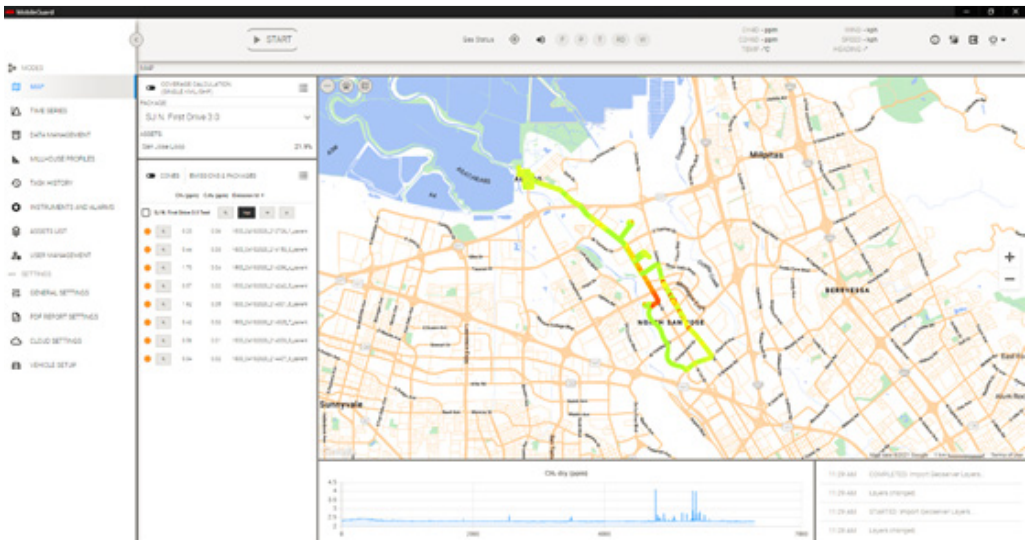
ABB MEASUREMENT & ANALYTICS | SOFTWARE USER MANUAL

ICOS FastScanner™ (formerly MobileGuard™ Software)



Contents

1 Preface

Copyright

Disclaimer

This document contains product specifications and performance statements that may be in conflict with other ABB published literature, such as product flyers and product catalogs. All specifications, product characteristics, and performance statements included in this document are suggested specifications only. In case of conflict between product characteristics in this document and specifications in the official ABB product catalogs, the latter takes precedence.

ABB reserves the right to make changes to the specifications of all equipment and software, and to the contents of this document, without obligation to notify any person or organization of such changes. Every effort has been made to ensure that the information contained in this document is current and accurate. Please contact ABB if you find any error in this document, so we can make appropriate corrections.

Cybersecurity Disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is operator's sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be). Operator shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB, Inc. and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Customer Support

ABB provides product support services worldwide. To receive product support, either in or out of warranty, contact the ABB office that serves your geographical area, or the office indicated below:

ABB Inc. Measurement & Analytics
3400, rue Pierre-Ardouin
Quebec, (Quebec) G1P 0B2 Canada

Tel: 1 800 858 3847 (North America)
Tel: +1 418 877 2944 (Worldwide)
Fax: +1 418 877 2834
Technical Support: icos.support@ca.abb.com

...1 Preface

Text Formats and Warning Icons

Text Formats

This section describes text formats and warning icons used in this manual.

- *Italicized* text is used for emphasis in text and also to emphasize the names of screens or text fields.
- **Bold** text is used to show text that you type in fields and also button choices that you enter.

Warning Icons

Warning icons used in this manual are shown and described below.

⚠ NOTE OR IMPORTANT!

Emphasizes facts and conditions important to analyzer operation.

⚠ WARNING!

General Warning icon: gives general safety information that must be followed to avoid hazardous conditions.

2 Introduction

This manual covers the use and operation of MobileGuard™ user interface (UI) software, including installing the software, screen descriptions, and using the UI to detect and estimate the location of natural gas emissions from roadways.

Also included in this manual are instructions for suggested driving patterns, and data transfer and analysis through secured WiFi to other devices.

3 System Software

Overview

MobileGuard™ emission detection user-interface (UI) software displays real-time geospatial maps of multiple gas concentrations and stores data which can be transmitted to your Google Drive storage in real-time.

⚠ WARNING!

For cybersecurity reasons, users are advised to change all passwords from their default value.

Installing MobileGuard™ Software

In some cases, it may be useful to install the MobileGuard™ software on a separate computer (for example, a dedicated command center). This section describes installing MobileGuard™ software.

System Requirements

The MobileGuard™ software requires a computer with the following minimum specifications:

- Windows 10, 64-bit
- 8 GB memory
- 250 GB hard disk
- 802.11n/g/b compatible wireless adapter
- Minimum 1920x1080 screen resolution

The MobileGuard™ software requires access to the following TCP ports on the intranet:

- 22 basic SSH commands to analyzer
- 445 SMB port (not currently used)
- 8082 Watchdog Websocket connection
- 20002 Websocket data stream from analyzer
- 9090 Location Services
- 9091, 9092, 9093 Local Database and Windows Service communication

The MobileGuard™ software requires access to the following TCP port on the internet:

- 443 HTTPS

Ensure that these ports are not blocked by any firewall software on the intranet or internet.

ABB Inc. bares no responsibility for security vulnerabilities introduced by opening ports beyond those specified here.

Install Required Prerequisite Software

Install the following before the MobileGuard™ software.

- Google Chrome
- Amazon Corretto v8

⚠ NOTE

Amazon Corretto is recommended. If you want to use Java Development Kit (v8), 64-bit version, Java charges a fee.

If you use the Java Development Kit, and the MobileGuard™ software does not work after installation, check the following environment variables:

1. If the *JAVA_HOME* environment variable does not point to this installation, create or modify it.
2. Add *%JAVA_HOME%\bin* to the Path environment variable.

Install Peripheral Prerequisite Software

It is highly recommended to install the following software.

- TeamViewer ABB Host (refer to the *MobileGuard™ System Manual*)
- Notepad++
- 7-Zip
- Google Earth

...3 System Software

Install MobileGuard™ Software

1 Double-click the MobileGuard™ software setup installer, *ABB MobileGuard 3.x.y.exe*.

2 The *ABB MobileGuard Setup* screen appears: Click the **Yes** button to allow the installation to proceed. (See Figure 1.)

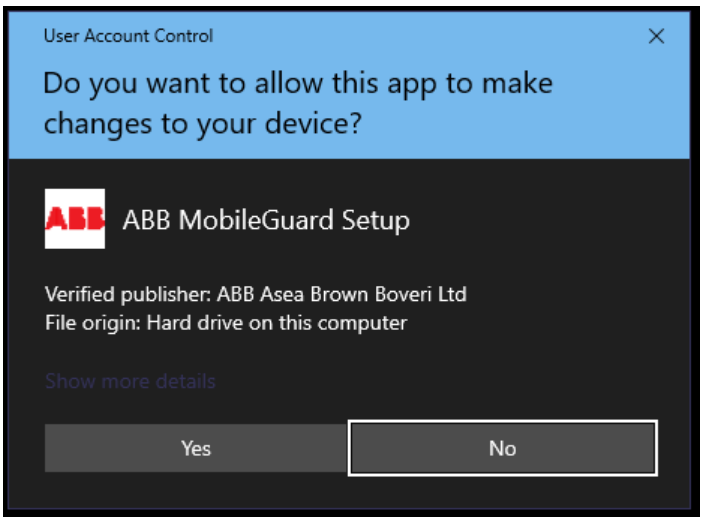


Figure 1 ABB MobileGuard Setup Screen

3 At the first prompt, set the services to be installed by placing a checkmark in the corresponding box (see Figure 2):

- **Install as Windows Service**: service that runs the MobileGuard™ software.
- **Add service tray** icon: displays current status of MobileGuard™ service.
- **Start service on Windows start**: Allow the services to start each time Windows starts.
- **Create shortcut for drive packages storage directory**: Create a shortcut to the location of where the drive packages are created and stored.
- **Configure Windows Firewall for MobileGuard remote access**: Allow MobileGuard™ services to connect to the internet.

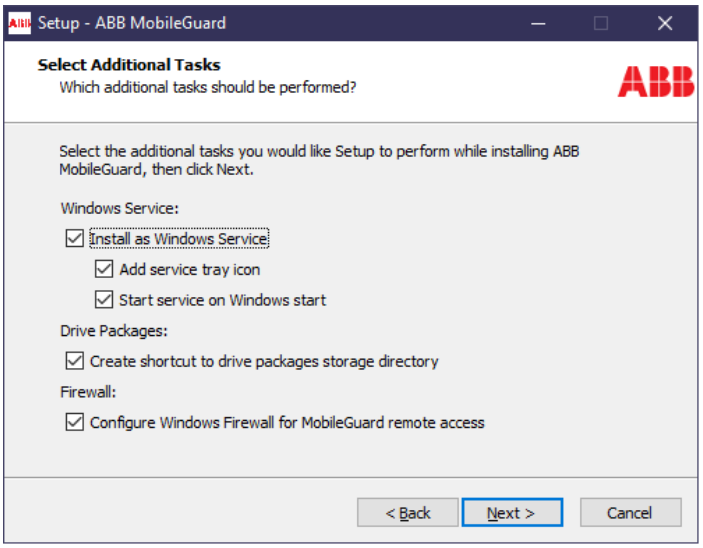


Figure 2 Setup Prompt for Services and Firewall Exception

4 Click **Next**. A window appears displaying a summary of actions prior to installation (see Figure 3).

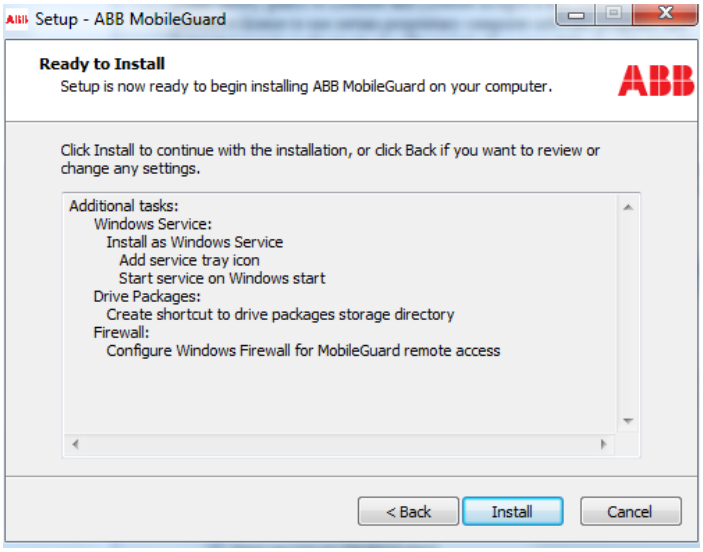


Figure 3 Summary of Actions Prior to Install

5 Click **Install**. The following screen appears while the installation is in progress. The installation time varies depending on the computer.

...3 System Software

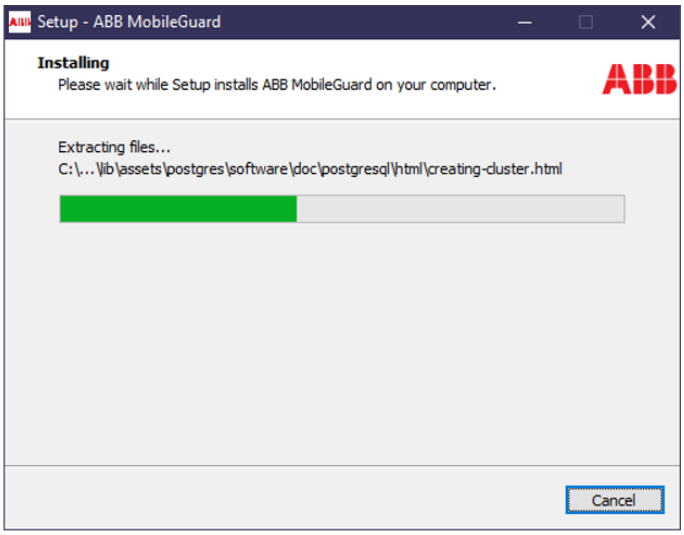


Figure 4 Installation in Progress

6 When installation is complete, the following screen appears (see Figure 5): Click **Finish**.

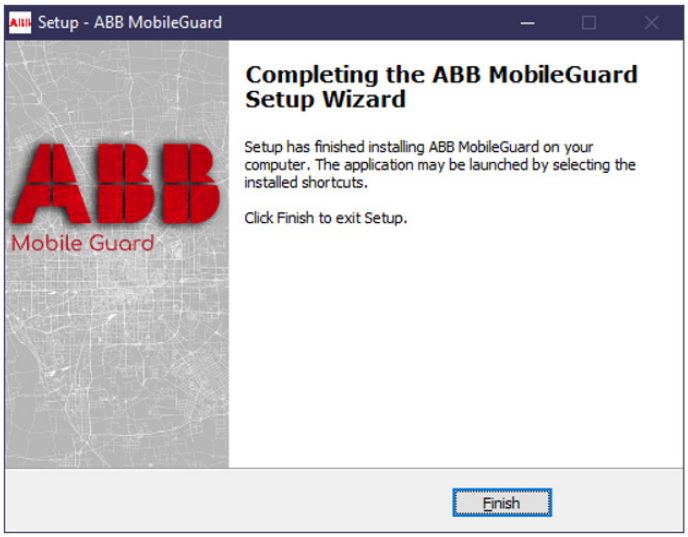


Figure 5 Installation Complete

7 Once installation finishes, allow the ABB MobileGuard™ service a few seconds to start (the *Tray* icon should change from a gray dot to a green dot – see Figure 6).

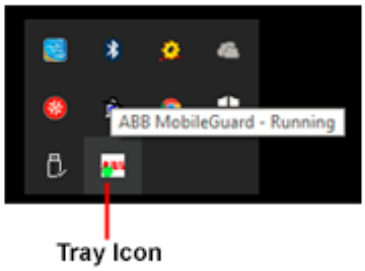


Figure 6 Tray Icon with Green Dot

8 Once the MobileGuard™ service is active, start the application in one of two ways:

- Double-click the **ABB MobileGuard** shortcut on the desktop.
- **Start** > **ABB MobileGuard** > **ABB MobileGuard**.

Required Settings

This section lists recommendations for running the MobileGuard™ software.

Windows

- Use malware protection.
- Do not disable Windows firewall.
- Create an admin account password.
- Create a user account.

Chrome

- Do not log in with a personal account.
- Do not manually update Chrome, unless instructed by ABB.

Amazon Corretto Version 8

- The MobileGuard™ application is compatible with Amazon Corretto Version 8. It is recommended to apply all available security patches, but do not change the major version.

MobileGuard™ Application

- Do not create group accounts for multiple users.
- Do not give standard users admin accounts.

Install License File

- Each MobileGuard™ Software package receives a license.bin file for the software to run normally. This must be placed in the installation directory prior to starting the software. (C:\ Program Files (x86)\ABB MobileGuard\license)
- Refer to the “License and Terms of Use” section for details on licensing.

...3 System Software

Screens

Login Screen

Figure 7 shows the MobileGuard™ *Login* screen. Enter your username and password, then click **Sign In** to access the MobileGuard™ application.

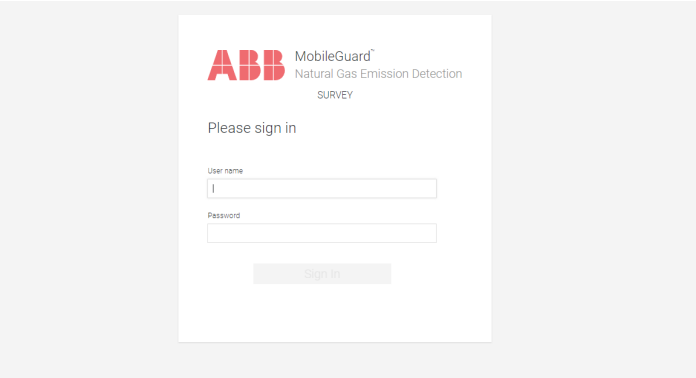


Figure 7 Login Screen

User Management Roles and Privileges

The MobileGuard™ software allows for creation of user accounts with various levels of access to features in the software. For example, Technician-level accounts allow drive packages to be collected; however, Technician-level accounts do not allow modification of any software settings.
Table 1 lists user role access (privilege level) to MobileGuard™ UI features.

Table 1 User Role Access Privilege Levels

Feature	Administrator	ABB Support	Scientist	Technician
Map	Yes	Yes	Yes	Yes
Start/Stop Drive	Yes	Yes	Yes	Yes
Time Series	Yes	Yes	Yes	No
Data Management	Yes	Yes	Yes	No
General Settings	Yes	Yes	Yes	No
Millhouse Profiles	Yes	Yes	Yes	No
Instruments and Alarms	Yes	Yes	Yes	No
Cloud Settings	Yes	Yes	No	No
User Management	Yes	No	No	No
Assets Management	Yes	Yes	Yes	No [1]
Task History	Yes	Yes	Yes	Yes [2]
Vehicle Setup	Yes	Yes	No	No
Analyzer Shutdown	Yes	Yes	Yes	Yes

1 Technicians may crop and import assets, but not delete them.

2 Technicians may access the task history, but not the associated logs.

...3 System Software

Map Screen

On the sidebar, select **Map** to access the *Map* screen. See Figure 8.

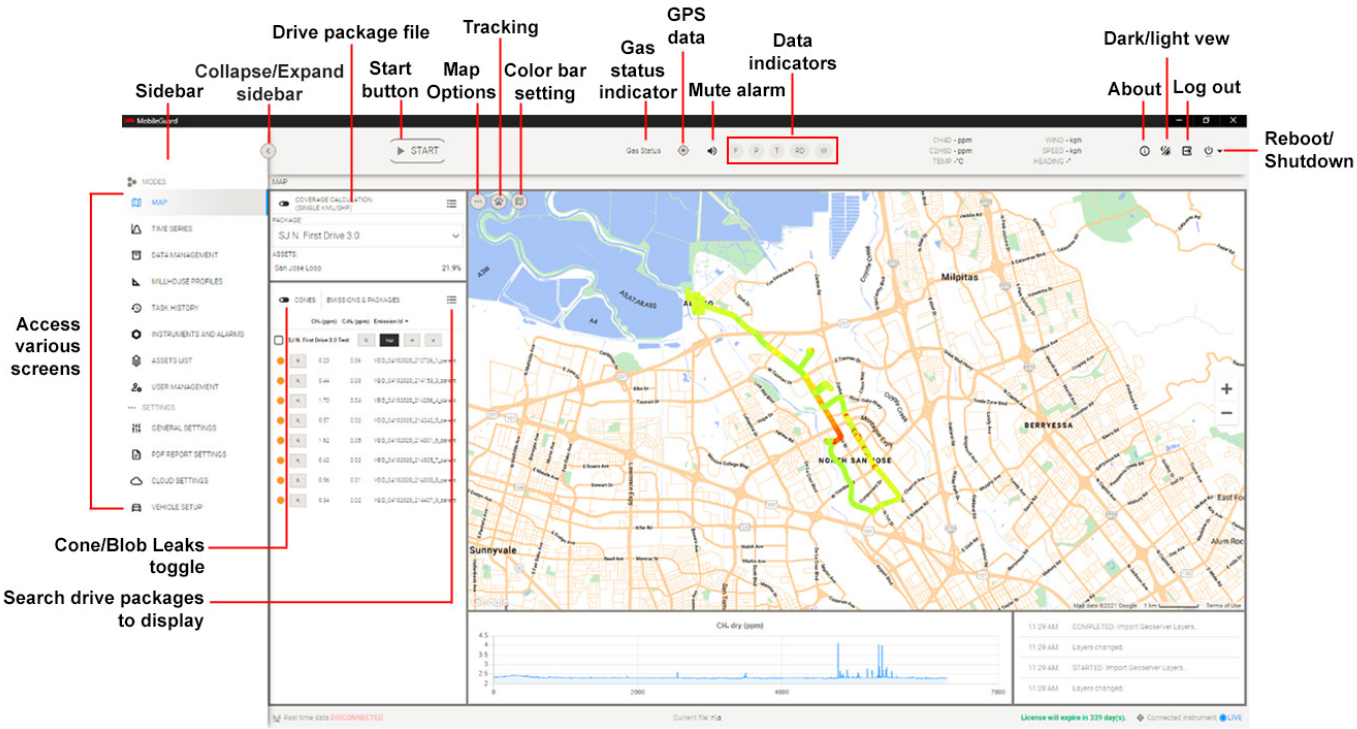


Figure 8 Map Screen

The following describes *Map* screen features:

- Sidebar – Accesses various *Modes* or *Map Options* screens. Click the adjacent arrow to collapse or expand the sidebar.
- Drive package file – Drive package/asset used for calculating survey coverage. Figure 8 shows an example of *San Jose Loop* for asset used for survey coverage.
- **Start** button – Click to start a drive package: A drive-package creation box appears in which you may optionally modify the automatically generated drive-package name. Click **OK** to start the drive package. Click **Stop** to finalize the drive package. The filename of the package is displayed next to the button.
- **Map Options** icon – Accesses map options. The sidebar changes as shown in Figure 9. To return the sidebar to *Modes* screens, click the icon again, or click the **X** on the sidebar adjacent to *Map Options*. For details, refer to the “Map Options Sidebar” section.

...3 System Software

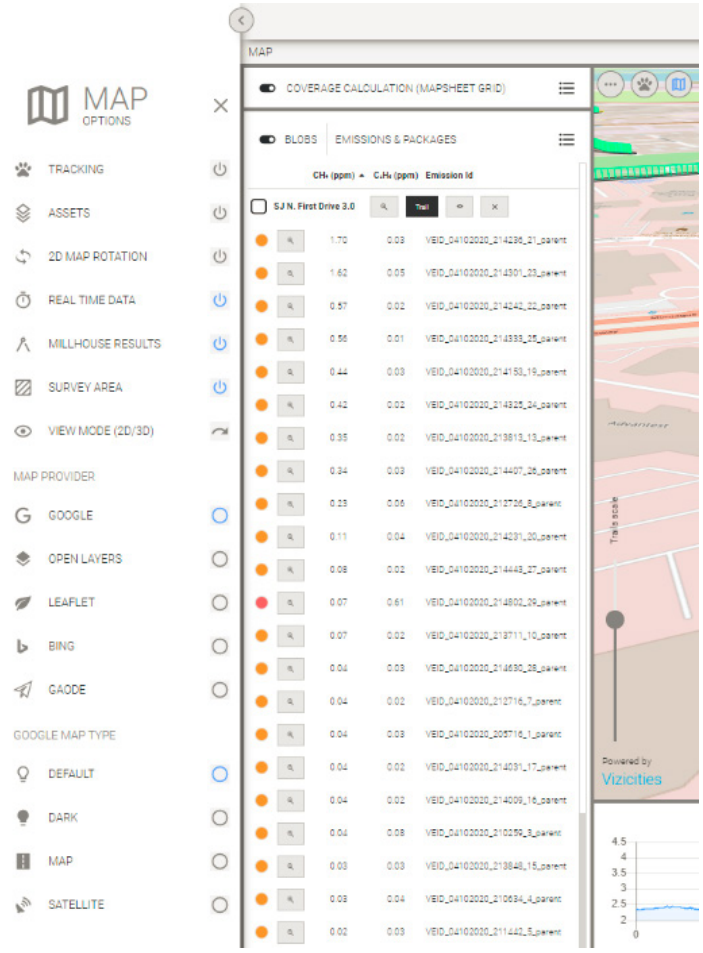


Figure 9 Map Options Sidebar

- **Tracking** icon – Click to follow the car on the map.
- Color bar setting – Click to edit the methane breadcrumb color scheme: The window shown in Figure 10 appears. When done editing the *min* and *max* fields, click **Save** to save the changes, then **Close** to close the window.
  - The *Breadcrumb Colorbar Min* and *Breadcrumb Colorbar Max* fields are stored as the standard setting. They are only available for administrator-level and support-level users, and are hidden for the technician-level driver. These fields are used to set parameters for the reports and are the superset for the lower controls.
  - The *min* and *max* fields are used as a narrowing of the upper range (*Breadcrumb Colorbar Min* and *Breadcrumb Colorbar Max*) for a detailed viewing on the map and do not affect the generated report.

