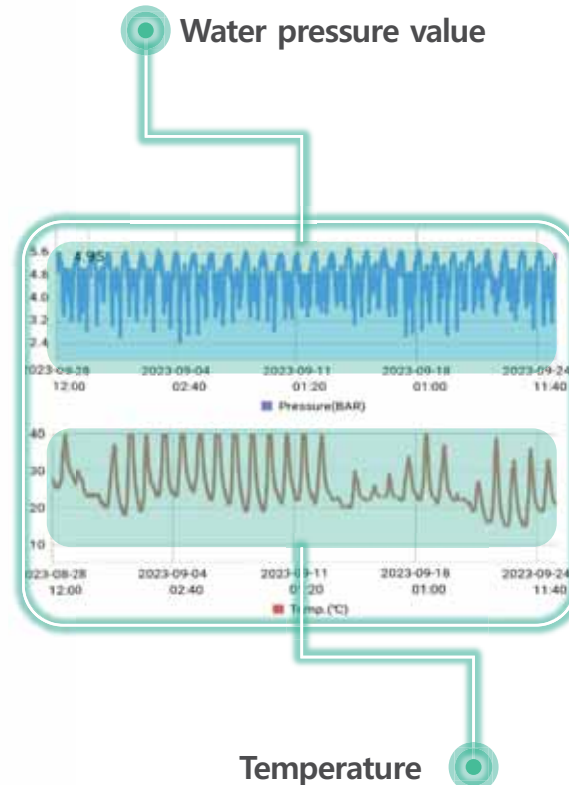
Checking the water pressure data

- 1 Press the  icon to check the data of a specific date
(Press the arrow < > icons to move one day at a time)
- 2 Select   to view one month or three-
months data
- 3 Select from     to view by
the desired number of days.

[Go to the next page](#)

Water Pressure Data Analysis

Checking the Water Pressure Data from the NELOW app



Daily pressure inquiry graph

- ✓ Aggregating the time data to create a daily graph for checking (Changes over a short period)
- Possible to use the temperature information to monitor the site as the pipe may burst from freezing in the winter season

Water Pressure Data Analysis

Checking the Water Pressure Data from the NELOW app



Checking the water pressure data from the NELOW web

- 1 Click "Water Pressure → Monitoring" on the menu
- 2 Use the point name to search for the water pressure monitoring data (in case there are many installation points)
- 3 Click the > icon to check the detailed information of the installation point
- 4  : Pressure value of the installation point expressed on a map

Water Pressure Data Analysis

Checking the Water Pressure Data from the NELOW app



Checking the water pressure data from the NELOW web

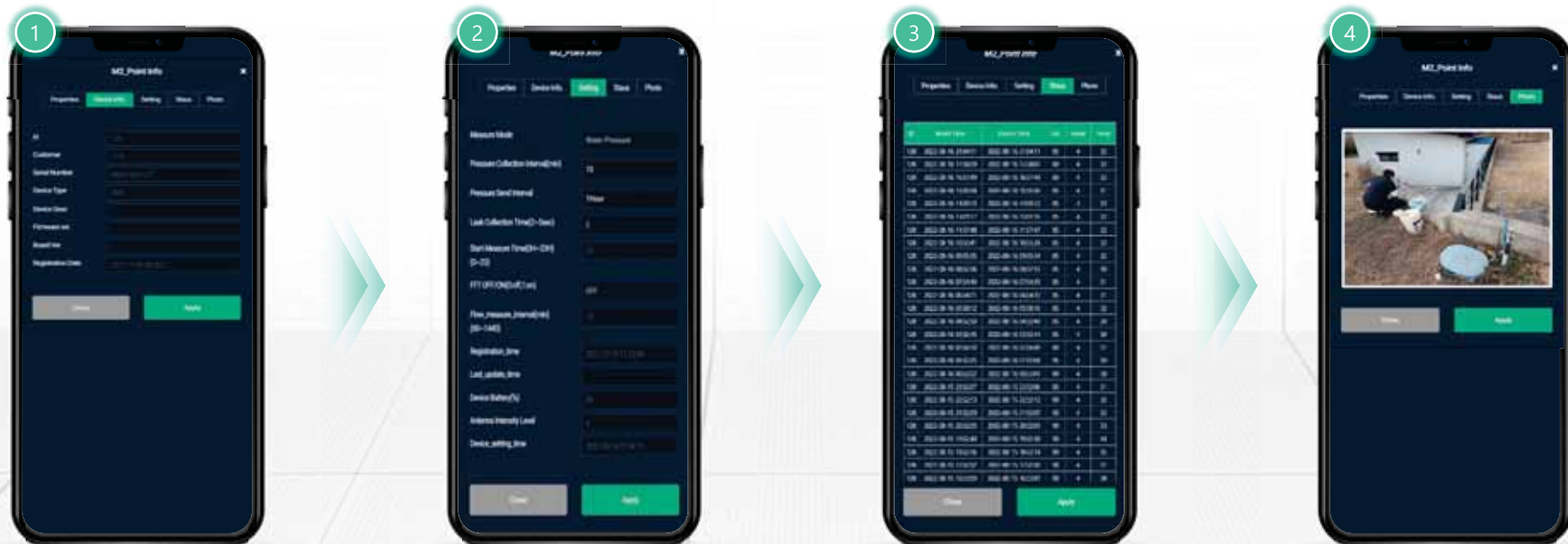
- 1 ⓘ : Detailed information and settings of the installation point
- 2 **Properties**
 - a. Possible to change the point name
 - b. Possible to change the point address
 - c. Enter additional detailed information
 - d. Enter or revise the elevation value
 - e. Set the minimum value of the maximum nighttime pressure to give alarm a warning