⚠ NOTE

Mutual validation prevents going beyond the scope declared in the other controls.

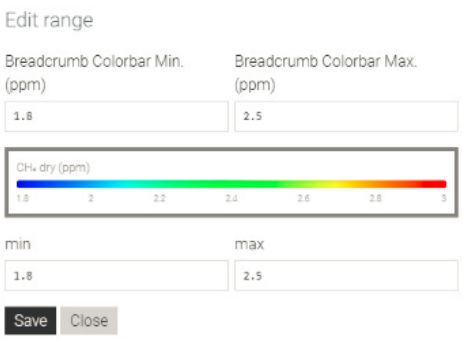


Figure 10 Color Bar Setting Window

- Gas status indicator – Click, or hover over, the indicator to check the status.
  - Green: The incoming methane concentration is within the user-defined threshold.
  - Red: The methane concentration exceeds the user-defined threshold.
- GPS indicator – Incoming GPS data.
- **Mute** button – Click to mute the gas alarm.
- Data status indicators – Click, or hover over, an indicator to check the status of analyzer components and wind. Green and red indicate good communication between the software and analyzer. Green indicates data present are within specification. Red indicates data present with a major alarm. Gray indicates no communication between the software and analyzer, or a problem with an analyzer component, such as a disconnection. Indicators represent the following:
  - F – Gas flow
  - P – Cell pressure
  - T – Gas and ambient temperatures
  - RD – Cavity (Laser 1 and 2) ringdown time
  - W – Incoming wind data
- **About** icon - Click to access the *About* screen (Figure 11) to view information about the MobileGuard™ software.

...3 System Software

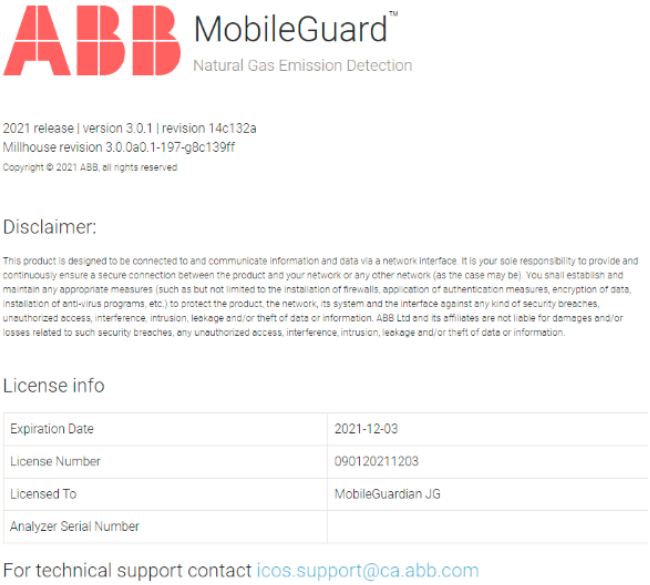


Figure 11 About Screen

- **Dark/Light** icon – toggles the UI between dark and light mode. Dark mode is useful for night driving.
- **Log out** icon – Click to log out of the MobileGuard™ UI.
- If you select **Change password**, the window shown in Figure 12 appears:

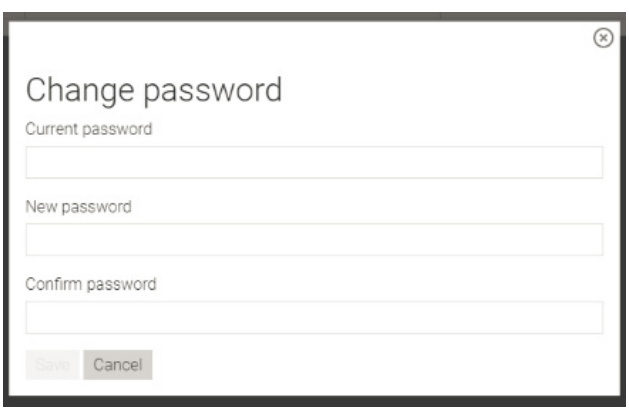


Figure 12 Change Password Window

To change your password, type your current password, new password, confirm your new password, then click **Save**.

- Reboot/Shutdown – Click the **On/Off** icon, then select **Reboot** or **Shutdown** to reboot or shut down the analyzer (see Figure 13).

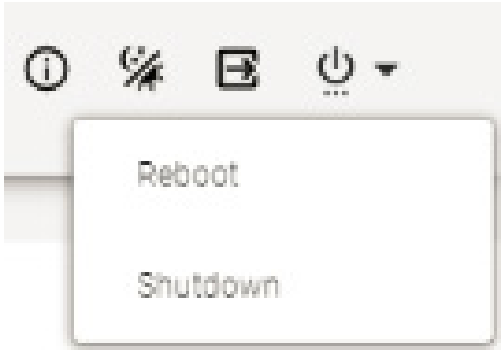


Figure 13 Reboot/Shutdown

Map Screen - Mapsheet Grids Coverage and Cropping

The mapsheet grid coverage calculation lets you import a large asset file with numerous grids and other pipeline data into the application. The cropping mechanism lets you select a specific mapsheet and create a separate asset file (KML) of that mapsheet with the other pipeline data within its bounds.

The following is an example procedure for using this feature.

1 From the *Map* screen, click the **Coverage Calculation Mapsheet Grid** menu icon (Figure 14).

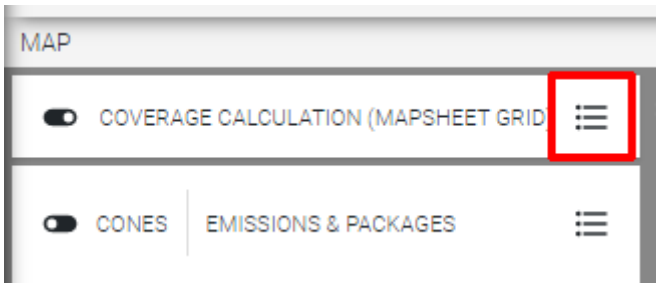


Figure 14 Coverage Calculation Mapsheet Grid Menu Icon

...3 System Software

The screen shown in Figure 15 appears:

Figure 15 Select Asset File Types

2 Select the following type of asset files:

- Grids – mapsheet data
- Main – pipeline data
- Service – pipeline data

MobileGuard™ automatically searches for asset filenames that contain these names, but you can specify by confirming each file.

⚠ NOTE

Mapsheet grid assets should have unique naming. Mapsheets with duplicate names could cause the incorrect mapsheet to be cropped when using the Asset Cropping feature.

3 To automatically import cropped assets, check the **Auto upload to geoserver after cropping** box.

4 Select the mapsheet from the imported grid file (see Figure 16). Checking the adjacent box will calculate the real-time coverage for that specific mapsheet. Clicking the **Scissors** icon crops (creates) a new KML file with pipeline data within the mapsheet bounds.

You can also click the **Crop All Selected** button to crop multiple files.

Figure 16 Asset Selection for Cropping

5 After you select the **Scissors** cropping button (or **Crop All Selected** button), click **Confirm**.

6 Click **Yes** to automatically upload the newly created asset into the Geoserver for viewing on the map.

You can now select the newly created asset file for coverage calculation. The example shown in Figure 18 is *San Jose Loop*.

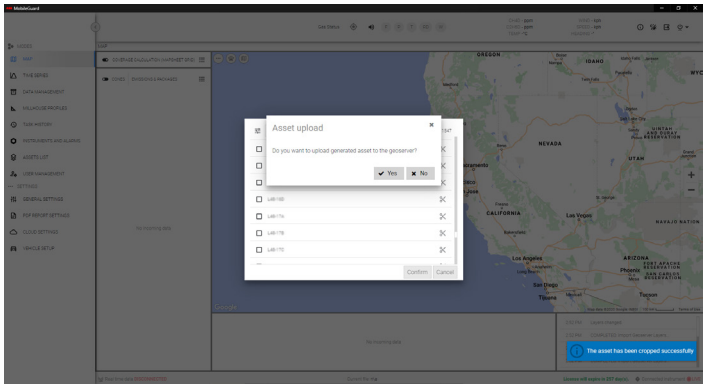


Figure 17 Auto Upload Asset after Crop

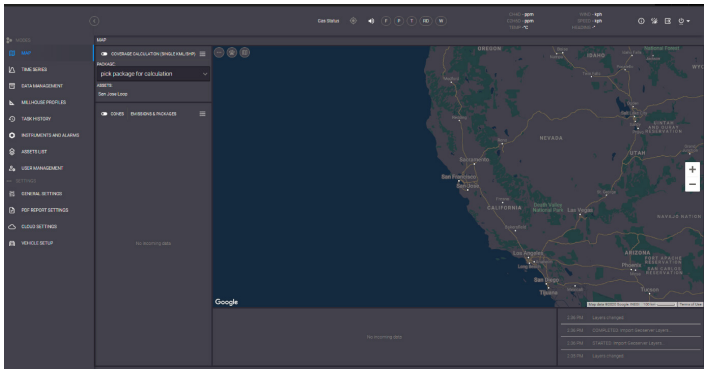


Figure 18 Coverage Loaded Asset

...3 System Software

Map Screen - Emissions and Packages

Click the icon to the right of *Emissions and Packages* (see Figure 19) to search drive packages to view on the map or use for coverage calculation.

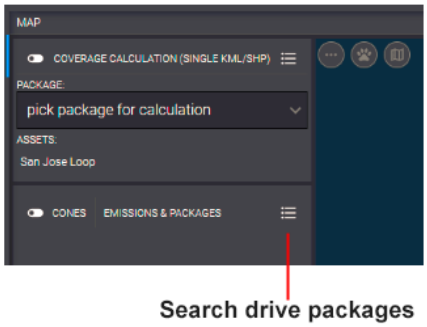


Figure 19 Search Drive Packages

When clicked, the *Drive Packages* window appears (see Figure 20) in which you can search all fields, then select multiple drives by selecting the adjacent box or radio button.

- Check box(es) to view drive package(s) on the map.
- Select a radio button to use a drive package for coverage calculation.

After making selection(s), click outside the window to return to the *Map* screen: The drive packages are listed (see Figure 21). Click on an item to display details. *CH_4 ppm* lists peak methane concentrations. *C_2H_6 ppm* lists peak ethane concentrations. *Emission Id* lists the corresponding ID. Figure 20 shows an example of multiple drive packages: Each emission is nested under a header which indicates from which drive package it came. You can sort by column names.

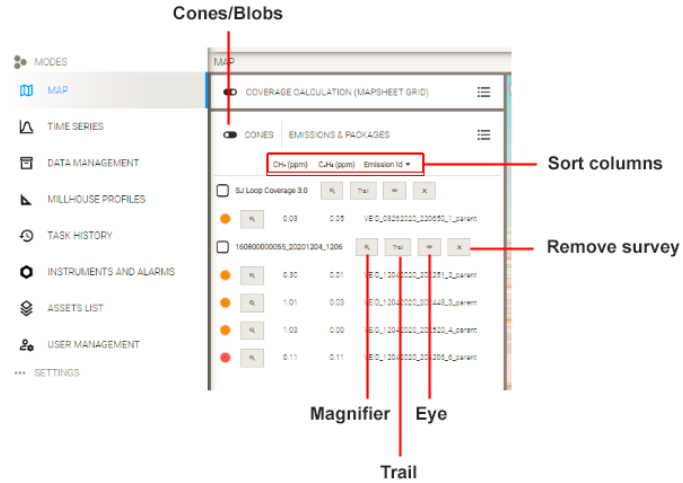


Figure 21 Multiple Drive Package Display

- **CH_4 (ppm)**, **C_2H_6 (ppm)**, **Emission Id** – Sort columns by clicking on these headers.
- **Cones/Blobs** – Toggle between **Cones** and **Blobs** to select how leak emission indications are displayed. For example, if you select **Cones**, the area around the emission would be a cone shape.

  To comment on a hazard or impediment indication displayed by a cone, refer to “Comment Using Cone Button”.

- **Magnifier** – Locate and center survey on map.
- **Trail** – Display breadcrumb on survey.
- **Eye** – Highlight survey over others displayed.
- **X** – Remove survey from *Map* screen.

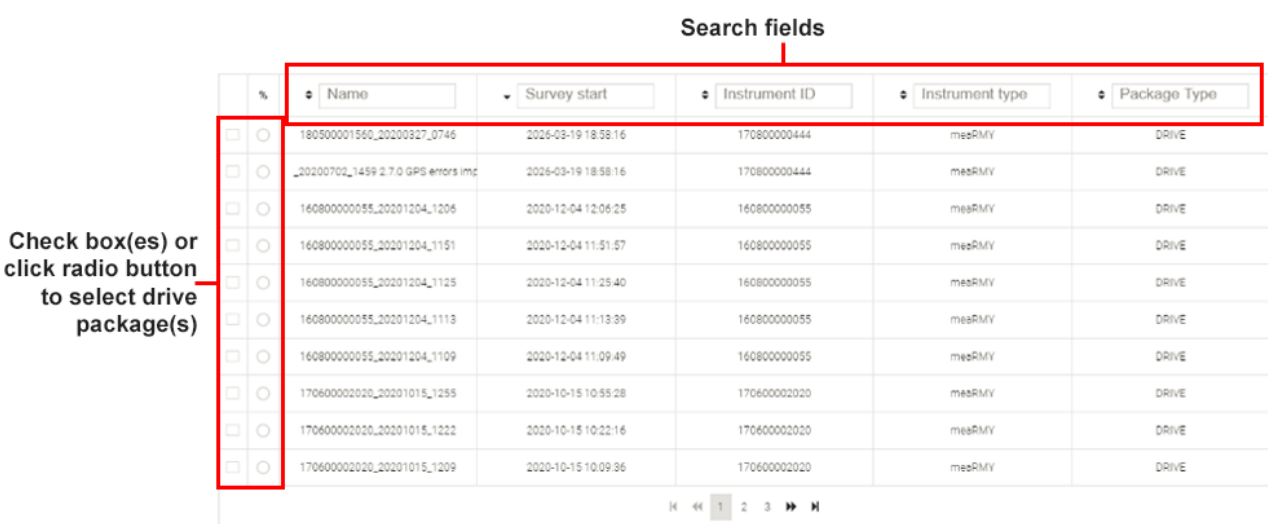


Figure 20 Drive Packages Window

...3 System Software

Map Options Sidebar

The following describes *Map Options* sidebar features (see Figure 9).

- **Tracking** – Click to lock the map on the current GPS location.
- **Assets** – user-specified utility assets.
- **2D Map Rotation** – Click to enable when changing the Surface Pro Tablet orientation.
- **Real Time Data** – breadcrumb (vehicle path and methane concentration) and wind vector.
- **Millhouse Results** – map without emission indicators.
- **Survey Area** – toggles estimated survey area.
- **View Mode (3D/2D)** – Click to view the map as three-dimensional, two-dimensional split view, or two-dimensional full view (default).

  You can view surveys in 3D, enabling a curtain view of the recorded CH_4 to visualize emission indications. The map can be 3D full view (Figure 22), split view with 2D (Figure 23), or hidden for 2D Map as full view (default). Figure 23 shows split view with 2D with leak-emission indication zoomed in.

The following describes changing views.

- Activate Curtain view – Click the **Trail** header in the *Emissions & Packages* area. Then, change the scaling of the curtain view: Slide the **Trails** scale on the bottom left of the map.
- Change perspective - Hold down the left mouse button and move the mouse.
- Zoom in/out – Scroll using the mouse scroll wheel.
- Drag map – Hold down the right mouse button and move the mouse.
- Trails scale – Increase the size of the curtain view scaling.

...3 System Software

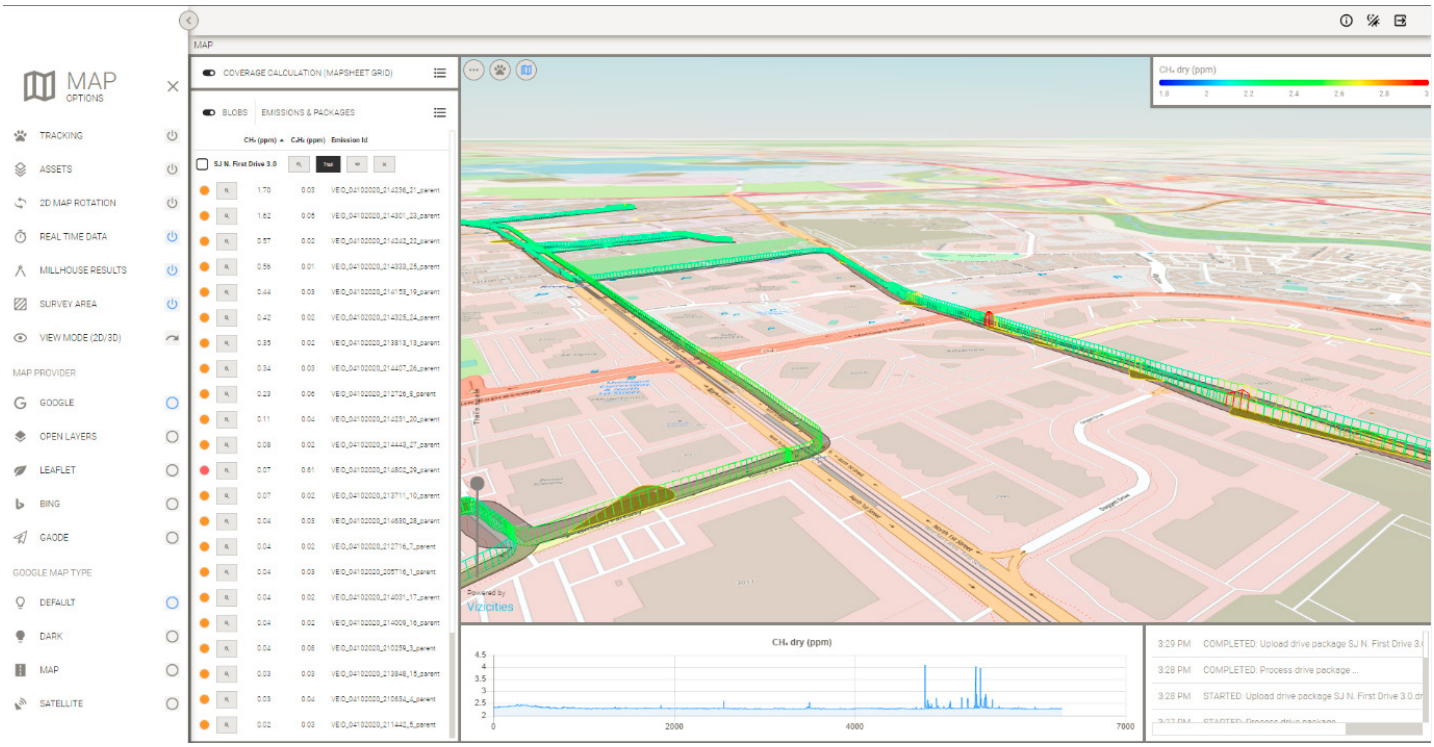


Figure 22 Full-View 3D Map

Figure 23 Split View with 2D

...3 System Software

Map Options Sidebar - Map Provider

Select one of the following to open the desired map provider type area. Choices include:

- **Google**
- **Open Layers**
- **Leaflet**
- **Bing**
- **Gaode**
- **Geoserver**

Map Options Sidebar - Google Map Type

This area lets you select the view:

- **Default** – map (default)
- **Dark** – dark mode for night driving
- **Map** – street map
- **Satellite** – satellite imagery

Map Options Sidebar - Offline Map

MobileGuard™ supports use of offline maps in SHP format. OpenStreetMap Data Extracts can be downloaded here: https://download.geofabrik.de/

⚠ WARNING!

Importing large regions slows MobileGuard™ performance. It is recommended to only load specific regions necessary for surveying.

To import offline maps:

1. Go to the *Map* screen (select **Map** on the sidebar).
2. Select **Geoserver** as the map provider (see Figure 24).
3. Click **Add Offline Layer** (see Figure 24).
4. Navigate to the directory that has the map data (see Figure 24).

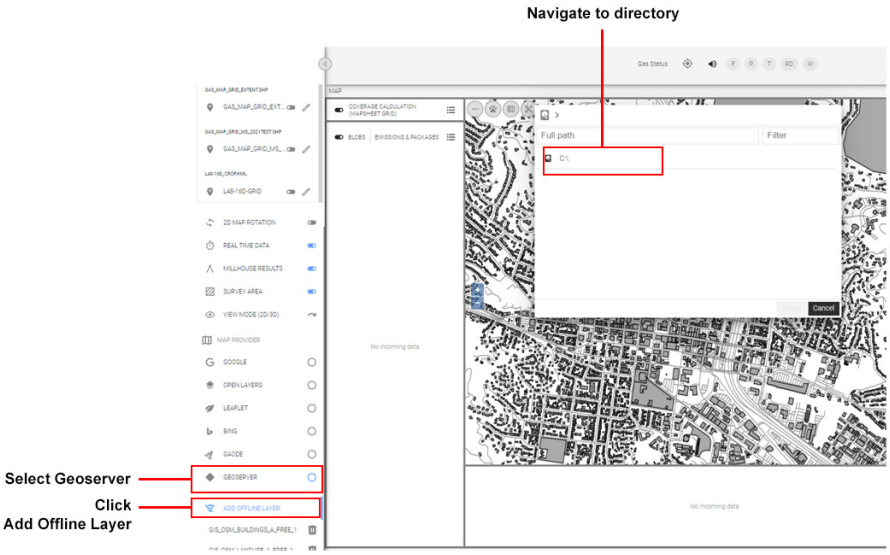


Figure 24 Import Offline Map

...3 System Software

See Figure 25 for an example of Northern California offline maps (buildings and land use) used during a test survey.

⚠ NOTE

When using offline maps, the PDF report will not have the map summary embedded: For this, reprocessing with internet connection and selecting a different map provider will be required.

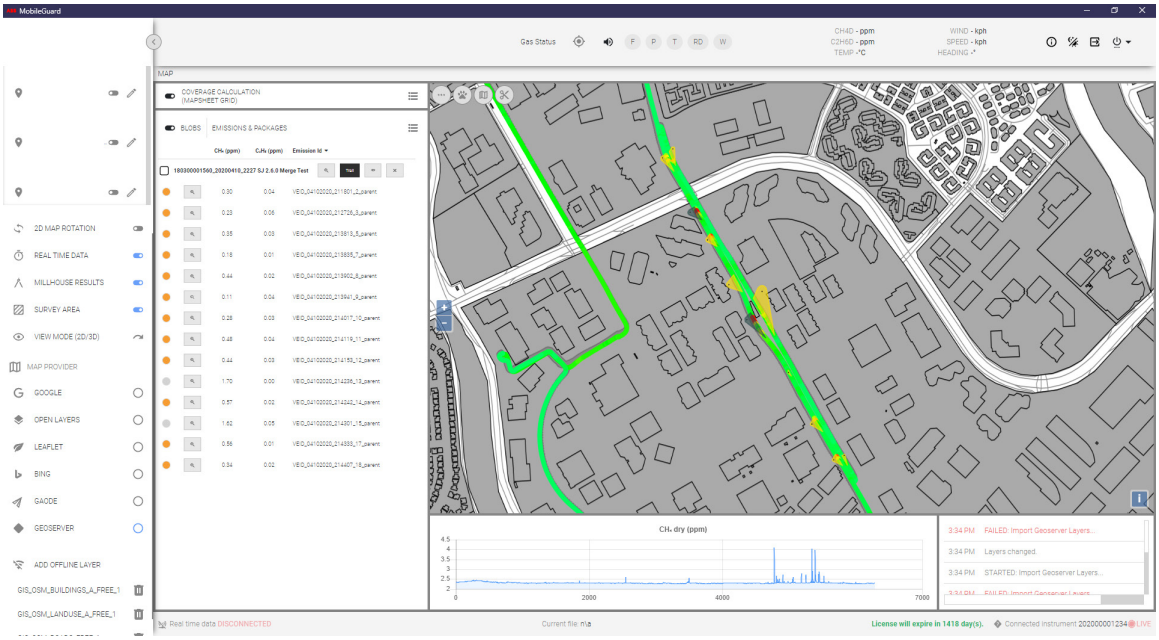


Figure 25 Offline Map Example

...3 System Software

Time Series Screen

The time history of methane, ethane, and water concentrations collected during an active drive can be plotted on the *Time Series* screen.

On the sidebar, select **Time Series** to access the screen shown in Figure 26.

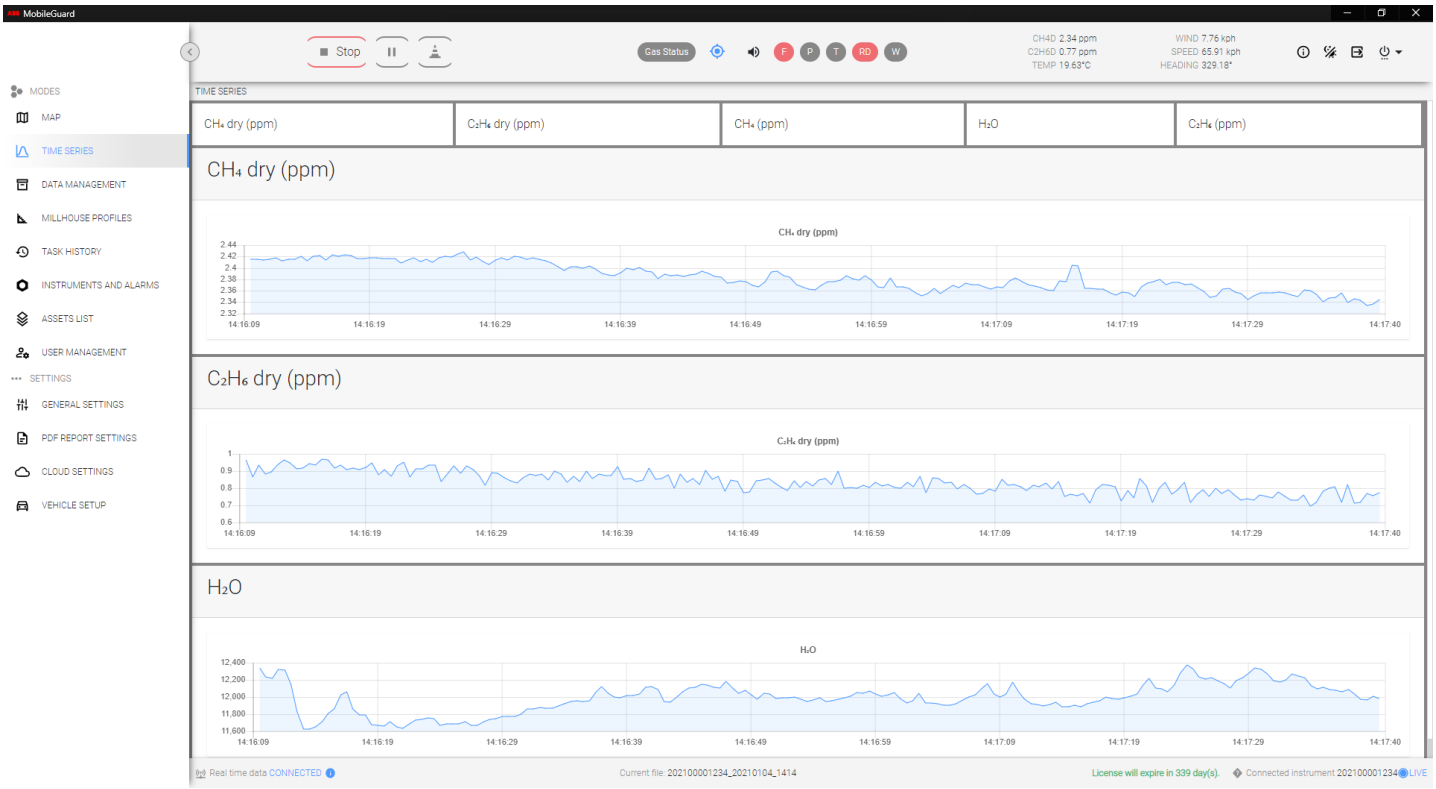


Figure 26 Time Series Screen

This screen displays the time history for gas species being detected. It functions only during active drives. A specific gas can be selected to be displayed.

...3 System Software

Data Management Screen

The *Data Management* screen is the first screen displayed after *COMMAND CENTER* admin users log in. See Figure 27. (For details on user license types, refer to “License Types”. For details on logging in, refer to “Login Screen”.)

On the sidebar, select **Data Management** to access the screen shown in Figure 27.

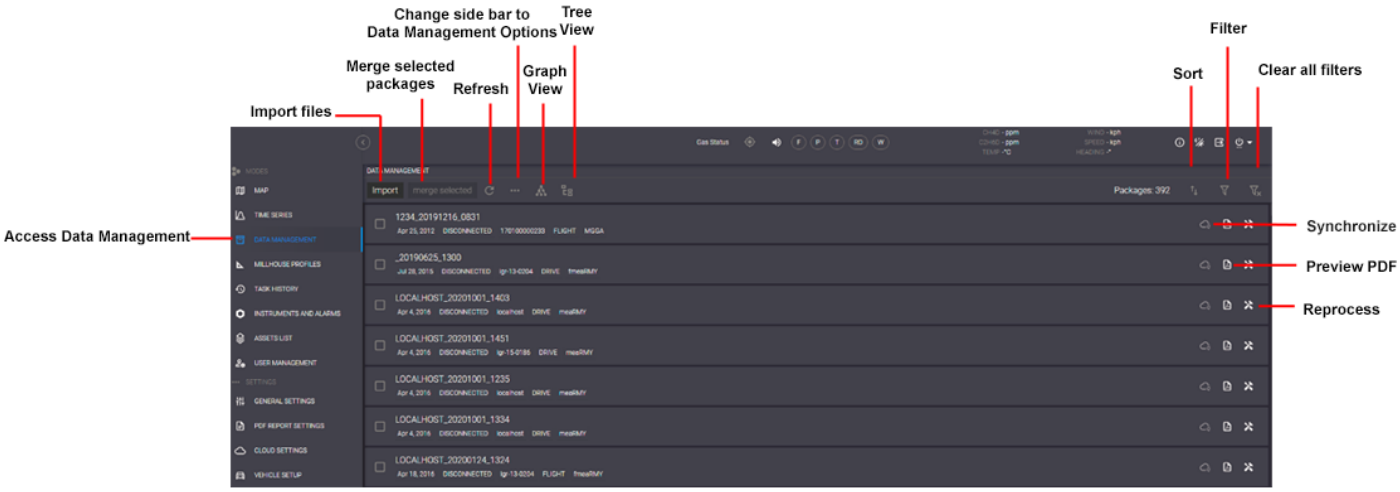


Figure 27 Data Management Screen

This screen lists data associated with drive packages: name, date, status, instrument ID, package type, and instrument type (see Figure 28).

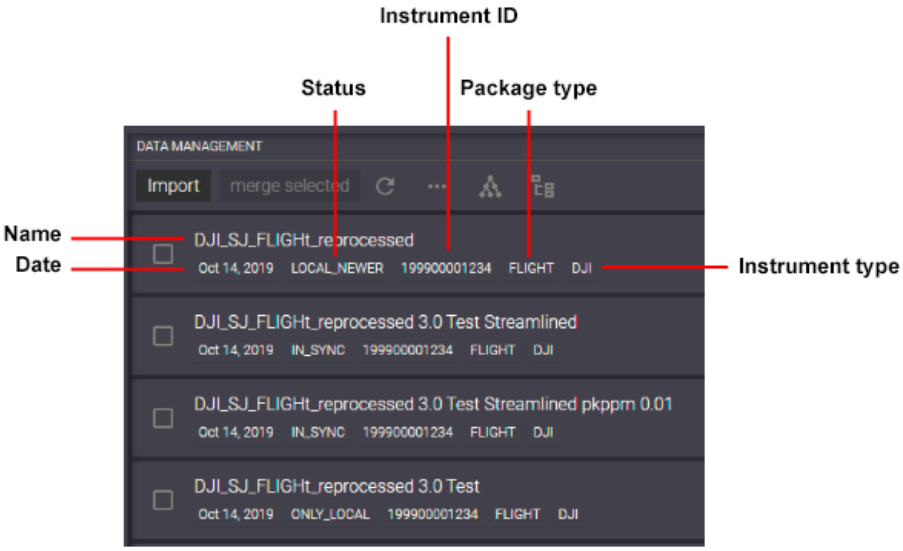


Figure 28 Drive Package Data

...3 System Software

Data Management Screen - Synchronization Status

Drive-package synchronization statuses are as follows (see Figure 29):

- ONLY_CLOUD – file stored only in the cloud (Google Drive or ABB Ability Cloud repository), not locally on computer
- ONLY_LOCAL – file stored only local on computer, not in the cloud
- CLOUD_NEWER – same file as file stored locally, but stored in the cloud with more recent data
- LOCAL_NEWER – same file as file stored in the cloud, but stored locally with more recent data
- IN_SYNC – file stored in the cloud and locally with identical data

⚠ NOTE

The *Data Management* screen lists all known drive packages (local and remote) and their synchronization status with Google Drive or ABB Ability Cloud.

If the Google account is not connected, or when the MobileGuard™ application is unable to retrieve or refresh the list of files currently stored in Google Drive, only local files are shown, and their status is set to *DISCONNECTED*. If this occurs, click the **Refresh** icon.

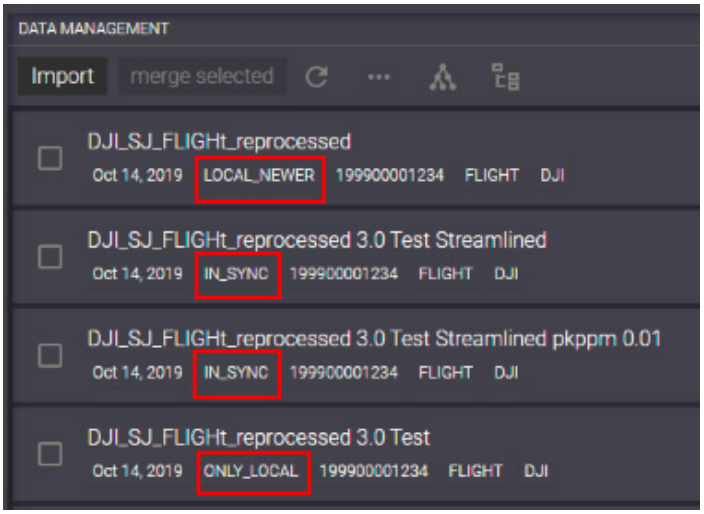


Figure 29 Synchronization Status

Data Management Screen - Import

Click **Import** (see Figure 27) to add analyzer raw data files to the list.

Data Management Screen - Merge Selected Packages

You can select multiple locally stored drive packages and merge the data into one file on the list. This combines raw data from different drive packages and processes the data using Millhouse algorithms. To do this:

1 Check the boxes next to the files you want to merge.

2 Click **merge selected** (see Figure 27).

The files are merged into one file in the list.

...3 System Software

Data Management Screen - Options

Click the **Options** icon to access the *Data Management Options* screen (see Figure 30).

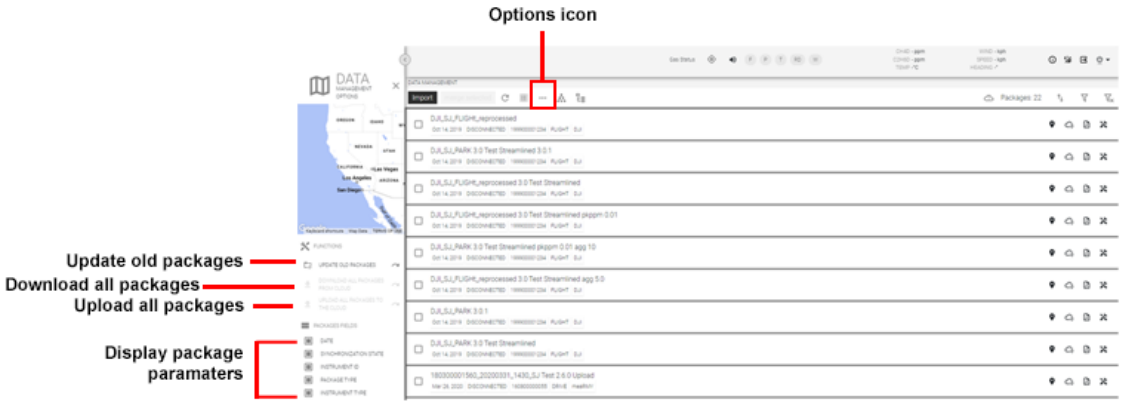


Figure 30 Data Management Options Screen

Use the left side bar to:

- Update old packages to create data-set identifiers and vehicle-analysis identifiers. This is required to merge older packages.
- Download all packages from Google cloud.
- Upload all packages to Google cloud.
- Display package metadata date, synchronization state, instrument ID, package type, and instrument type: Click the adjacent square to select the desired parameter.

To return the sidebar to *Modes* screens, click the icon again, or click the **X** on the sidebar adjacent to *Data Management Options*.

Data Management Screen - Graph View

Click the **Graph** icon to access the *Data Management* screen in graph view (see Figure 31). (Clicking this icon returns you to the default view.) Old packages will have to be updated for this display to link the raw data files.

Use this screen to view the relationship between raw and processed data (analysis packages).

- Left side: raw files
- Right side: processed packages that used the raw data

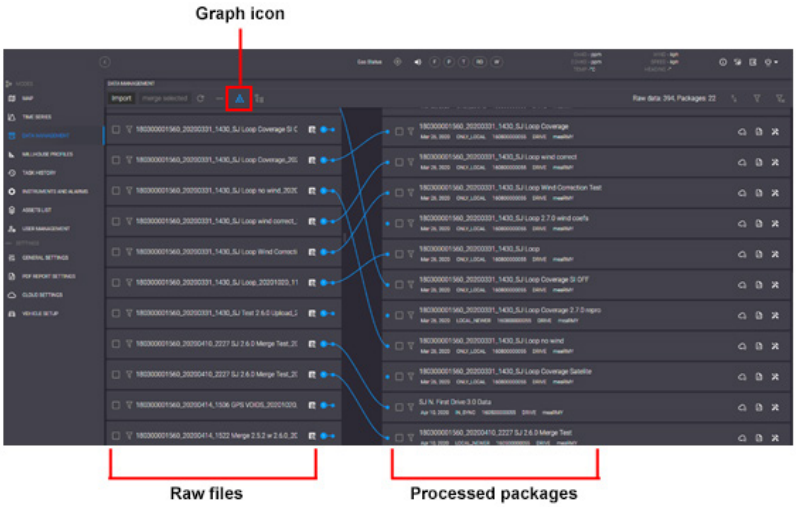


Figure 31 Data Management Screen – Graph View

...3 System Software

Data Management Screen - Tree View

Click the **Tree** icon to access the *Data Management* screen in tree view (see Figure 32): This expands the entire tree structure. Choose a structure and use the drop-down menu to expand and view its contents.

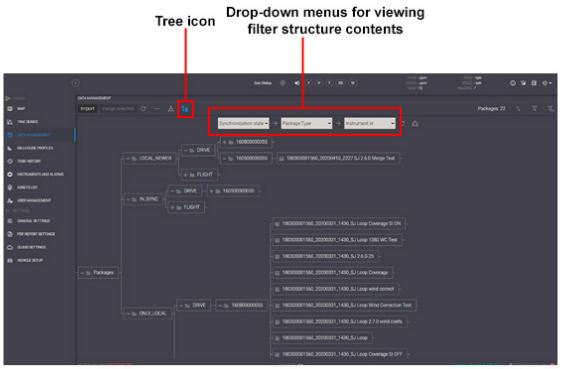


Figure 32 Data Management Screen – Tree View

Data Management Screen - Filter

Use to search any package in the list.

1 Click the **Filter** icon (see Figure 27): The screen shown in Figure 33 appears.

2 Enter search information in the *Name contains* field.

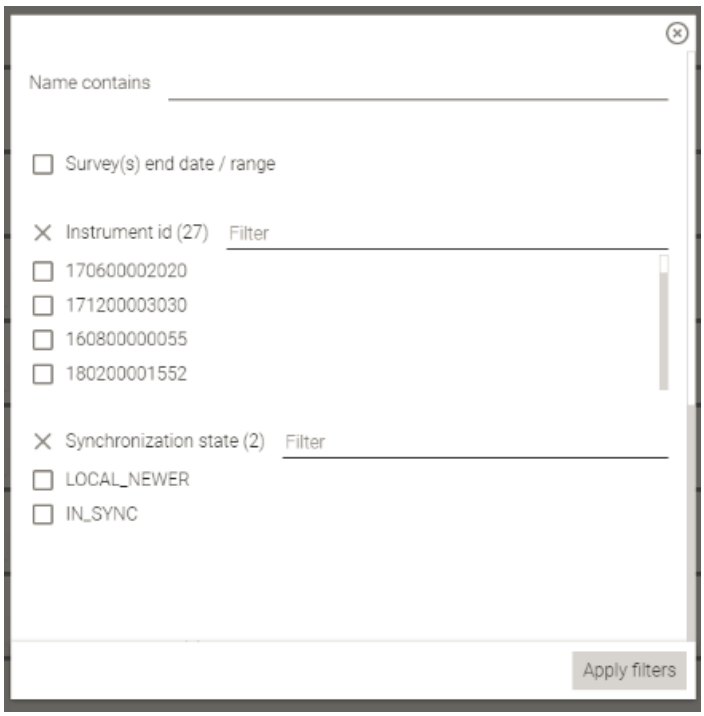


Figure 33 Data Management Filter Window

3 Select filters.

To select a range of dates to filter, click the **Survey(s) end date/range** box: The screen shown in Figure 34 appears. Select the start day, then end day, to highlight a section to filter.

4 Click **Apply filters**.

...3 System Software

Figure 34 Data Management Filter Selection

To remove all search filters currently being used, use the **Clear All Filters** button (see Figure 27).

Data Management Screen - Synchronize

Select a file's **Synchronize** icon (see Figure 27) to store a file's current data in the cloud and locally (IN_SYNC state).

Data Management Screen - Preview PDF

Click the **Preview PDF** icon (see Figure 27) to preview the PDF report of the drive package. See Figure 35 for an example of a report.

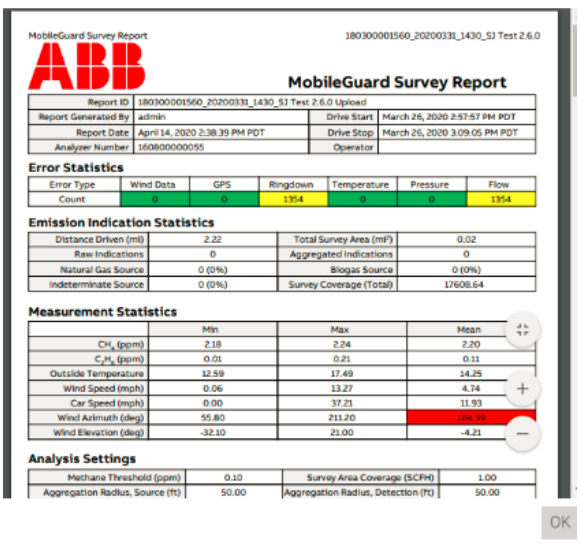


Figure 35 PDF Report Example

Data Management Screen - Reprocess

Select a file's **Reprocess** icon (see Figure 27) to reprocess the package. The Millhouse profile can be selected before processing. The window in Figure 36 appears.

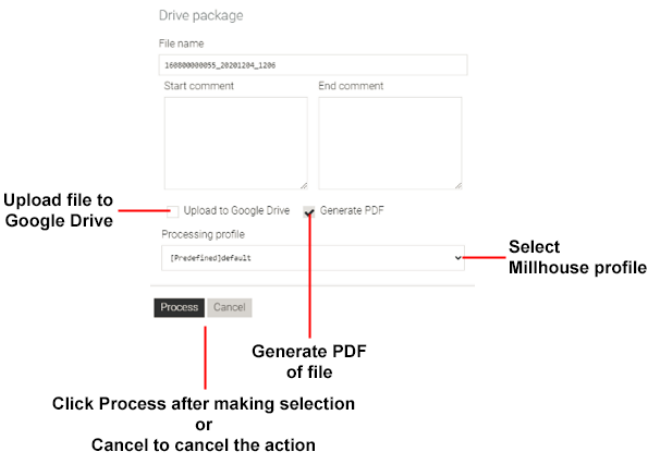


Figure 36 Reprocess Window

The following options are available:

- Upload the file to Google Drive – check the adjacent box.
- Generate a PDF of the file – check the adjacent box.

⚠ NOTE

The above two options may be used simultaneously.

- Processing profile – Select which Millhouse profile to use from the *Processing profile* drop-down menu. Provides easy access to reprocess using a different Millhouse profile.

After making selections, click **Process** or **Cancel** to cancel the action.

...3 System Software

Data Management - Highlight Packages Based on Sync Time

When connected to your Azure Storage account, you can set which packages are highlighted based on sync time. Under **General Settings** > **GUI Settings** > **Package modification indicator**, you can set the time to highlight packages that were modified within this time (see Figure 37). For example, setting to 1440 minutes would highlight all packages that have been modified/uploaded to the cloud in the past 24 hours, as shown in Figure 38.