[Go to the next page](#)

Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

- 1 Device info: Information of the device installed on the point
- 2 Setting: Possible to set the communication information of the device
- 3 Status: Possible to check the device battery and communication status for one month
- 4 Photo: Possible to check any uploaded photo



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

- 1 Installation point list (Possible to search from the search window on the top)
- 2 Check the daily water pressure data in a graph
- 3 Check the water pressure data on a map
- 4 Comprehensive water pressure data table (Maximum/Average/Minimum/MNF)



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

- 1 Select the graph period among 1/2/3/6 months
- 2 Change the search date
- 3 Go to the detailed data chart page
- 4 Calculate the hydraulic head value and indicate on the map



- 1 Indicate the location point name on the map
- 2 Search the location to find on the map
- 3 Select the standard water pressure value on the map from among
- 4 Icon to enlarge the map to a full view



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

- 1 Go to Monitoring detail → Detailed data chart page



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

- 1 Click Chart on the previous screen → Click Pressure by time
- 2 Graph indicating the pressure data by time (Short-term changes)
- 3 Put the mouse pointer above the graph to see the precise value
- 4 Change the search date and graph period into months (Long-term changes)
- 5 Download the data values in an Excel file
- 6 Temperature values
- 7 Water pressure data
- 8 Drag to enlarge the graph to view in more detail



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

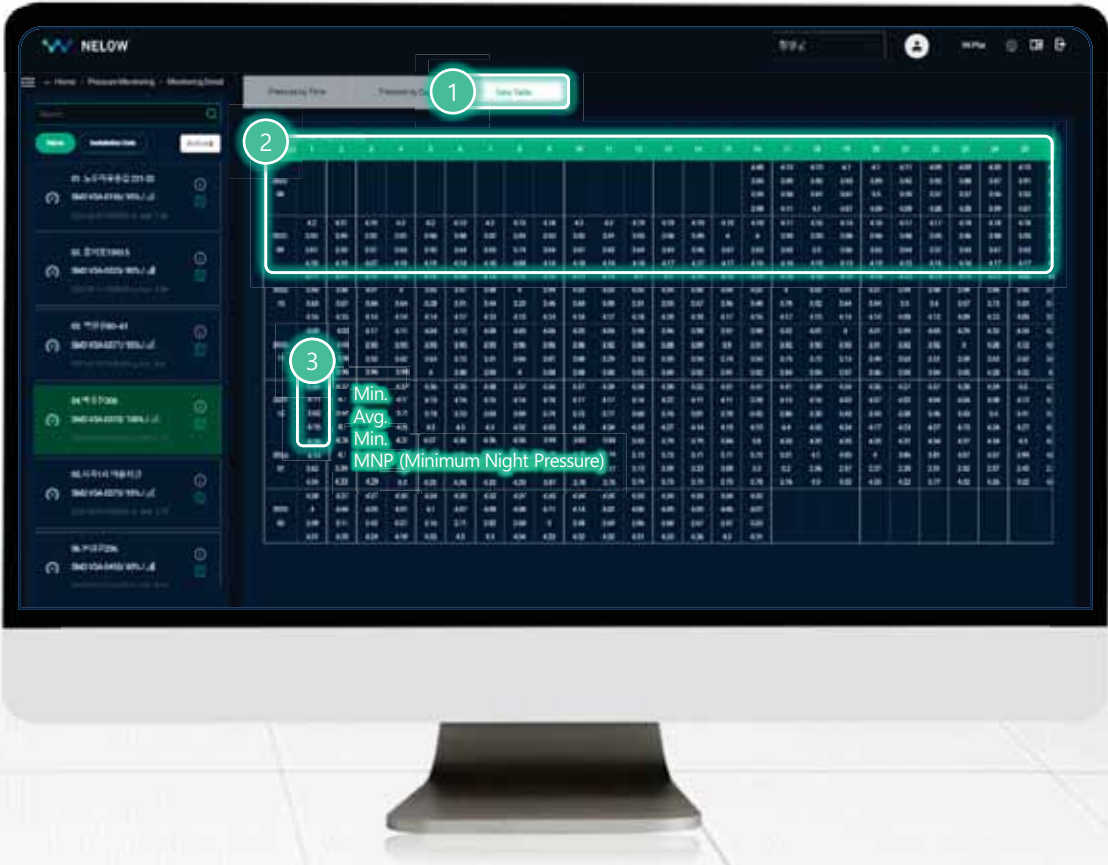
- 1 Click Pressure by Day on the previous screen
- 2 Check the daily water pressure data values on the graph
- 3 Minimum, average and maximum values are indicated in polygonal lines on the graph and MNP is expressed as bar graphs
- 4 Change the search date and graph period to months
- 5 Download the data values in an Excel file