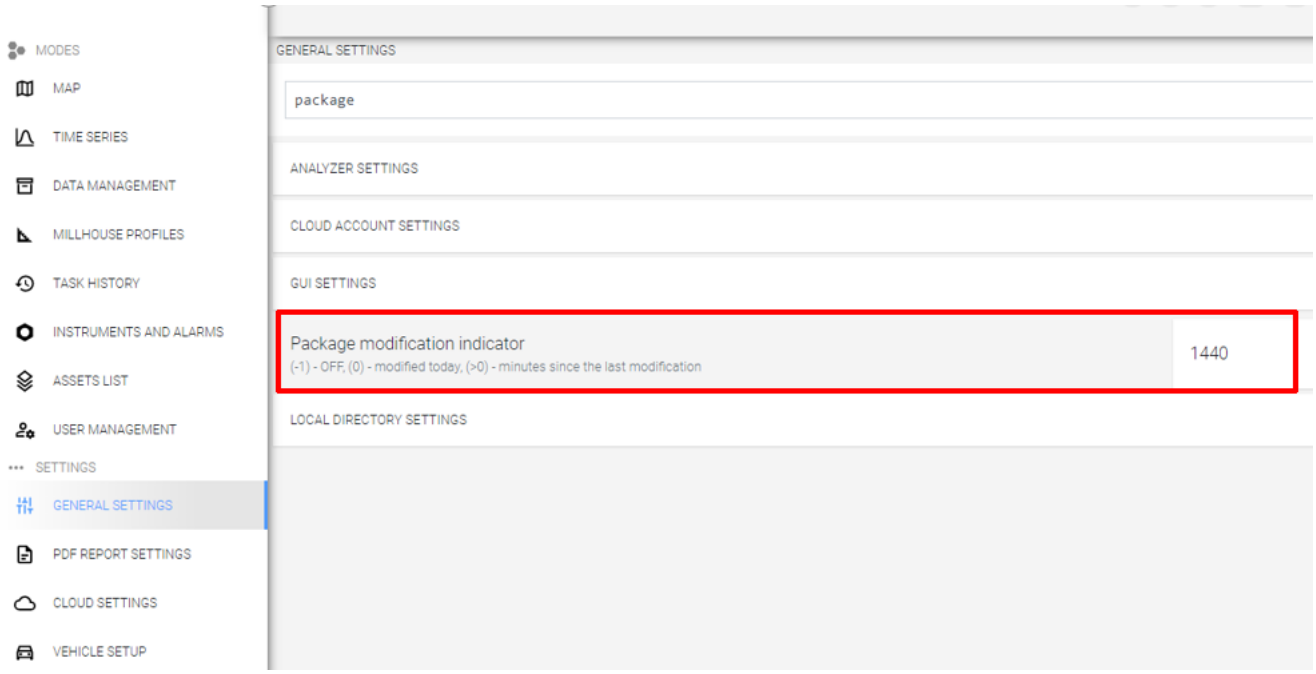


Figure 37 Data Management Highlight Option

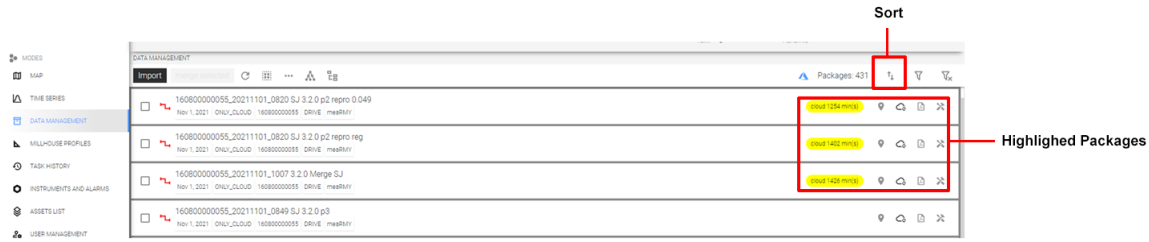


Figure 38 Data Management Highlighted Packages

To display the most recently uploaded/modified packages at the top, click the **Sort** icon (see Figure 38), then select the sorting option, **Last modified on cloud on top** from the drop-down menu (see Figure 39).

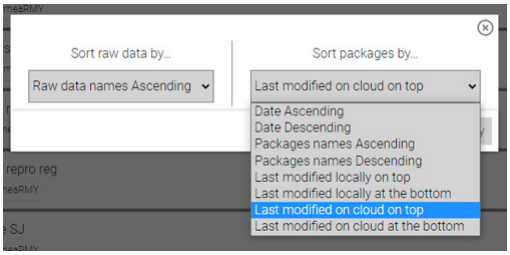


Figure 39 Sort Packages Drop-Down Selection

...3 System Software

Data Management - Download/Upload Selected Packages from/to Cloud
In addition to downloading or uploading all packages from/to the cloud, you also have the option of downloading or uploading *selected* packages from/to the cloud.

To download selected packages from the cloud:

1 From the *Data Management* screen, select the **Options** icon (see Figure 30).

2 Select the desired package(s).

3 From the sidebar, click **Download Selected Packages from Cloud** (see Figure 40).

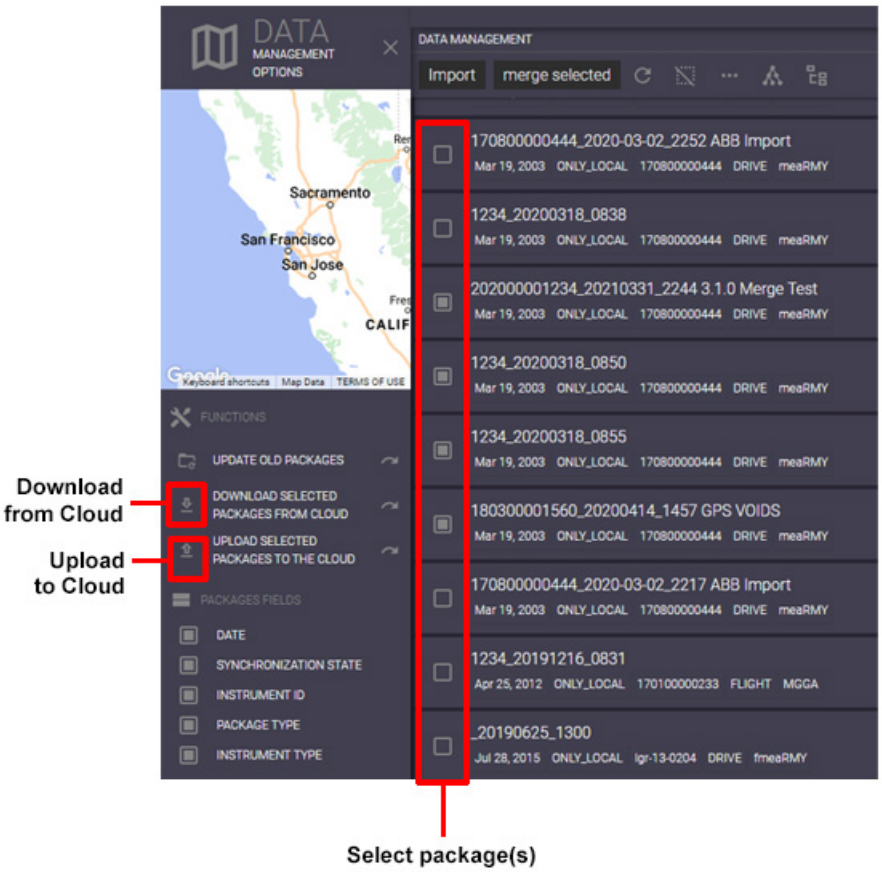


Figure 40 Data Management Options - Download/Upload Selected Packages

To upload selected packages to the cloud:

1 From the *Data Management* screen, select the **Options** icon (see Figure 30).

2 Select the desired package(s).

3 From the sidebar, click **Upload Selected Packages to the Cloud** (see Figure 40).

Figure 41 shows the progress of uploading multiple packages to the Azure Storage container.

After the upload has completed, a summary result is shown to alert you if any packages were unsuccessfully uploaded (see Figure 42).

...3 System Software

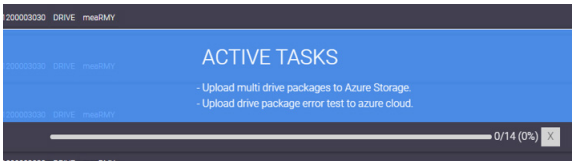


Figure 41 Uploading Multiple Packages to Cloud

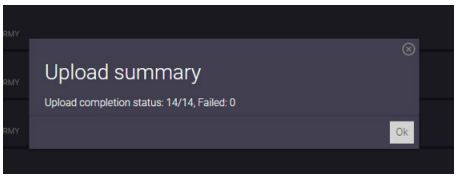


Figure 42 Cloud Upload Summary

Data Management - Drive Package Map Preview

To view a map preview of a drive package from the *Data Management* screen:

1 From the *Data Management* screen, click the **Map** icon on the desired drive package (see Figure 43): A map preview of the drive package appears.

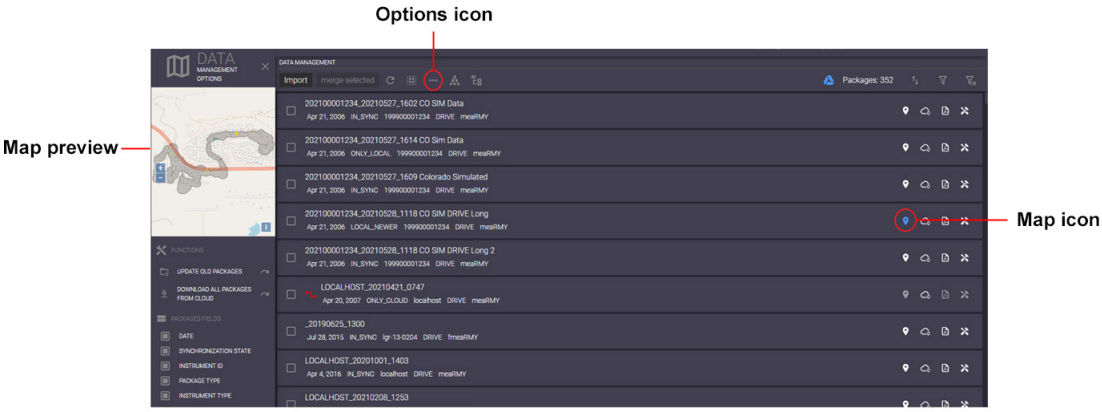


Figure 43 Data Management Map Preview

2 Select the **Options** icon to view the map: The UI switches to the *Map* screen for a larger view.

...3 System Software

Millhouse Profiles

On the sidebar, select **Millhouse Profiles** to access the *Millhouse Profiles* screen (Figure 44).

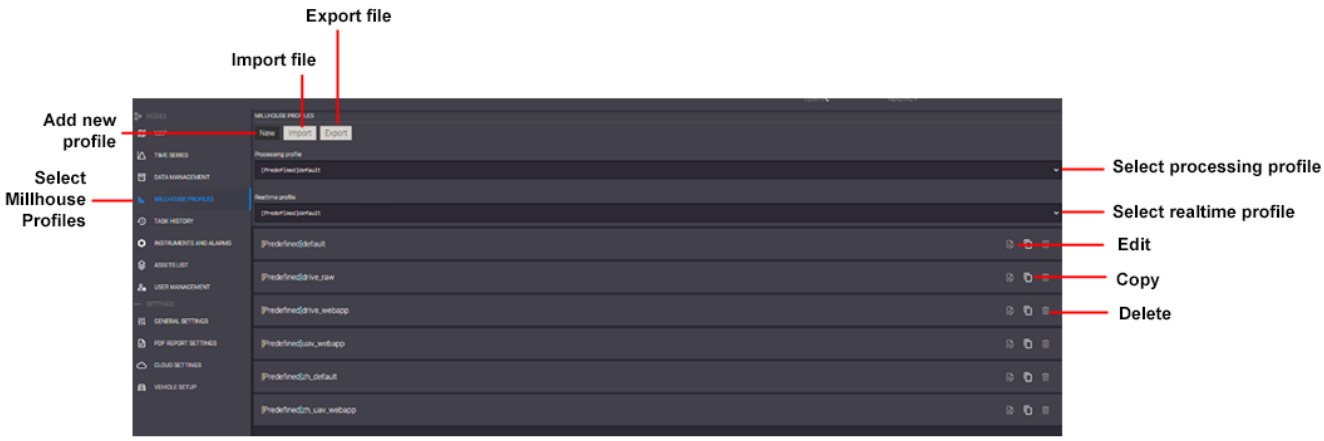


Figure 44 Millhouse Profiles Screen

Use this screen to set variables in Millhouse profiles. Use the drop-down menus to select a processing or real-time profile. Pre-defined profiles cannot be altered; a copy must be made first.

To add a new profile, click **New**: The screen shown in Figure 45 appears.

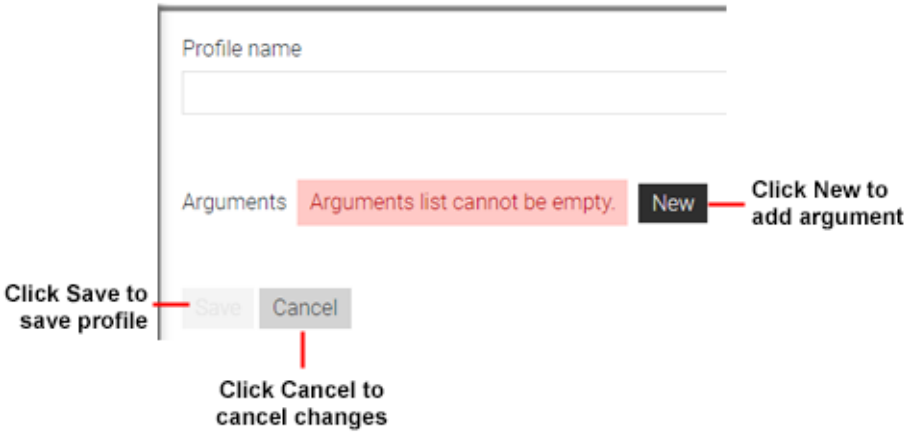


Figure 45 Add New Millhouse Profiles Screen

...3 System Software

If the *Arguments* list is empty, click **New** to add an argument. After adding the profile, click **Save** to save the profile and return to the *Millhouse Profiles* screen or **Cancel** to cancel the changes and return to the *Millhouse Profiles* screen.

To import a file, click **Import** (see Figure 44), click **Choose** to choose the file, then click **Import** to import the file or **Cancel** to cancel the action.

To export a file, click **Export** (see Figure 44) to create a text file and store in the desired location (for example, storing on a local computer for importing to another computer).

To copy a file, click the **Copy** icon (see Figure 44) in the row of the file. The screen shown in Figure 46 appears. Rename the file, and add, modify, or delete arguments as needed. Then click **Save** or **Cancel** to cancel the action.

Figure 46 Copy Millhouse Profile

To delete a file, click the **Delete** icon (see Figure 44) in the row of the file to delete, then click **Save** or **Cancel** to cancel the action.

Table 2 describes Millhouse settings.

...3 System Software

Table 2 Millhouse Setting Descriptions

Keyword	Description	Default Value	Metadata Variable
filename	CSV file to analyze	None	File
plumes	Flag for proceeding with Gaussian plume analysis	1	FLAG
aggregate_source	Aggregate emission indications by source position	0	METERS
aggregate_detection	Aggregate emission indications by detection	0	METERS
leak_prefix	Emission ID prefix (eg, drive identifying string)	“LEAKTOOL”	PREFIX
leak_png	Save emission pictures as png	1	FLAG
leaks	Save emission indication information to a file	1	FLAG
leak_csv	Save emission digest to a CSV file	1	FLAG
survey_area	Calculate survey area (rate in standard cubic feet per hour)	1.0	RATE
survey_area_png	Save survey area overlay as png	1	FLAG
survey_area_max_pixels	Largest X or Y size of survey area overlay image	5000.0	PIXELS
kmz	Write KML analysis file	“MillhouseResults.kmz”	FILENAME
xml	Write XML analysis file	“MillhouseResults.kmz”	FILENAME
xml_user	Username for XML file		NAME
xml_instrument_type	Instrument type for XML file		TYPE
xml_instrument_id	Instrument ID for XML file	"0xFFFF"	ID
xml_trigger_type	Trigger type for XML file	"ivory"	TYPE
xml_algorithm	Algorithm name for XML file	"quicksort"	NAME
xml_data_files	Names of data files for XML file	[ ]	FILENAMES
peak_ppm	Methane peak detection threshold	0.01	PPM
baseline_ppm	Methane de-baselining threshold	0.005	PPM
ch4_ridge_ppm	Methane ridge detection threshold	0.005	PPM
ch4_smoothing_seconds	Methane de-baselining smoothing sigma	60.0	SECONDS
c2h6_baseline_gaussian_seconds	Ethane de-baselining smoothing sigma	10.0	SECONDS
c2h6_signal_boxcar_samples	Ethane signal smoothing samples	20	SAMPLES
natural_gas_c2h6_fraction	Fraction (from 0 to 1) of ethane in natural gas	0.03	FRACTION
c2h6_std_ppm	Expected standard deviation of 3-sample max of boxcar-smoothed C_2H_6 signal	30.003	PPM
minimum_speed	Omit data from analysis when vehicle speed is below this level	0.1	KNOTS
timeslip	Time slip (seconds) for gas data	0.0	SECONDS
wind_factor	Wind-speed multiplier to compensate for flow over vehicle	1.0	FACTOR
minimum_indication_distance_m	Minimum upwind distance from detection point to emission indication (constraint during fitting)	1.0	METERS
maximum_indication_distance_m	Maximum upwind or transverse distance from detection point to emission indication (constraint during fitting)	1000000.0	METERS
maximum_indication_clamp_distance_m	Adjust emission indication source points back to this distance (after fitting)	1000000.0	1000000.0
output_dir	Directory for output files. Default for log_dir, results_dir, and image_overlay_dir		PATH
log_dir	Directory for log and debug files		PATH
results_dir	Directory for XML and KML reports		PATH
image_overlay_dir	Directory for UI overlay images		PATH
save_raw	Save raw data to a CSV file	1	FLAG
save_concentrations	Save preprocessed data to a file	0	FLAG
num_lines	Clip data file to first N lines		N
minimum_wind_mps	Minimum wind speed gate (m/s)	044704	
maximum_wind_mps	Maximum wind speed gate (m/s)	11.176	
Iy	Turbulence parameter	0.125	
Iz	Turbulence parameter	0.061	
pad_2d	Enables 2-dimensional padding for plume fitting	Disabled	
shp	Enables SHP file output in millhouse folder, that is: shp=millhouse_shapefile	Disabled	
anemometer_mounting_angle_deg	Adjusts the wind calculation based on the mounting angle of the anemometer (UAV only)	0.0	

...3 System Software

Task History

On the sidebar, select **Task History** to access the *Task History* screen (Figure 47) to see the status, details, and history of tasks performed.

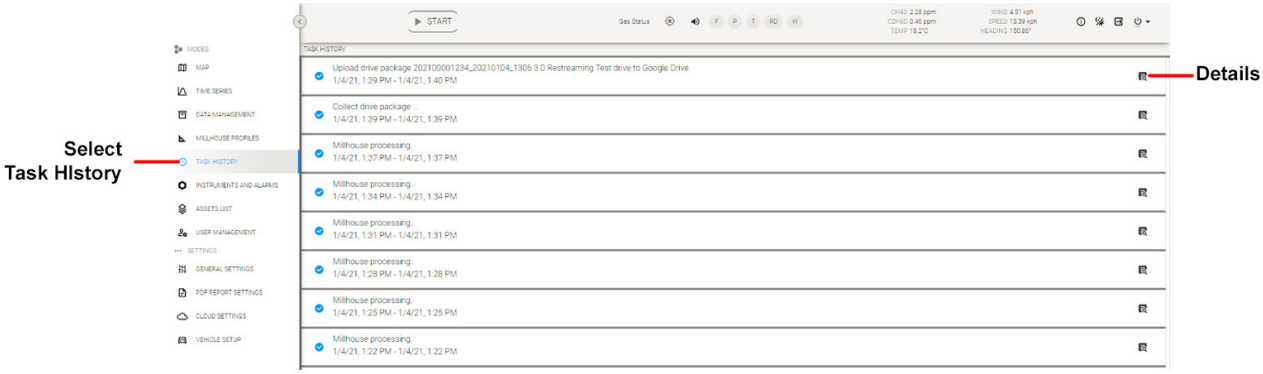


Figure 47 Task History Screen

- Click the **Details** icon (Figure 47) to see more details on the task: The screen shown in Figure 48 appears.
  - To save the details displayed, click the down arrow at the upper right corner.
  - Click **Back to list** to return to the *Task History* screen (Figure 47).

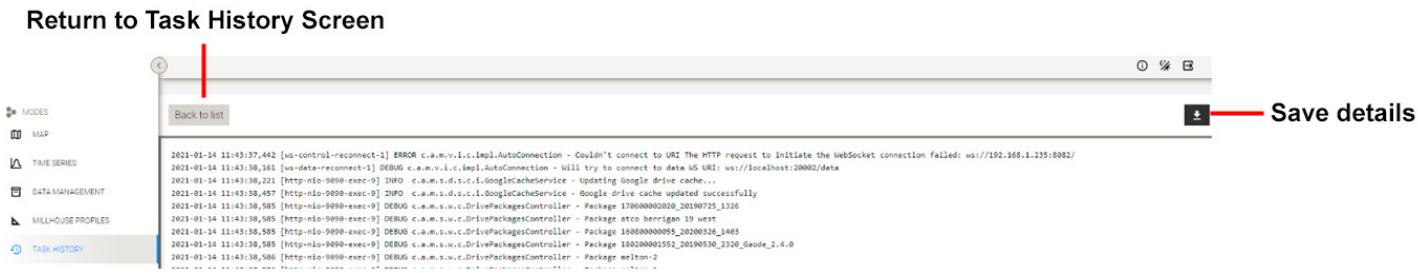


Figure 48 Task History Details Screen

- The following are examples of task details shown in Figure 47:
  - *Upload drive package*: The task performed was uploading a drive package to the Google Drive account (optional).
  - *Collect drive package*: The task performed was stopping the drive in progress.
  - *Millhouse processing*: This task is performed every 3 minutes to process the data.
- If an error occurs in the application, **Task History** highlights red and remains red until you click **Task History** again. (See Figure 49.) In this way, drivers are alerted when an error occurs. **Task History** remains highlighted red even if subsequent processes are successful.

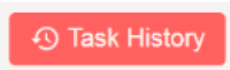


Figure 49 Red-Highlighted Task History

...3 System Software

Instruments and Alarms

On the sidebar, select **Instruments and Alarms** to access the *Instruments and Alarms* screen (Figure 50).

⚠ WARNING!

Please consult with ABB Support before making any changes in the *Instruments and Alarms* screen.

Figure 50 Instruments and Alarms Screen

The types of analyzers are listed.

Instruments and Alarms - Create New Instrument with Alarm Parameters

To create a new instrument and corresponding alarm parameters, perform the following:

1 Click **Create new** (see Figure 50): The screen shown in Figure 51 appears.

2 Enter the instrument type and CSV header: After these fields are filled, the **Generate** button is highlighted.

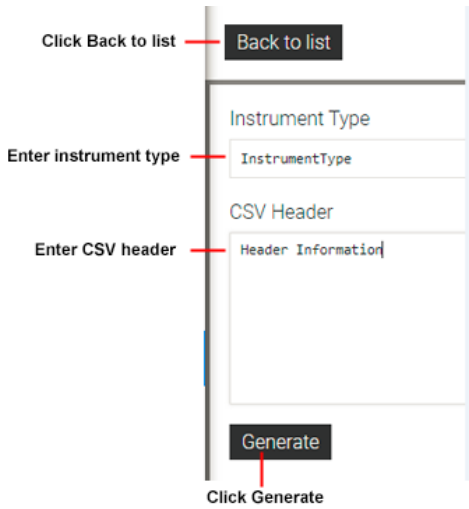


Figure 51 Create New Instrument/Alarm Screen

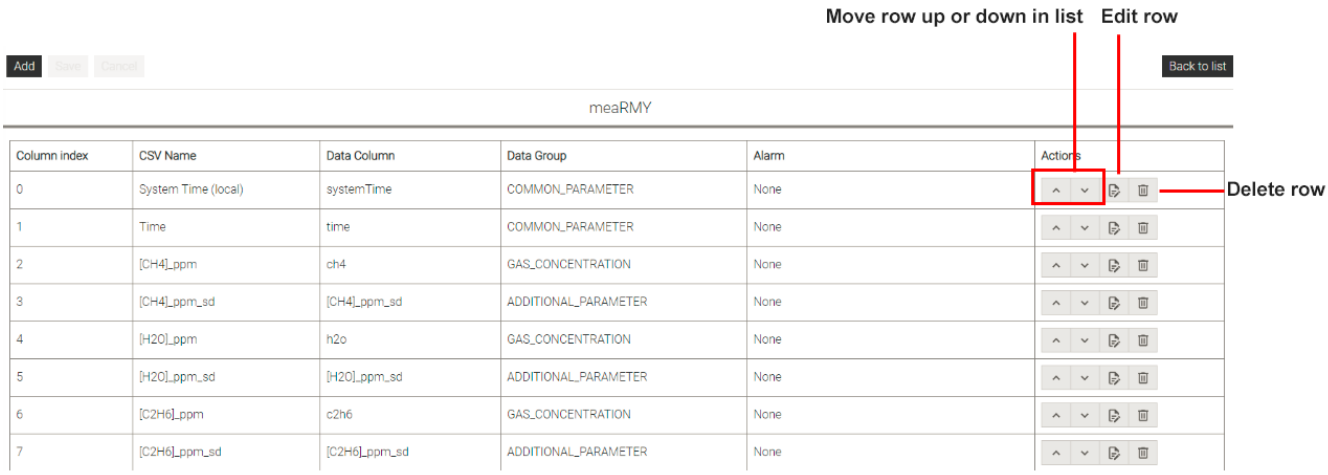
3 Click **Generate** (Figure 51).

4 Click **Back to list** to return to the *Instruments and Alarms* screen: The new entry appears in the list.

...3 System Software

Instruments and Alarms - Edit Instrument Alarm Parameters

To display or edit an instrument's alarm parameters, click the **Edit** icon (see Figure 50): The screen shown in Figure 52 appears.



Column index	CSV Name	Data Column	Data Group	Alarm	Actions
0	System Time (local)	systemTime	COMMON_PARAMETER	None	
1	Time	time	COMMON_PARAMETER	None	
2	[CH4]_ppm	ch4	GAS_CONCENTRATION	None	
3	[CH4]_ppm_sd	[CH4]_ppm_sd	ADDITIONAL_PARAMETER	None	
4	[H2O]_ppm	h2o	GAS_CONCENTRATION	None	
5	[H2O]_ppm_sd	[H2O]_ppm_sd	ADDITIONAL_PARAMETER	None	
6	[C2H6]_ppm	c2h6	GAS_CONCENTRATION	None	
7	[C2H6]_ppm_sd	[C2H6]_ppm_sd	ADDITIONAL_PARAMETER	None	

Figure 52 Edit Instrument/Alarm Screen

To add a row for an alarm, click **Add** in the top-left corner (see Figure 52) and select an alarm. The screen shown in Figure 53 appears.

Use the *Alarm* type drop-down menu (see Figure 53) to select the type of the alarm: **Gas** or **System**, then specify alarm parameters. (Alarm parameters appear when **Gas** or **System** is selected.) (See Figure 53.)

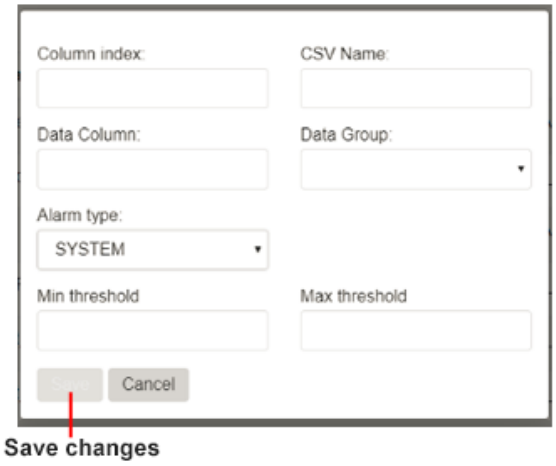


Figure 53 Add Row for Instrument Alarm Parameters

After entering and selecting the parameters, click **Save** to save the changes or **Cancel** to cancel the changes. Either of these actions return you to the *Edit Instrument/Alarm* screen (see Figure 52). The row appears at the bottom of the screen.

To edit a row, click the **Edit** icon under *Actions*: (see Figure 52) The screen shown in Figure 53 appears with the *Column index* automatically populated. Specify and save or cancel parameters the same as when adding a row.

To delete a row, click the **Delete** icon under *Actions* (see Figure 52): The row is removed.

To save all changes made in the *Edit Instruments/Alarms* screen (see Figure 52), click **Save** in the upper left corner. To cancel any changes made in the *Edit Instruments/Alarms* screen, click **Cancel** in the upper left corner.

Click **Back to list** (see Figure 52) to return to the *Instruments and Alarm* screen.

...3 System Software

Assets List

On the sidebar, select **Assets List** (see Figure 8) to access the *Assets List* screen (Figure 54).

Figure 54 Assets List Screen

This screen displays the assets imported to PostgreDB and served (published) by the local instance of Geoserver.
Click the **Buildings** icon (to the On position) (see Figure 54) to display infrastructure data in an asset file (in the 3D map view). To turn off this, feature, click the **Buildings** icon again (to the Off position). See Figure 55 for an example.

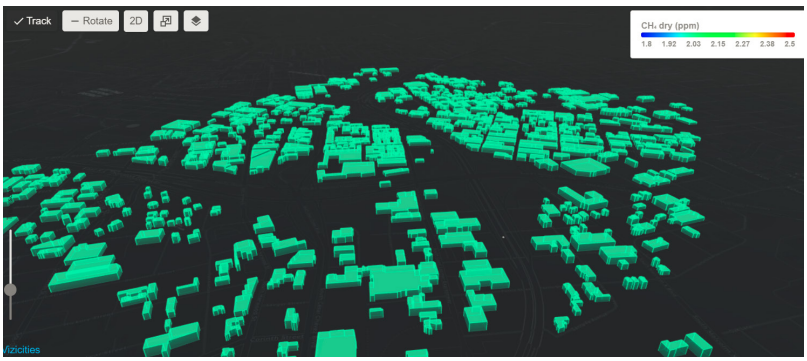


Figure 55 Asset File with Building Information

Click the **Edit** icon to edit the name and properties of an asset (see Figure 54).
Click the **Delete** icon to delete an asset (see Figure 54).

Assets Import

On the sidebar, select **Assets List** (see Figure 8), then click the **Assets Import** button to access the *Assets Import* screen (Figure 56).

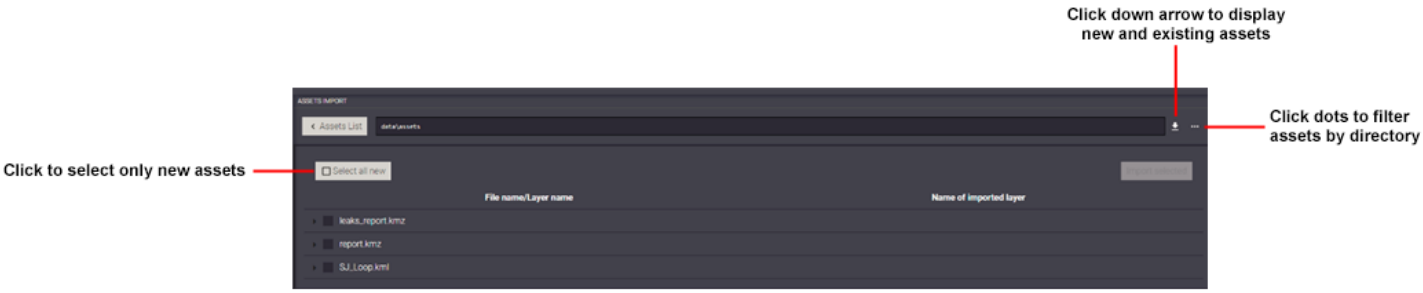


Figure 56 Assets Import Screen

...3 System Software

To import assets from the installation directory (C:\Program Files (x86)\ABB MobileGuard\data\assets), do the following:

1 Click **Assets List**, then click the **Assets Import** button.

2 If you want to change the directory to import assets from, click the three dots (Figure 56), then navigate to the location of the desired directory.

3 Click the down arrow on the right side of the screen to search the directory for asset files (KML, KMZ, SHP) (see Figure 56).

⚠ NOTE

The maximum KML, extracted KMZ, file size the software supports is 900 MB. It is recommended to use SHP format for larger asset files.

⚠ NOTE

Assets should be in the following formats: LineString, MultiLineString, and in WG84 (or EPSG:4326).

- While the directory is being searched, the following screen (Figure 57) is displayed:

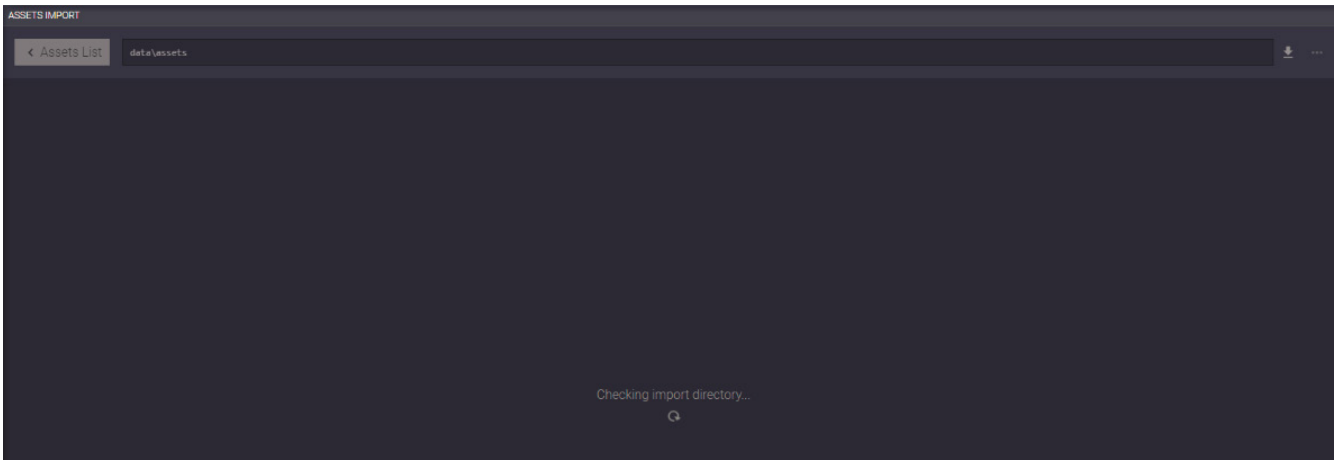


Figure 57 Checking Import Directory

- The list displays which asset files are new and which have already been loaded into the MobileGuard™ application. A *Disk* icon indicates files already in MobileGuard™ (see Figure 58).

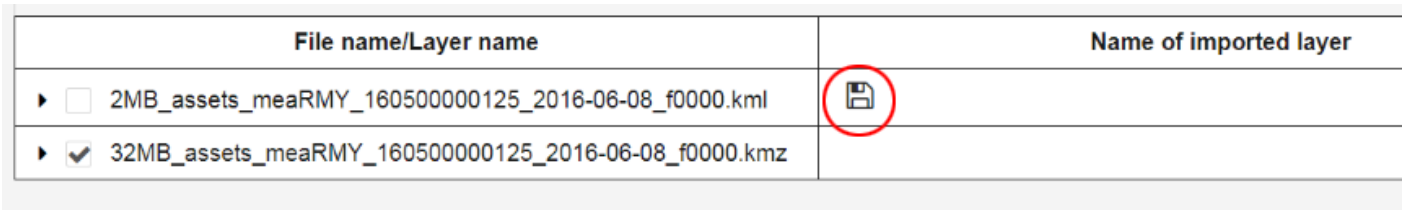


Figure 58 Assets Already in Application

4 When the assets are displayed, check the box next to the assets file you want to import (see Figure 59). To select only new asset files that have not already been loaded into the MobileGuard™ application, check the **Select all new** box.

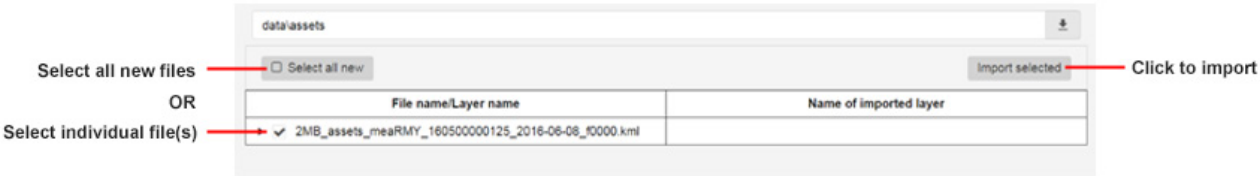


Figure 59 Select Assets to Import

...3 System Software

5 Click **Import selected** (see Figure 59). The screen shown in Figure 60 is displayed during the import process.

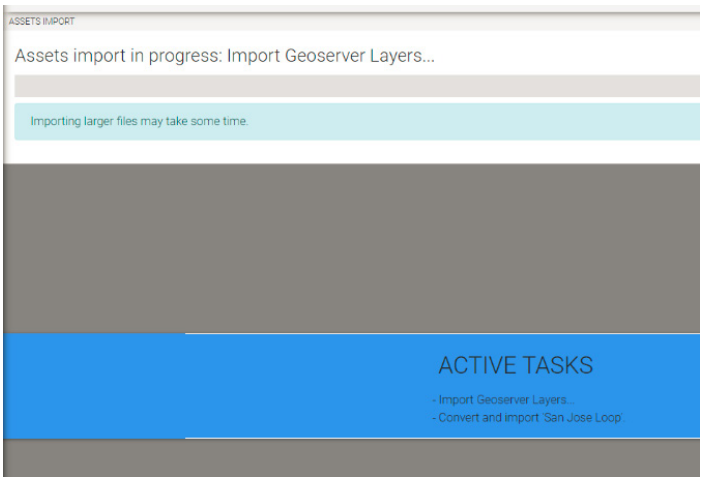


Figure 60 Assets Import in Progress

When the file is imported, you can see the assets displayed in the *Assets List* screen (Figure 54).

6 To display the assets on the *Map* screen (see Figure 8), click the **Map Options** icon, then on the sidebar: Select **Assets** and filter the assets as needed (see Figure 61).

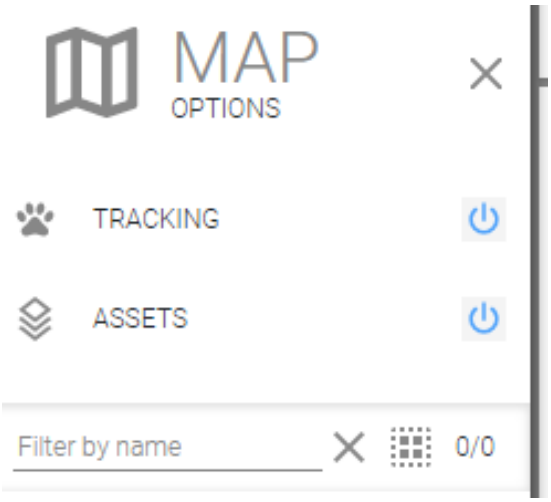


Figure 61 Filter Assets

...3 System Software

User Management

Access to use of the MobileGuard™ application is controlled by user accounts and the privileges granted to those users' accounts. The accounts consist of a username, password, email and role (refer to Table 1 for role definitions). The username is used to log who performs operations with the application.

On the sidebar, select **User Management** (see Figure 8) to access the *User Management* screen (Figure 62).

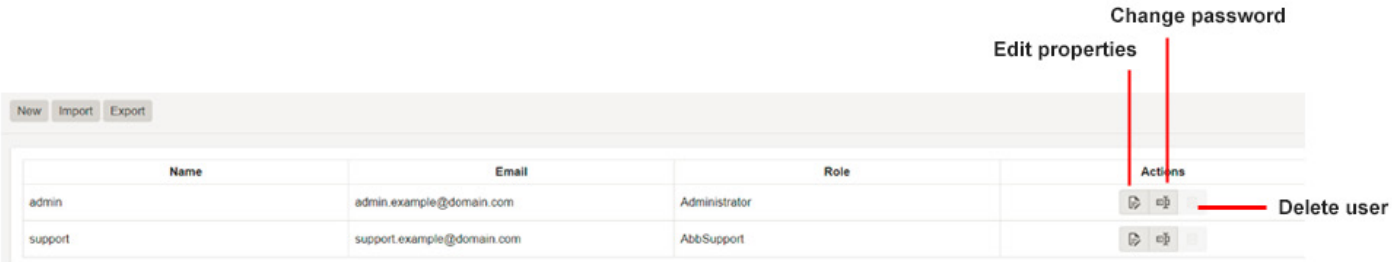


Figure 62 User Management Screen

This screen displays a list of current users that can be managed, depending on the privilege level (listed under the *Role* column). An administrator may perform the following:

- Click **New** to add a user: In the screen which appears, type user information in the fields, then click **Submit** to add the user or **Cancel** to cancel the action.
- Click **Import** to import a list of users from an encrypted file to another computer. Click **Choose** to browse for the encrypted file of users. Enter the same password as that created when exporting the list of users. Select one of the following from the *Import type* drop-down menu:
  - **Add** – Add users from the imported list. Users in the imported list with the same username as users in the MobileGuard™ application are not imported to the MobileGuard™ application.
  - **Overwrite** – Add users from the imported list and overwrite existing users (with the same username) in the MobileGuard™ application.
  - **Synchronize** – Add users from the imported list and delete users (except default users - admin, support) from the MobileGuard™ application not in the imported list. If the imported user has the same username as the user in the MobileGuard™ application, the user in the application is overwritten.

  Then, click **Import** to import the list of users or **Cancel** to cancel the action.

- Click **Export** to export the list of users in the User Management screen to an encrypted file, which can then be imported to another computer. Use the *Password* field to create a password. Checking the **Include administrators** box includes users assigned the Administrator role. If you do not want to export users assigned this role, uncheck this box.

  Then, click **Export** to export the list of users or **Cancel** to cancel the action.

- Click the **Edit** icon in the row of a user to edit the user's properties.
- Click the **Change Password** icon in the row of a user to change the user's password.
- Click the **Delete** icon in the row of a user to delete the user.

...3 System Software

User Management - with Azure Connected

Once connected to the Azure active directory, the Azure group admin can create (commission) other users in the MobileGuard™ *User Management* screen, and also remove (decommission) users. (To connect to Azure, refer to “Azure Account Configuration”.)

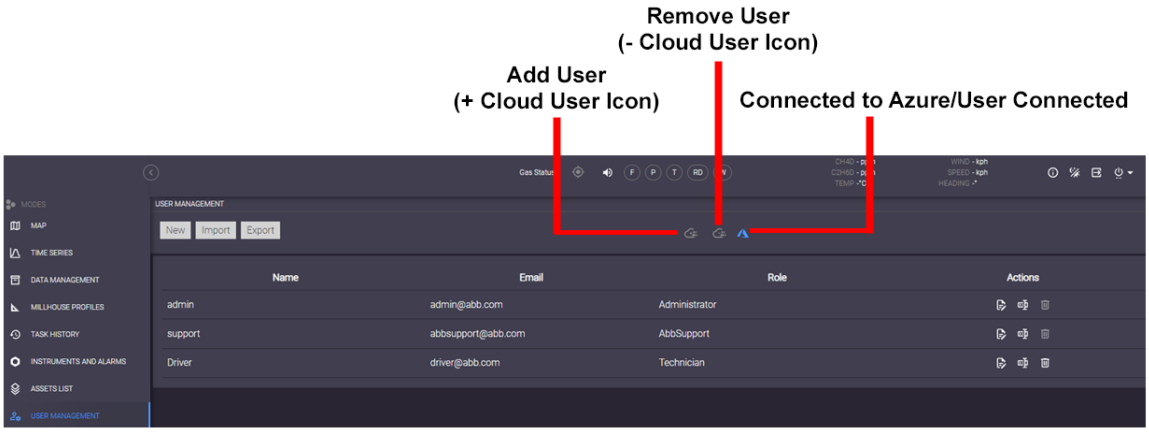


Figure 63 User Management Screen with Azure Connected

Create users:

1 Click the **+ Cloud User** icon (see Figure 63): The *Users Commissioning* dialog-box appears.

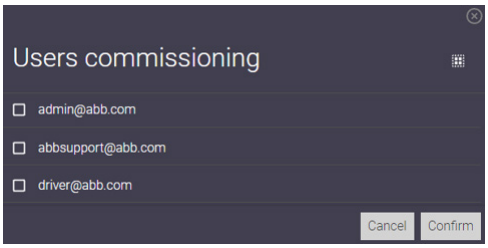


Figure 64 Users Commissioning Dialog-Box

2 Select which local user(s) to invite to the Azure Storage account. These users will get an email invitation to join the Azure storage group, similar to the Group Admin commissioning.

3 Click **Confirm**: The user(s) are added to the account. In Figure 65, *driver@abb.com* is added.

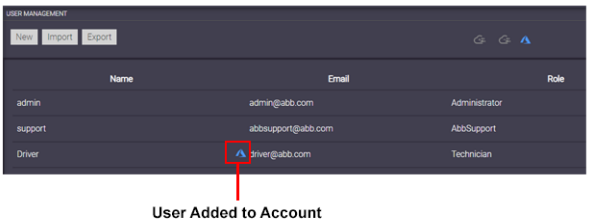


Figure 65 User Commissioning Added

...3 System Software

Remove users:

1 Click the **- Cloud User** icon (see Figure 63): The *Decommissioning Users* dialog-box appears.

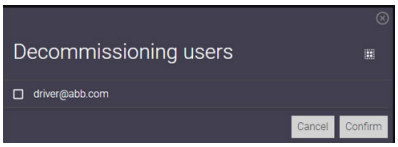


Figure 66 Decommissioning Users Dialog-Box

2 Select which local user(s) to remove from the Azure Storage account.

3 Click **Confirm**: The user(s) are removed from the account.

...3 System Software

User Management - Default User Accounts
The software has two pre-installed default user accounts that may not be deleted (see Figure 62).

Admin
This account has full administrative privileges as defined in Table 1.
Username: admin
Default password: admin123
Default email: admin.example@domain.com

Support
This account has support role privileges as defined in Table 1.
Username: support
Default password: support123
Default email: support.example@domain.com

⚠ WARNING!