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

- 1 Click Data Table on the previous screen
- 2 Check the daily water pressure data values on the table
- 3 Water pressure values are displayed in the order of maximum, average, minimum and MNP values



Water Pressure Data Analysis

Checking the water pressure data from the NELOW web

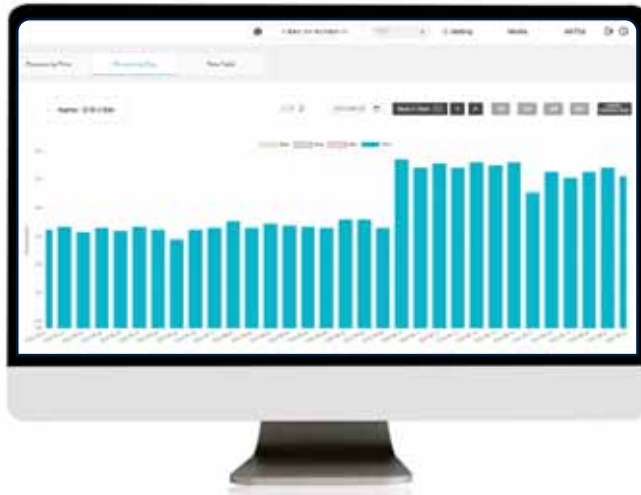
- 1 Click the ⓘ icon → Click the purple circle on the map
→ Possible to check up to three graphs on the right
- 2 Set to view/hide the GIS data (map)
- 3 Check the installed point name on the map
- 4 Indicate the GIS data (facility) on the map
- 5 Select the standard water pressure value on the map
from among the average/minimum/maximum/MNP values
- 6 Change the hydraulic head value and pressure data unit
- 7 Use the arrows to set the data indication into 10-minute or 1-day units

Click the Enlarge map icon on the previous screen (See page 81)



Water Pressure Data Analysis

Case Study: Pressure Management Through Water Pressure Monitoring



- 1 Suspected Leak Areas > Leak Recovery
- 2 Verification of Pressure Increase After Leak Recovery (3.4 bar → 3.9 bar)



- 1 Confirmation of Pressure Anomaly Through Pressure Monitoring (4.5 bar → 9.0 bar)
- 2 Abnormal Pressure Alert Provided
- 3 Business Branch Pressure Reduction Valve Abnormality Detected and Restored (10.0 bar → 4.5 bar)

V System Analysis

Important Notes



Important Notes

Always wear a **Safety Uniform**



Always work as a **pair** for **safety on road**



Important Notes

Always **explain what is the purpose of the work kindly** to the local residents when asked.



Follow **rules & precautions** from training material and follow manager's directions.



FCC Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Intelligent Water Loss Management

NELOW USER MANUAL

THE END