For cybersecurity reasons, users are advised to change all passwords from their default value.

...3 System Software

General Settings

On the sidebar, select **General Settings** (see Figure 8) to access the *General Settings* screen. (See Figure 67).

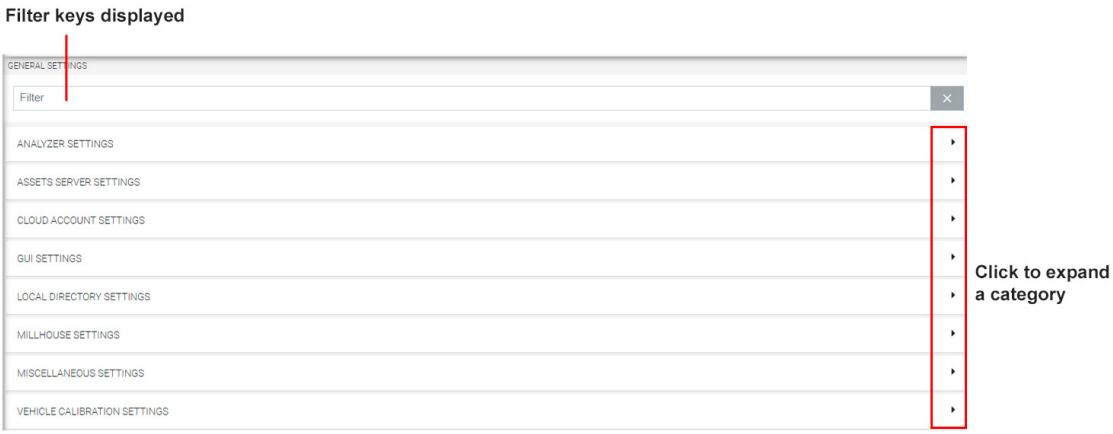


Figure 67 General Settings Screen

This screen displays categorized general MobileGuard™ settings.

- Click a category to access the category's settings and corresponding values.
- Use the *Filter* field to limit the type of settings displayed.
- To edit a setting's value, expand a category, click the setting, type the value in the field, then click **Save** (see Figure 68).

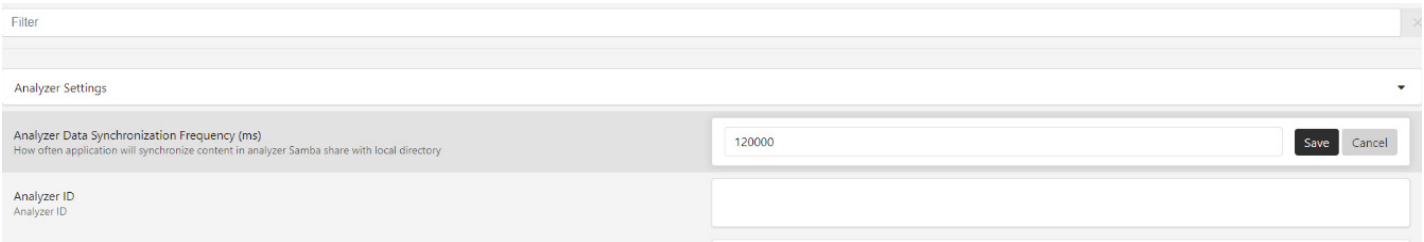


Figure 68 General Settings Screen with Category Expanded

PDF Report Settings

On the sidebar, select **PDF Report Settings** (see Figure 8) to access the *PDF Report Settings* screen (Figure 69).

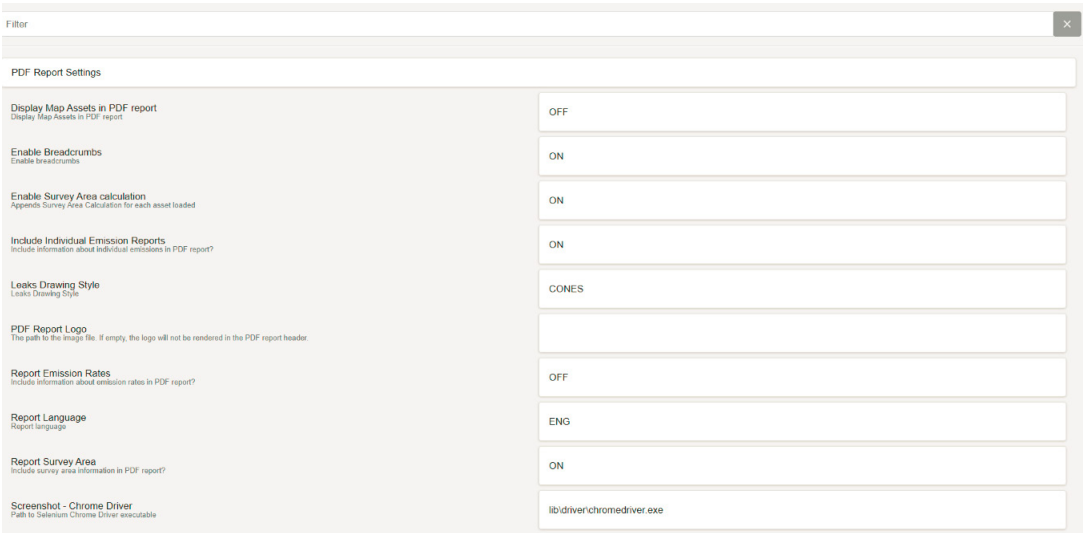


Figure 69 PDF Report Settings Screen

...3 System Software

Use this screen to configure how the PDF report is generated for each MobileGuard™ drive package (refer to the “PDF Report” section for details on this report).

To select a variable, check the box or select from the drop-down menu, then click **Save** or **Cancel** to cancel the action. (See Figure 70.)

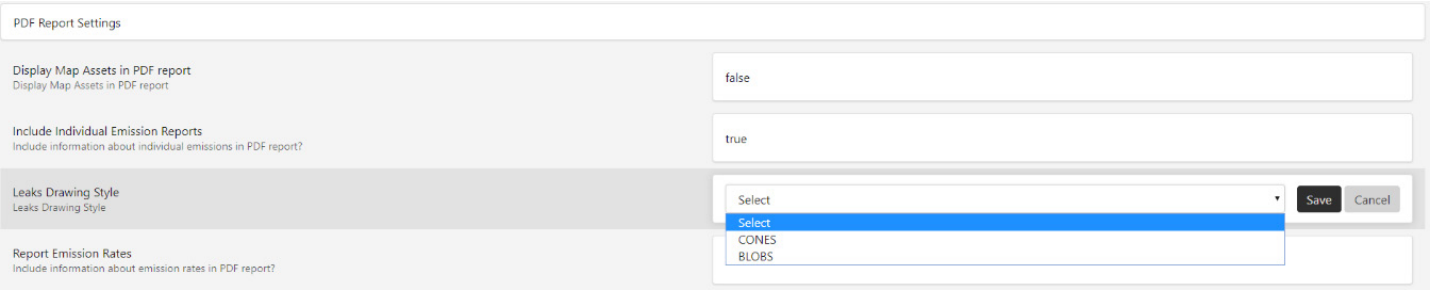


Figure 70 Select PDF Report Settings

Cloud Settings

On the sidebar, select **Cloud Settings** (see Figure 8) to access the *Cloud Settings* screen (Figure 71).

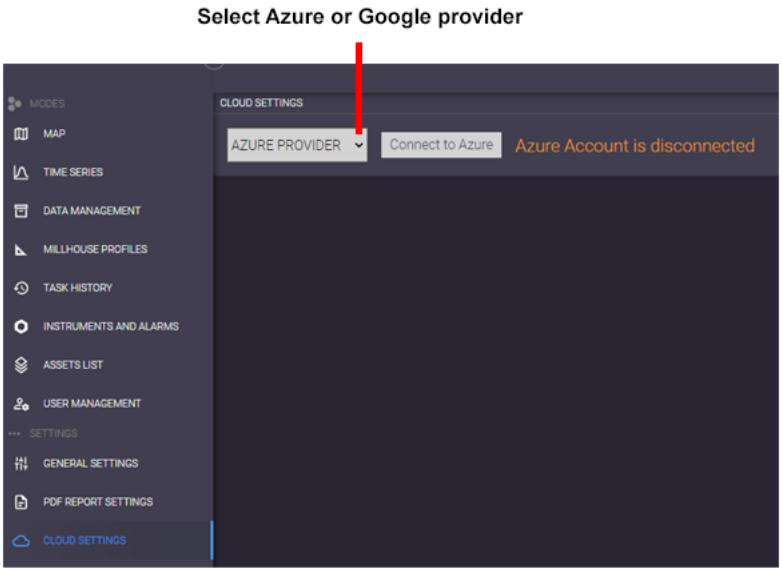


Figure 71 Cloud Settings Screen

This screen lets you choose your provider for drive package storage location: Azure or Google Drive.

...3 System Software

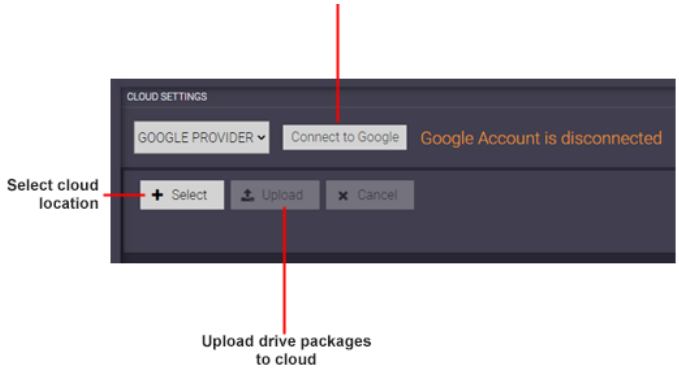


Figure 72 Cloud Settings Screen - Google Provider

This screen lets you connect to your Google Drive storage location for your drive packages and upload the packages.

- Click **Select** to choose the cloud secret file (.json).
- Click **Upload** to upload the secret file to MobileGuard™.
- Click **Cancel** to cancel changes made in this screen.
- Click **Connect** to connect to your Google account.

...3 System Software

Vehicle Setup

On the sidebar, select **Vehicle Setup** (see Figure 8) to access the *Vehicle Setup* screen (Figure 73).

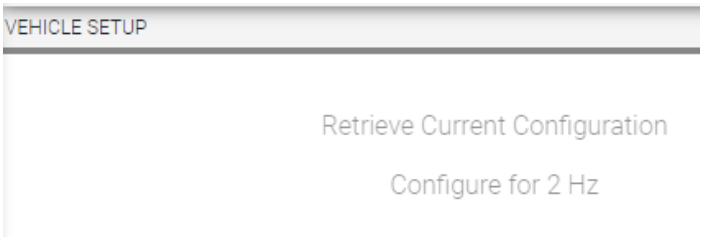


Figure 73 Vehicle Setup Screen

Vehicle Setup - GPS Receiver Configuration

Click **Retrieve Current Configuration** to display the GPS receiver's current configuration.

Click **Configure for 2 Hz** to configure the GPS receiver for 2 Hz (standard MobileGuard™ configuration).

The GPS receiver must broadcast a National Marine Electronics Association (NMEA) standard GPRMC data stream and no other content. No other NMEA streams or error codes should be broadcast: Doing so may result in unpredictable behavior.

License and Terms of Use

License Types

ABB supplies two types of licenses for users:

- *SURVEY* allows the user to connect to the GLA232-FMEA Fast Methane/Ethane Analyzer for data collection and analysis. This license type is paired with the analyzer that comes with the purchase of a MobileGuard™ system and is valid through the license agreement term.
- *COMMAND CENTER* is used only for post-processing data. The user can reprocess, import, merge, and view data taken by the vehicle. This license type does not allow for connecting to an analyzer and taking real-time data.

License Terms

License files are distributed by our Service Department as a *license.bin* file, which is to be placed in the installation directory of the MobileGuard™ program (that is, *C:\Program Files (x86)\ABB MobileGuard\license*). If the file is missing, the screen shown in Figure 74 appears when logging in.

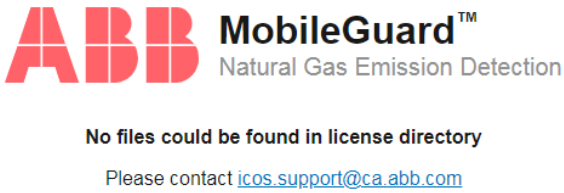


Figure 74 Missing License File (Unable to Log in)

The following screens show how the MobileGuard™ application interprets the license terms. As the end date approaches, the application displays a timer to alert the user of the end date, changing color from green (over 90 days), yellow (less than 90 days and over 30 days), and red (less than 30 days).

Once the *license.bin* file is copied to the installation directory, the following login screen is displayed. The license type is shown near the bottom of the login prompt.

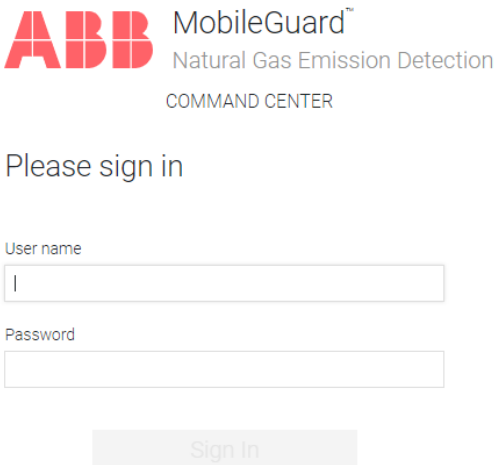


Figure 75 License File Present in Installation Directory at Login

The following screen appears when the license agreement has ended and is expired. The software will not let you log in until an updated license.bin file has been generated by ABB Service.

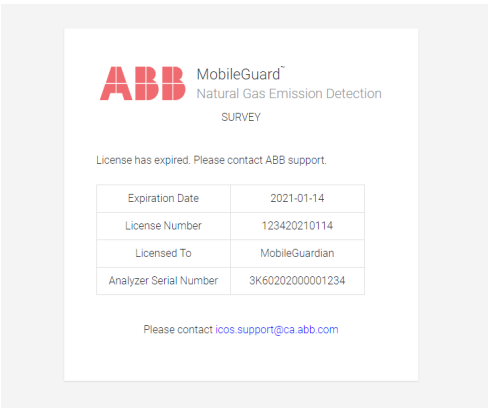


Figure 76 License Agreement Expired

...3 System Software

The following screen is displayed if the *license.bin* file does not match the serial number of the analyzer in the vehicle, or the analyzer is currently not connected to the MobileGuard™ application. To take real-time data, the SSH connection (bottom right) must be LIVE (refer to the “General Settings” section), and the serial number must match.

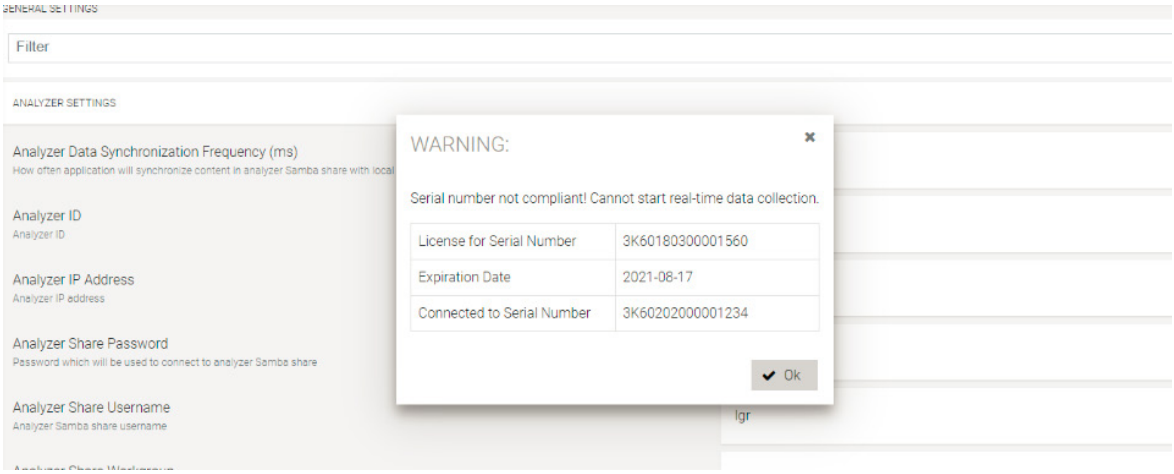


Figure 77 Serial Number not Compliant

Once the SSH connection is established and serial numbers are compliant, the software allows for real-time data acquisition and displays the **Start** button (top left – see Figure 78).

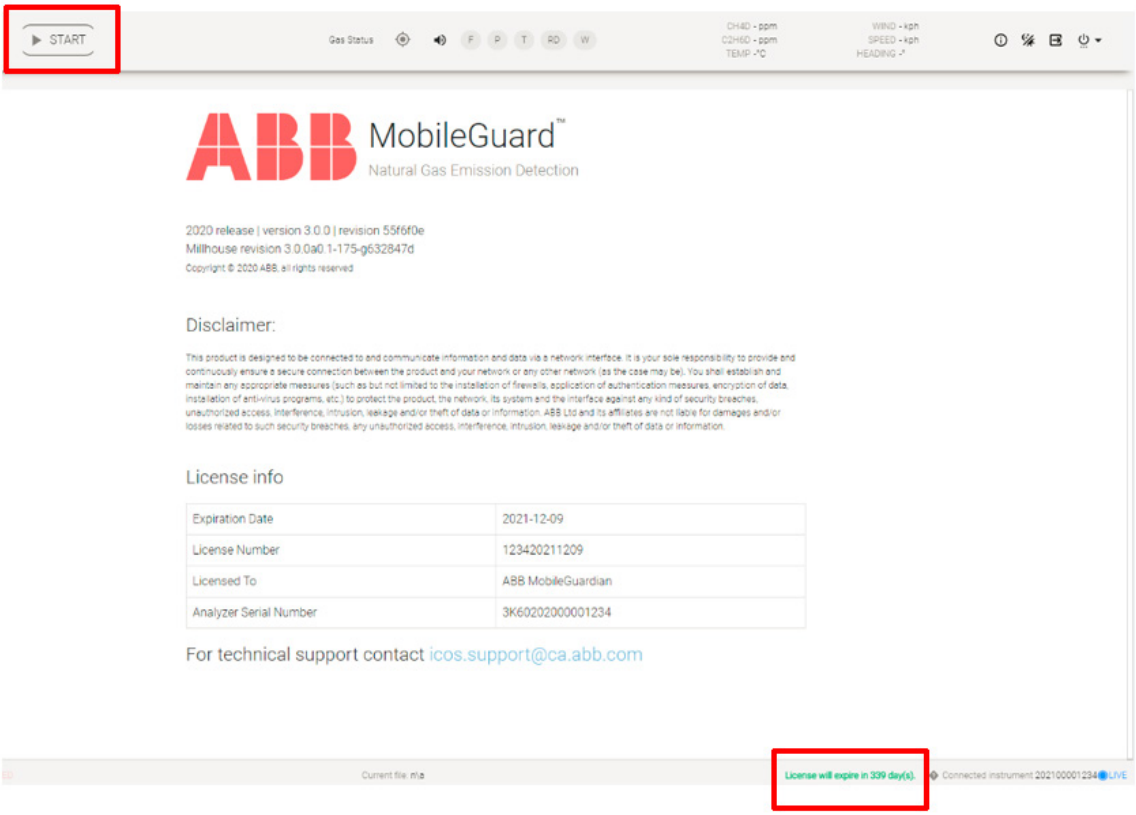


Figure 78 License Valid over 90 Days – Green Font Color

...3 System Software

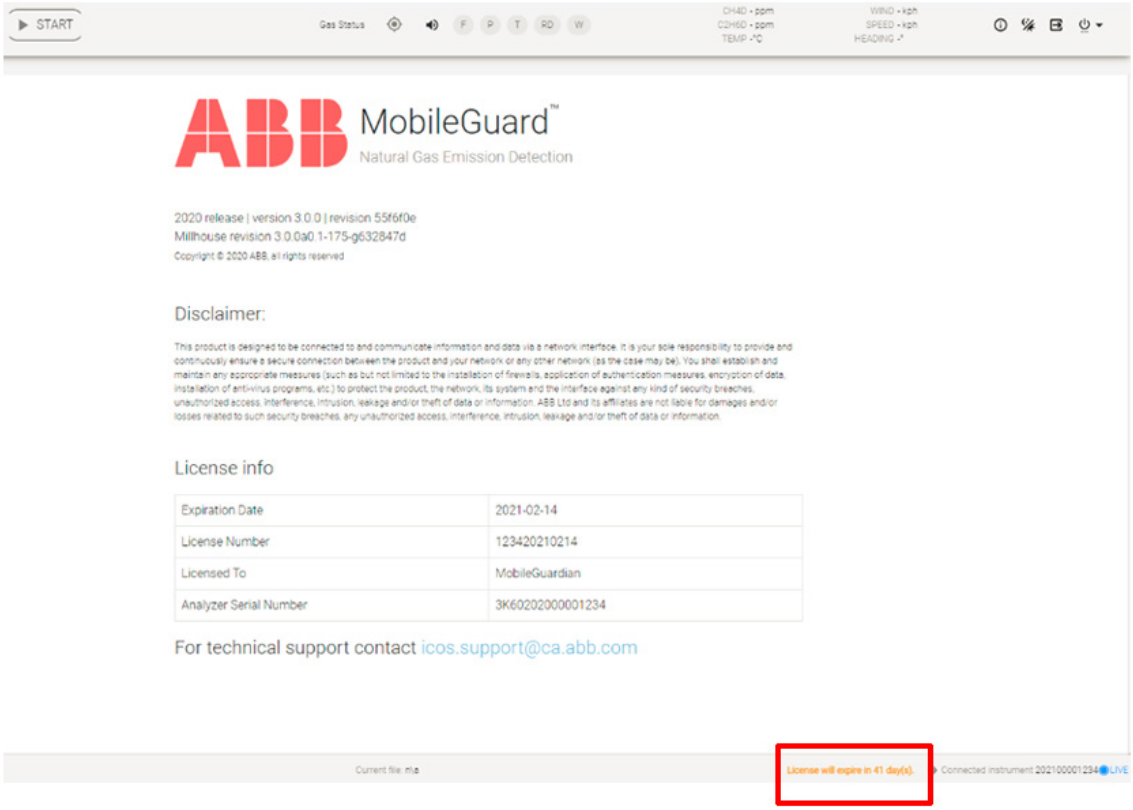


Figure 79 License Valid 89-31 Days – Yellow Font Color

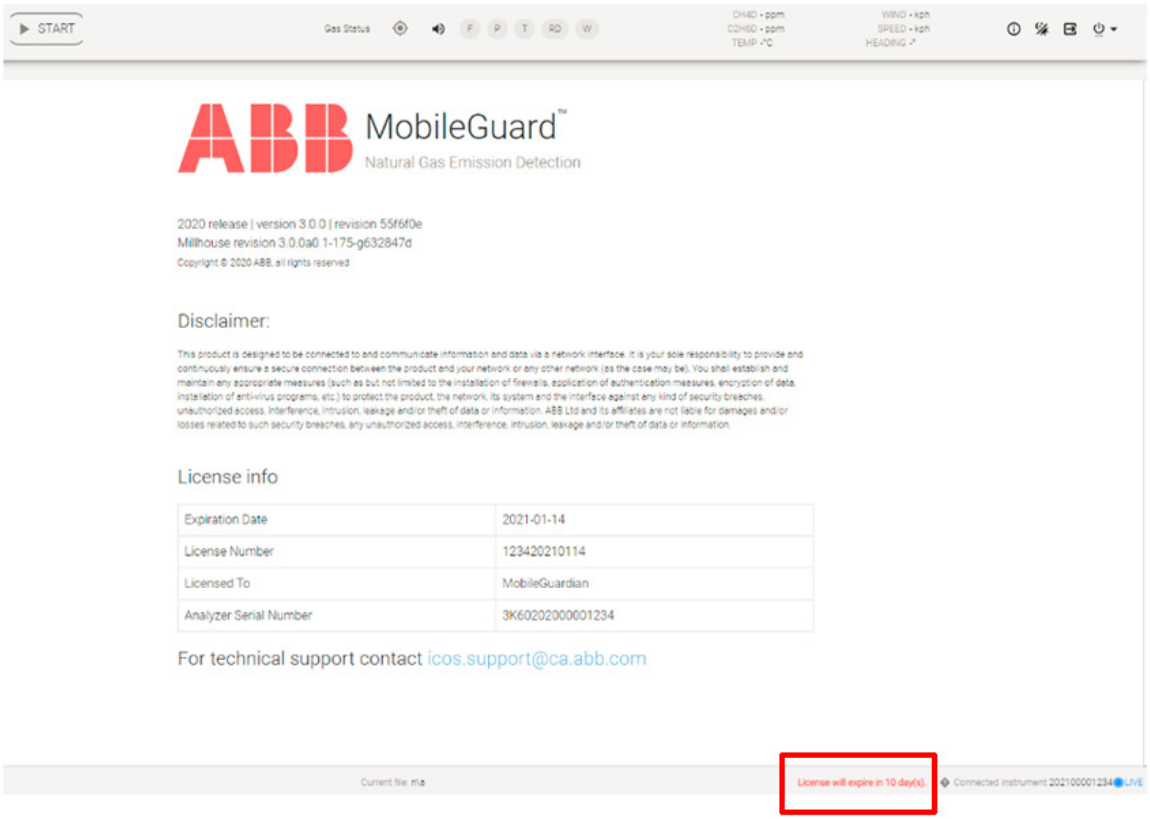


Figure 80 License Valid Less than 30 Days – Red Font Color

...3 System Software

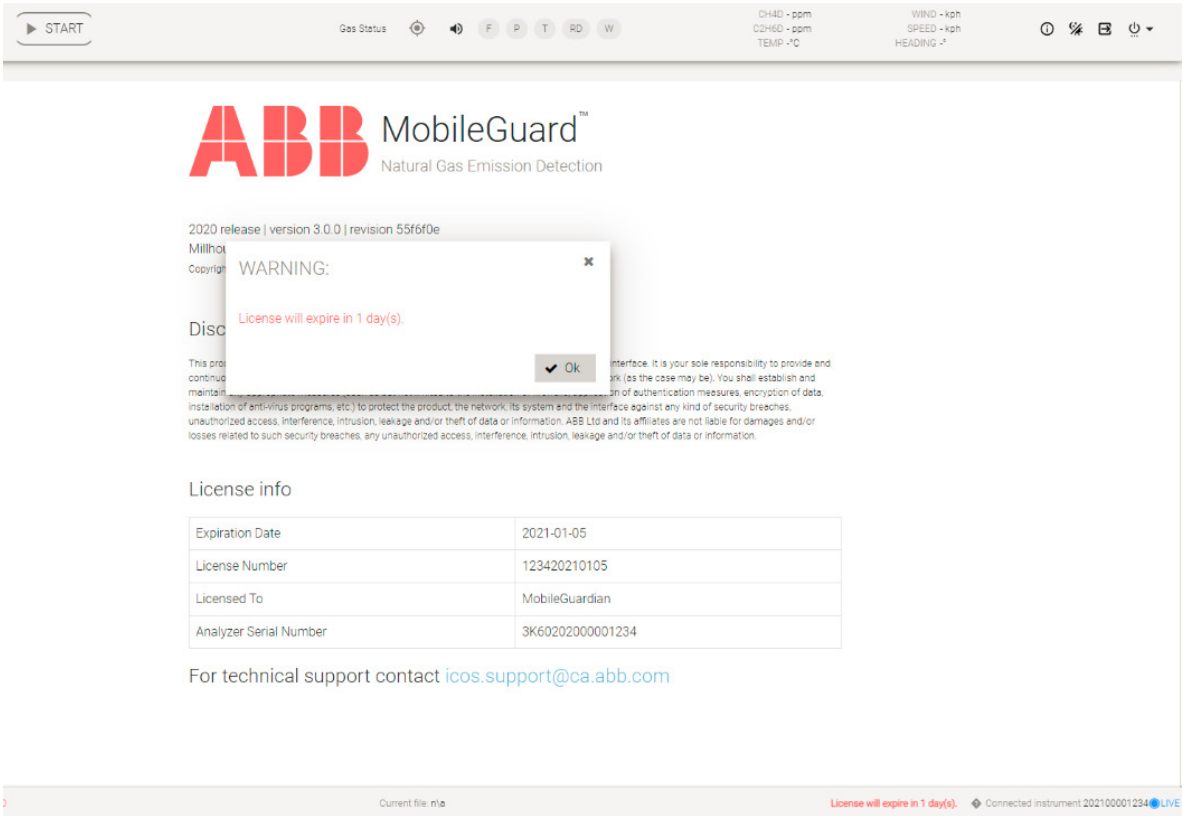


Figure 81 License will expire in 1 day – Message Prompt to Warn User

4 Using the System

Hardware Pre-Drive or Pre-Flight Inspection

For the MobileGuard™ pre-drive inspection, refer to the *MobileGuard™ System Manual*.

For the HoverGuard™ pre-flight inspection, refer to the *HoverGuard™ Solution Manual*.

System Power-On

For the MobileGuard™ system power-on, refer to the *MobileGuard™ System Manual*.

For the HoverGuard™ system power-on, refer to the *HoverGuard™ Solution Manual*.

Software Startup

Access UI

1 Power on the laptop/tablet.

2 Connect the laptop/tablet to the Cradlepoint's wireless network.

3 Ensure the ABB MobileGuard™ *Tray* icon has a green light and a status that reads *Running* (Figure 82). If the indicator light remains gray, reboot the laptop/tablet.

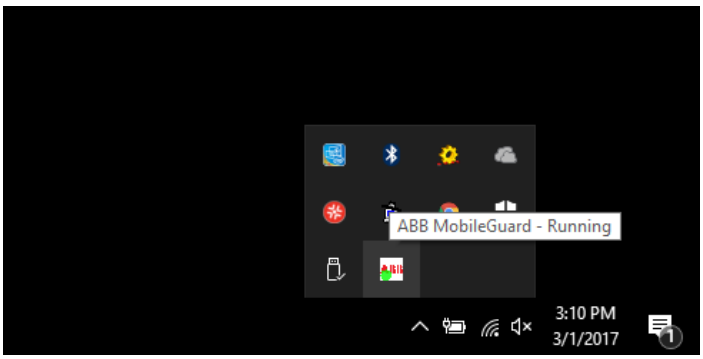


Figure 82 ABB MobileGuard™ Tray Icon

4 Double-click the **ABB MobileGuard** shortcut on the desktop to start the application.

5 Log into the UI using your designated username and password.

6 A test drive package is recommended at startup to ensure the system is working properly. Refer to "Conduct Test Drive Package".

Conduct Test Drive Package

1 Start a test drive package by clicking the **Start** button in the upper left part of the UI (see Figure 8).

2 Ensure the pump inside of the analyzer starts up during drive package initialization.

3 After the drive package starts, ensure that the *GPS* icon (bullseye), *F, P, T, RD,* and *W* indicator lights in the upper right part of the UI are not flashing red (see Figure 83).

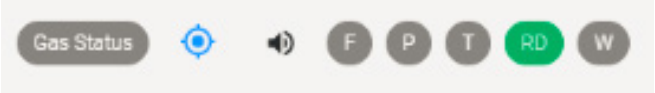


Figure 83 Status Indicator Lights for Analyzer in Good Condition

4 Click on, or hover over, each icon to see their reported current value.

⚠ NOTE

Gas Status may be red if the incoming methane concentration exceeds the user-defined threshold.

5 Ensure that the methane concentration is a physically believable value – the global methane background is approximately 2 ppm.

6 Click the **Stop** button in the upper left (see Figure 84) to close the test-drive package, and then **Abort** to discard the test run.

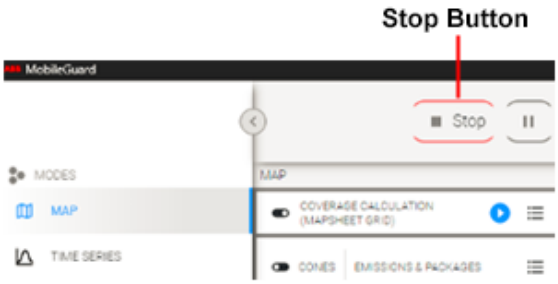


Figure 84 Stop Button

...4 Using the System

Standard Operation

Conduct a Mobile Survey

⚠ WARNING!

Use extreme caution when conducting drive surveys to avoid hitting the sonic anemometer on overhanging objects. The anemometer is a sensitive measurement device and will be damaged or destroyed by impacts. The mast height (including anemometer) is approximately 3 meters (10 feet).

⚠ NOTE

The vehicle must be moving at a minimum speed to detect emission sources. The default minimum speed (3 knots / 3.5 mph / 5.6 kph) may be configured in **General Settings** > **Vehicle Calibration Settings** > **Min. Car Speed (knots)**.

1 After driving to the survey area, pull off the road in a safe area.

2 Start a drive package: Click the **Start** button in the upper left part of the UI (see Figure 8).

3 When the drive-package creation box appears, optionally modify the automatically generated drive-package name with a human-interpretable label. For details on drive-package naming, refer to “Drive Package Naming”.

4 Add any comments to the comment box, then click **OK**.

5 The drive package begins its approximately 1 minute initialization procedure – ensure that the analyzer pump starts during this period.

6 After warm-up, check that the data stream is being read correctly: Check for a blue *CONNECTED* icon in the lower left part of the UI (see Figure 85).

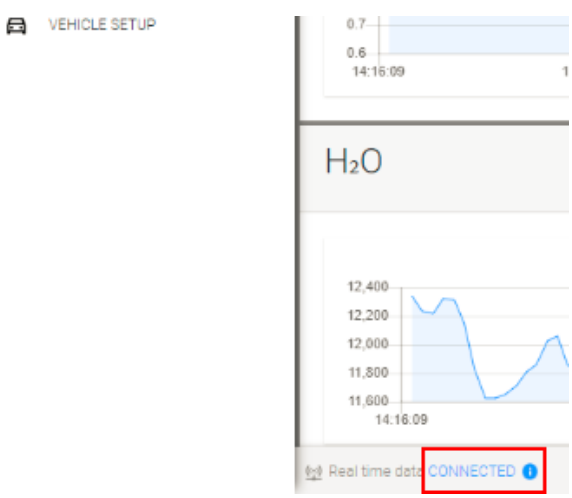


Figure 85 Connected Icon

7 Check the instrument condition: Ensure all icons in the upper right part of the UI (see Figure 83) are green by clicking or hovering over the icons.

8 Drive the survey area in accordance with the driving guidelines described in the *MobileGuard™ System Manual*.

9 When the survey is complete, click the **Stop** button in the upper left part of the UI (see Figure 84) to finalize the drive package.

10 Add any end-of-drive comments, then click **OK**.

11 Wait for the final drive-package analysis, then upload the data to your Google Drive storage location, if desired.

12 A local copy of drive packages is available from the desktop shortcut to *ABB MobileGuard™ Drive Packages* - these can be transferred using any standard PC file transfer methods. If Google Drive Upload is enabled, you can find the completed drive packages in your Google Drive folder.

⚠ NOTE

Refer to the “System Software” section for more detailed information about using the software.

...4 Using the System

Drive Package Naming

Adding additional tags to a drive package filename is beneficial when surveying the same assets multiple times. Keeping similar drives together by a naming convention alleviates the work to merge them together later.

The following describes adding additional tags to a drive package:

1 Click the **Start** button in the upper left of the UI (see Figure 8): The *Drive package* box appears (Figure 86).

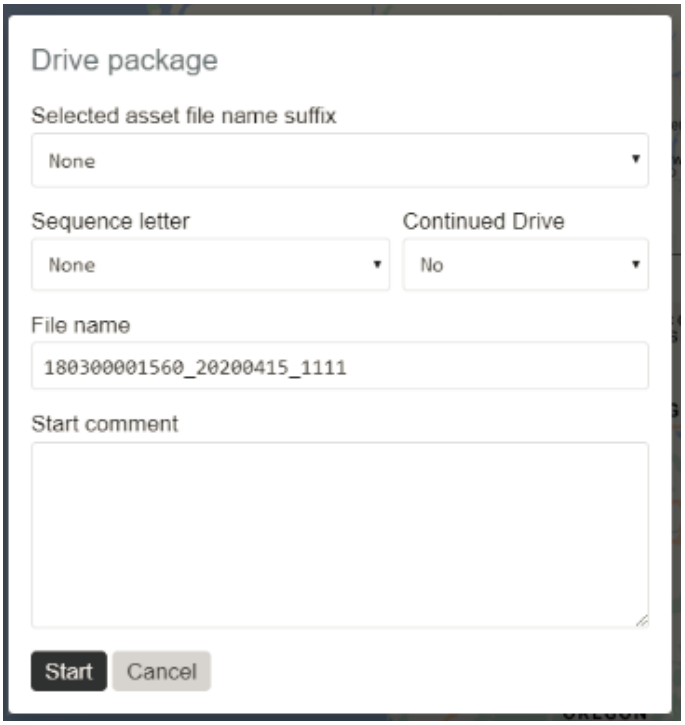


Figure 86 Drive Package Box

2 From the *Selected asset file name* suffix drop-down list, append the asset filename to the drive filename. This list displays all currently loaded asset files.

3 From the *Sequence Letter* drop-down list, append the sequence letter (for example, **A**, **B**, **C**) of the drive to specify multiple passes were taken on a particular mapsheet.

4 From the *Continued Drive* drop-down list, append the **Continued #** tag to flag the drive as a partial survey.

The *File name* field displays the filename of the drive package. This field is updated with each additional tag selected (for example, *180300001234_20200131_0537 SJ_Loop – A Continued 1*).

How to

Display Data in MobileGuard™ Software

1 On the MobileGuard™ UI, select **Map** at the top of the sidebar (see Figure 8).

2 Click the icon to the right of *Emissions & Packages*: The window shown in Figure 20 appears.

3 Search drive package(s) to view on the map.

4 Select the desired drive package(s) by checking the adjacent box(es).

5 Click outside the window to return to the *Map* screen.

6 Check the box next to an item (below *Emissions & Packages*) to display details.

7 The map display shows the details. Zoom in and out as needed to check data.

Combine Multiple Drive Packages

To select multiple locally stored drive packages and merge the data into one file on the list:

⚠ NOTE

Packages must be IN_SYNC, ONLY_LOCAL, and of the same TYPE.

1 Click **Data Management** on the sidebar (see Figure 27).

2 Check the boxes next to the files you want to merge.

3 Click **Merge selected**.

Reprocess Data with Different Analysis Settings

1 Click **Data Management** on the sidebar (see Figure 27).

2 Select the drive package you wish to reprocess: Click the left-hand checkbox.

3 Click the **Reprocess** icon on the right-hand side: The *Reprocess* window appears (Figure 36).

4 Select the desired file from the *Processing Profile* menu (Figure 36).

5 Click **Process**.

...4 Using the System

Import Data

⚠ NOTE

For information on importing and processing data if using HoverGuard™, refer to the “Import and Process Data” section.

1 Click **Data Management** on the sidebar (see Figure 27).

2 Click the **Import** button: A file navigation window appears.

3 Select the data file you wish to reprocess.

⚠ NOTE

Only .csv, .zip, and .txt files are accepted, in the following format: [Instrument_ID]_[Serial_Number]_[YYYY-MM-dd]_[fXXXX]. For example: meaRMY_lgr-18-1234_2022-01-02_f0000.csv.

This should only be done with raw data files from the analyzer.

4 Modify the filename if needed: This will be the folder containing the reprocessed drive data.

5 Select **Drive** for Package Type.

6 Enter *Start comment* and *End comment*: These will appear as the operator notes in the drive package results PDF summary.

Reprocess or Merge Data with Survey Coverage

In many cases, the survey coverage has already been calculated based on a cropped mapsheet. If you want to merge or reprocess this data at a later time, the coverage assets must be present.

The following screens alert you if an asset file used for a previous drive file is missing at the time of merging or reprocessing.

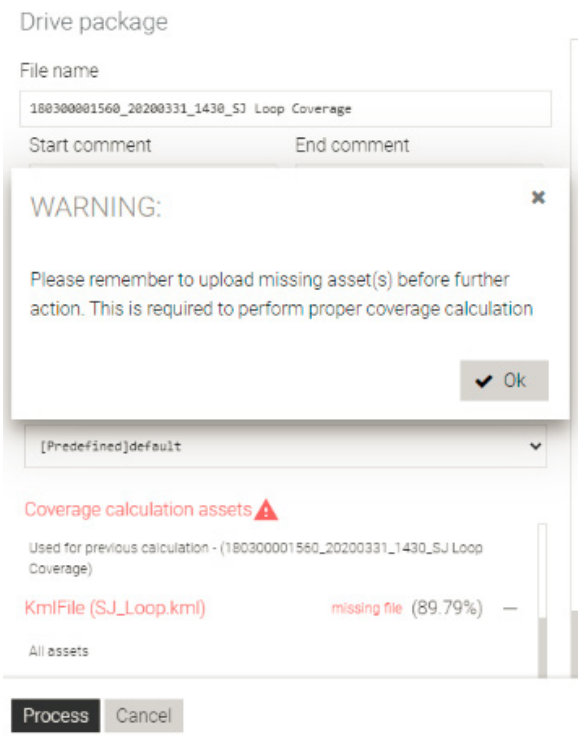


Figure 87 Warning Prompt

...4 Using the System

A warning prompt appears if the drive about to be reprocessed is missing the asset file used for calculating survey coverage.

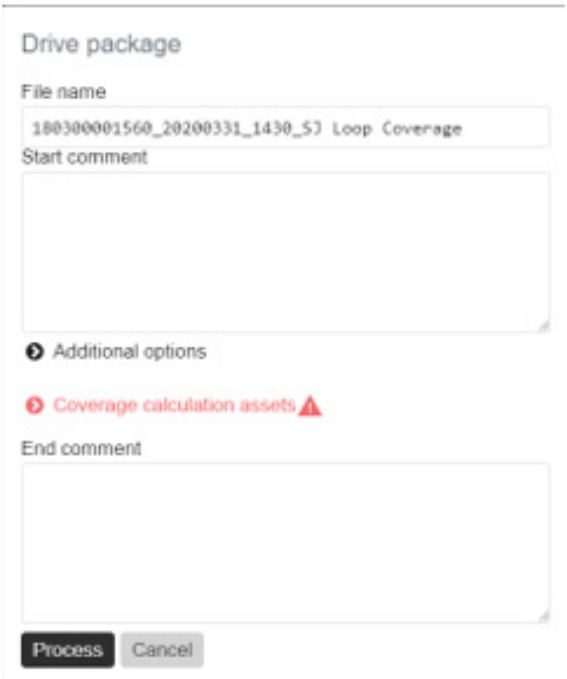


Figure 88 Error - Missing Asset File

An error appears indicating a missing asset file: Click on the red arrow to show the missing asset file.

Figure 89 below shows the missing asset file highlighted in red font with the corresponding coverage calculation.

Figure 89 Missing Asset File Highlighted

If the asset file is currently imported into the database and is loaded on the map, the reprocessing prompt shows the correct file is selected for reprocessing. See Figure 90 below.

Figure 90 Reprocessing Prompt Showing Correct File

...4 Using the System

Crop Pipeline Data Using Lasso Tool

Crop pipeline data based on custom polygons using the lasso tool as follows:

1 Enable pipeline assets:

a From the *Map* screen, select the **Map Options** icon (3 dots).

b From the *Map Options* sidebar, set the **Assets** toggle in the right position (to enable assets in general).

c Enable individual Map SHP file(s): **Map** > **Options** > **Assets** > **MAPX.shp** (set **Toggle** icon to ON).

2 Select the **Scissors** icon on the *Map* screen to activate the lasso (see Figure 91).

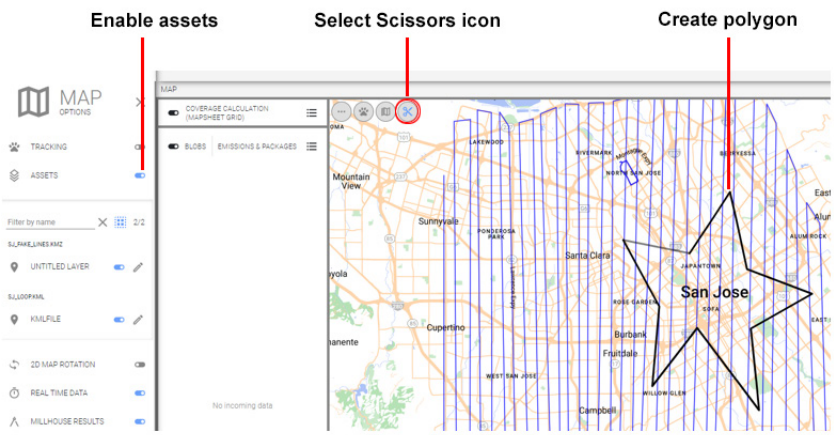


Figure 91 Map Screen Scissors Icon

3 Create a custom polygon to crop the assets within the boundary by clicking on the map and returning to the original point.

– Once the original point is clicked, the assets are cropped and imported to the Geoserver.
– A new KML file is created containing the polygon and pipeline data, auto named to *Feature-1*, *Polygon*, and nested under *DRAW_XXX.KML*.

4 To rename each asset layer and/or the KML file, click the **Pencil** icon (see Figure 92).

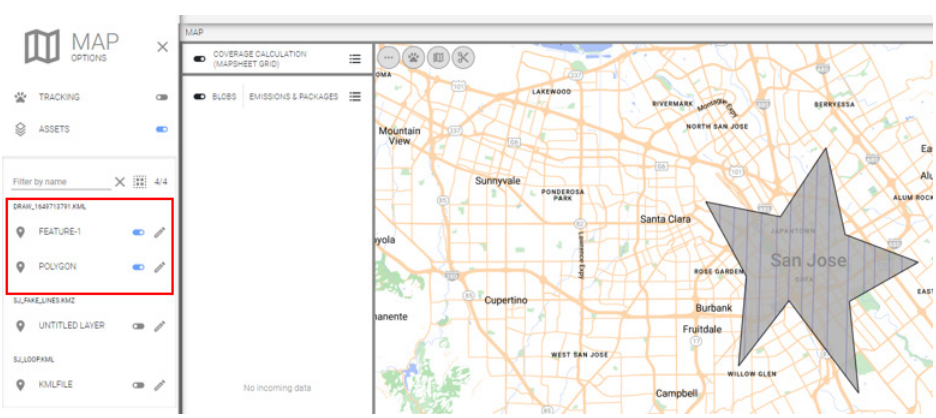


Figure 92 Rename Asset Layer/KML File

...4 Using the System

Auto-Suggest Assets Based on Location

Automatically select which assets to load for surveys as follows:

1 Verify assets have been imported (or cropped).

2 From the *Map* screen, select the **Map Options** icon (3 dots).

3 Double-click the location on the map: A circle appears and automatically loads assets whose segments fall within the circle (see Figure 93).

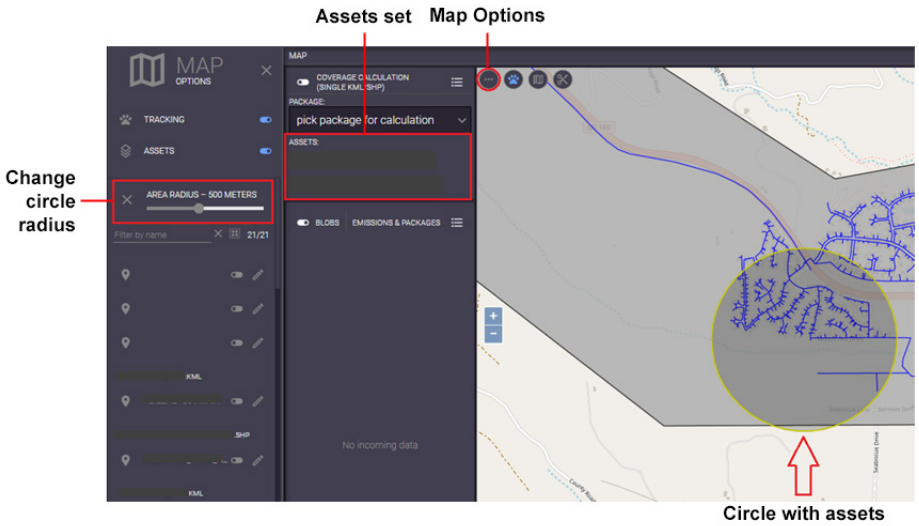


Figure 93 Circle Containing Assets for Survey

4 The default is 500 m (1640 ft): If desired, change the circle radius using the **Area Radius** slide bar (see Figure 93).

Assets (if enabled) are also set for survey coverage calculation, real-time, and the PDF report.

...4 Using the System

Comment Using Cone Button

To log hazards, or impediments, of your investigation during a survey, perform the following:

1 Click the **Cone** button (see Figure 94).

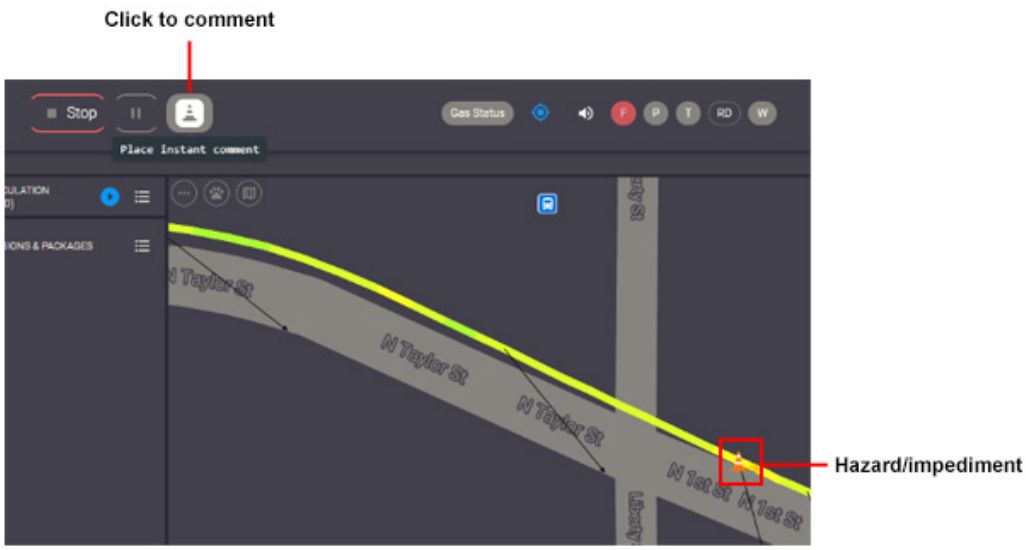


Figure 94 Cone Button

2 The window shown in Figure 95 appears: Enter a comment.

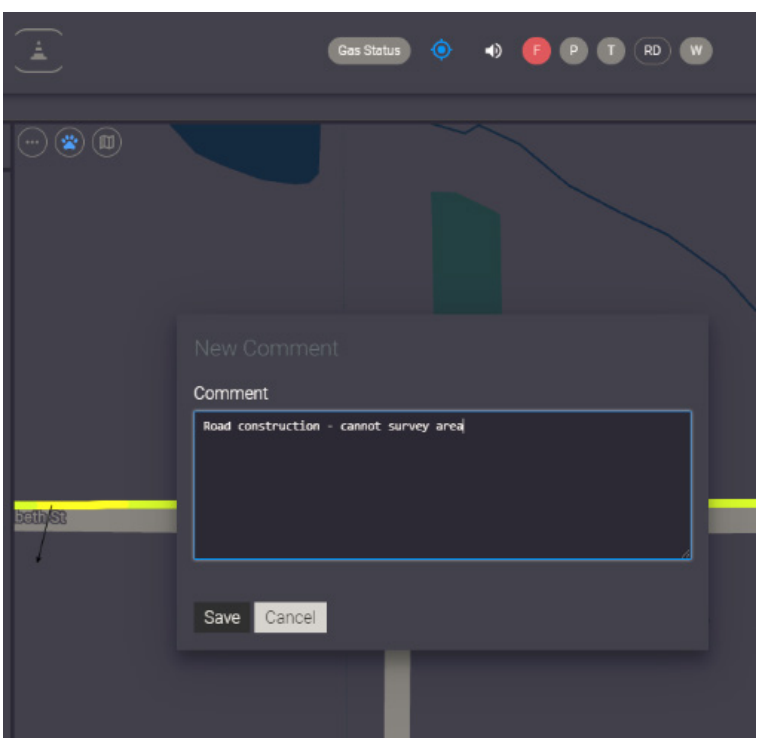


Figure 95 Cone Comment Window

3 Click **Save**.

The cone and comment will appear when viewing the drive from the map view. In the PDF report, cones will be on the top layer of the map summary, and the comment will be near the end of the report.

...4 Using the System

Set up HoverGuard™ System Settings

HoverGuard™ can send real-time data from the UAV to the MobileGuard™ application via RF modem-to-serial connections.

To set up system settings, perform the following:

1 To allow the MobileGuard™ application to acknowledge whether the analyzer software is actively running: Type **ps -A | grep icos** in the *Analyzer SSH ICOS Query* field (see Figure 96), then click **Save**.

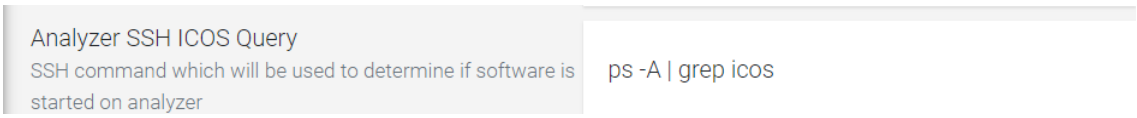


Figure 96 Analyzer SSH ICOS Query

2 Use the Analyzer **SSH Stop** command to remotely stop the analyzer software: Select the command shown in Figure 97, then click **Save**.

Figure 97 SSH Stop Command

3 For the modems to communicate to render the appropriate data on the map, verify the HoverGuard™ instrument type has the correctly mapped data parameters:

a Navigate to the *Instruments and Alarms* screen. (For details, refer to “Instruments and Alarms”.)

b Click the **Edit** icon. (For details, refer to “Instruments and Alarms - Edit Instrument Alarm Parameters”.)

c Use Table 3 to verify the proper mapping of data columns.

Table 3 Verify HoverGuard™ Instrument Type Parameters

CSV Name	Data Column	Data Group
Latitude (degrees)	latitude	COMMON_PARAMETER
Longitude (degrees)	longitude	COMMON_PARAMETER
GPS Fix Status	gpsFixStatus	COMMON_PARAMETER
Altitude (m)	elevation	COMMON_PARAMETER
Vehicle Heading (degrees)	course	COMMON_PARAMETER
WindSpeed3D (m/s)	windSpeed	COMMON_PARAMETER
WindDirection (degree)	windDirection	COMMON_PARAMETER
Temperature (C)	temperature	COMMON_PARAMETER

d If parameters require changing, click the **Edit** icon in the parameter row and change as needed. (For details, refer to “Instruments and Alarms - Edit Instrument Alarm Parameters”.)

...4 Using the System

Report Generation - MobileGuard™

What are Drive Packages?

Drive packages are zipped archives that contain several different files, the most important of which are described in Table 4.

Table 4 Drive Package Filenames

File Name	Description
drive.pdf	Report containing a summary of the results from the data contained within the drive package. In addition, statistics are provided for each individual emission indication.
<data_file-name>.csv	Raw data (eg, concentrations, wind conditions, GPS) for the drive package. Data file naming will be unique to the original drive or flight package taken.
drive.xml	Collection of metadata for the drive.
millhouse/	Folder containing analyzed results divided into various .kmz and .shp files.

PDF Report

A PDF report, drive.pdf, is generated for each MobileGuard™ drive package and is located in the top directory of the .drive archive. This report contains a summary of the drive package, including important statistics and details for each emission indication. This section briefly describes the data contained in each of these reports.

PDF Report - Drive Package Overview

Report Header

The first table of the PDF report provides the following general information about the drive package:

- Report ID – name of the drive package that contains this PDF report.
- Report Generated By – ID of the user that generated the report.
- Report Date – timestamp for generation of the current drive package.
- Analyzer Number – ID of the analyzer used to generate the drive package.
- Operator – user ID for the operator(s) that collected data used in the drive package.
- Drive Start – timestamp for the earliest data point used in the drive package.
- Drive Stop – timestamp for the latest data point used in the drive package.
- Nearest Town – estimated nearest town to the survey area in the drive package.

Error Statistics

This table tabulates the number of times various alarms were triggered by the data in the current drive package (the number of times data values were not recorded or fell outside of the range defined for a given instrument type).

These values are color-coded so that the fields are green if no alarms were detected, or red or yellow if one or more alarms were triggered. Yellow indicates alarms that should be reviewed, but are not inherently problematic to the system (for example, brief GPS dropouts may occur when the vehicle is under an overpass, but are well-handled by the software). Red indicates alarms that should not occur during normal operation and require immediate action. If alarms are consistently triggered by a given MobileGuard™ installation, this indicates a problem with the installation – contact ABB immediately.

The following alarms are recorded in the Error Statistics table:

- Wind Data – number of missing anemometer data points.
- GPS – number of missing GPS data points.

⚠ NOTE

Missing GPS data points occur frequently if the GPS antenna does not have line-of-sight access to satellites. For example, this may occur if the MobileGuard™ vehicle is stopped under an overpass or bridge. To surmount this issue, the MobileGuard™ software attempts to fix small gaps in the GPS location by interpolation between registered data points.

- Ringdown – number of data points where a measured laser-cavity ringdown value fell outside of the specified range for a given analyzer type. If ringdown errors persist, contact ABB for further assistance.
- Temperature – number of data points where the internal analyzer temperature (both ambient and gas temperature) fell outside of the specified range for a given analyzer type (typically 5 - 50 °C / 41 - 122 °F). If temperature errors occur, check that all fan inlets to the analyzer are unobstructed. It may be necessary to adjust the vehicle cabin temperature and allow some time for the analyzer to equilibrate. If temperature errors persist, contact ABB for further assistance.
- Pressure – number of data points where the instrument's internal pressure fell outside of the specified range for a given analyzer type (typically 295 - 305 Torr).
- Flow – number of data points where the measured flow fell outside of the specified range for a given analyzer type (typically 20 - 30 standard liters per minute). Flow errors may be caused by a clog in the inlet or dirty filters.
- Humidity – currently not applicable.

...4 Using the System

Emission Indication Statistics

This table contains basic statistics about the survey area and emission indications contained in the current drive package:

- Distance Driven (mi) – total distance traveled for data in the current drive package.
- Total Survey Area (mi²) – total area surveyed in the current drive package.

⚠ NOTE

This value depends on the *survey_area* parameter, which may be adjusted in the *Millhouse Profiles* screen.

- Raw Indications – total number of raw emission indications generated from data in the current drive package.
- Aggregated Indications – total number of emission indications from data in the current drive package after distance-based aggregation has been performed.
- Natural Gas Source (%) – percent of aggregated emission indications that arise from a natural gas source.
- Biogas Source (%) – percent of aggregated emission indications that arise from biogas sources.
- Indeterminate Source (%) – percent of aggregated emission indications that have an unidentified source.
- Survey Coverage (Total FT) – total asset (pipeline data) coverage in feet.

Measurement Statistics

This table contains basic statistics about raw measurement values obtained by the MobileGuard™ system. For each measurement type, the minimum, maximum, and mean recorded values are reported.

- CH_4 (ppm) – raw measured methane concentration (not baseline subtracted).
- C_2H_6 (ppm) – raw measured ethane concentration (not baseline subtracted).
- Outside Temperature (°C) – exterior temperature measured by the anemometer.
- Wind Speed (mph) – wind speed measured by the anemometer after correction for car speed.
- Car Speed (mph) – car speed measured by GPS.
- Wind Azimuth (deg) – angular direction of wind in the plane of the car. 180 degrees denotes wind moving from the front to the back of the vehicle.
- Wind Elevation (deg) – angular direction of the wind pointing outside of the plane of the car (plane of the car is 0 degrees).

Notes

Comments entered by the user at the beginning or end of a drive.

Complete Survey Route

Map segment which depicts the entire survey area for the drive package. Aggregated emission-indication survey areas from the drive package are overlaid on this map. (See Figure 98 for an example.)

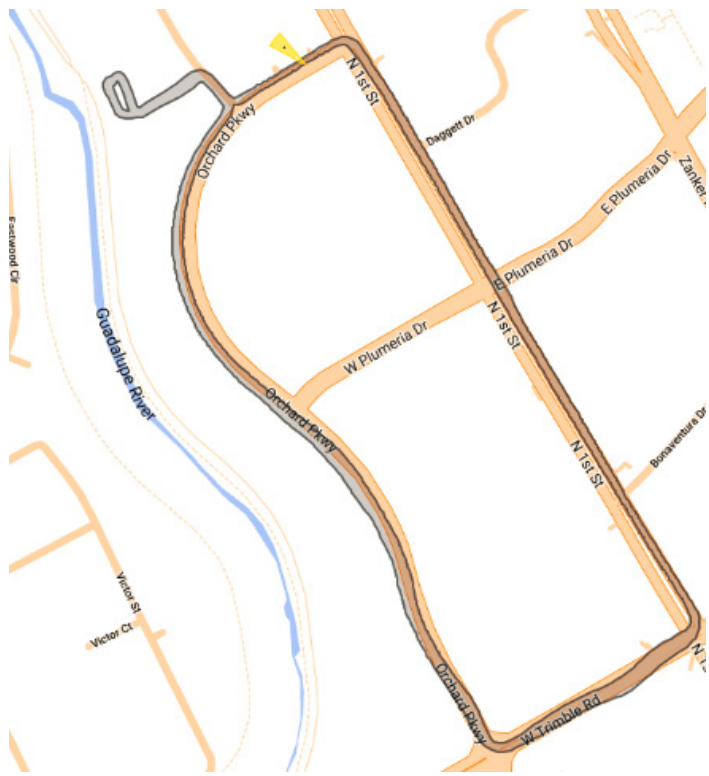


Figure 98 Complete Survey Route

...4 Using the System

Survey Detection Statistics

Two histograms of the peak CH_4 concentration associated with aggregated emission indications in the current drive package are provided. The left plot is a histogram spanning 0 to 1 ppm, and the right plot is a histogram for emissions with larger associated concentrations. (See Figure 99 for an example.) The right plot auto-scales the X axis and separates the available emission indication data into ten successive bins.

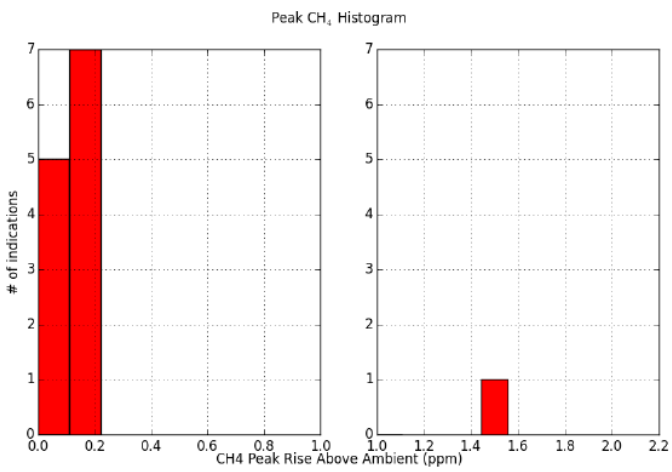


Figure 99 Survey Detection Statistics

Measured Time Traces

A set of time-dependent data is shown in a graph for each individual data set used in the current drive package. (See Figure 100 for an example.)

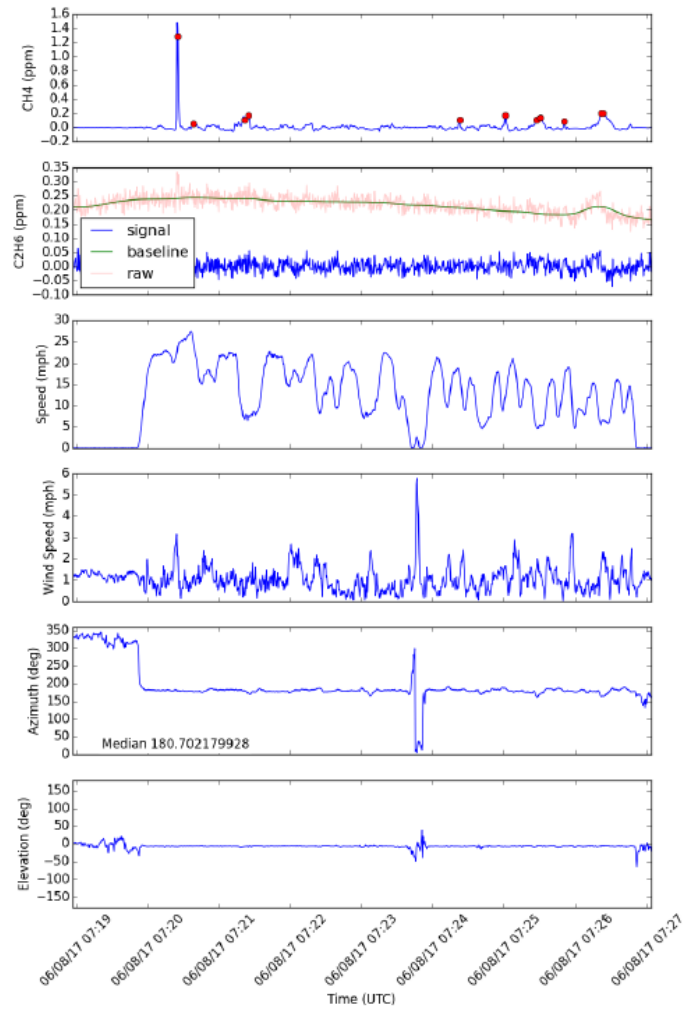


Figure 100 Measured Time Traces

- CH_4 – background subtracted methane concentration. A red dot appears at each point in time that a raw emission indication was identified.
- C_2H_6 – raw ethane concentration (pink), calculated background ethane signal (green), and background subtracted ethane concentration (blue).
- Speed – vehicle speed.
- Wind Speed – measured wind speed after correction for the speed of the vehicle.
- Azimuth – azimuthal angle of the wind direction and median azimuthal angle while the vehicle is in motion (see Figure 101).

...4 Using the System

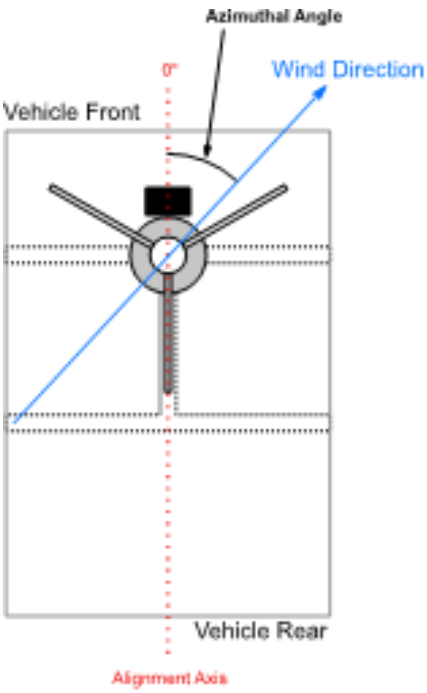


Figure 101 Azimuth Angle and Wind Direction

⚠ NOTE

The average azimuthal value should be between 178 and 182 degrees.

- Elevation – elevation angle of the wind direction (see Figure 102). The elevation angle is positive if the wind direction is pointing upward and negative for a downward wind direction.

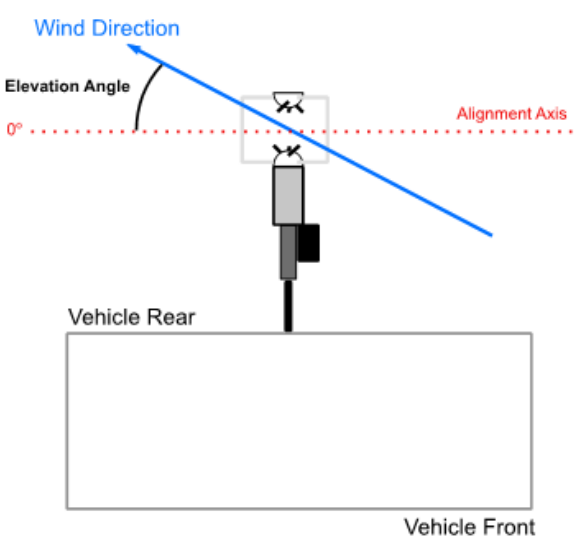


Figure 102 Elevation Angle and Wind Direction

PDF Report - Individual Emission Indication Reports

After the *Drive Package Overview* section, the MobileGuard™ PDF report contains additional pages with information about individual aggregated emission indications for the current drive package.

Emission Indication Measured Values

This table contains several entries that contain statistics tabulated for individual aggregated emission indications. The values in the table are:

- Detection Location – point at which the vehicle detects emission.
- Child Emission Count – the number of raw emission indications aggregated together for the current emission indication.
- Indication Start – start time of elevated methane concentration for the current emission indication.
- Indication Stop – stop time of elevated methane concentration for the current emission indication.
- Indication Length (ft) – distance traveled by the vehicle during the time window associated with the current emission indication.
- Indication Duration (sec) – length of time over which the elevated methane concentration for the current emission indication persisted.
- Car Speed Min (mph) – minimum observed car speed during the time window associated with measurement of the current emission indication.
- Car Speed Max (mph) – maximum observed car speed during the time window associated with measurement of the current emission indication.
- Car Speed at Peak (mph) – car speed at the peak methane concentration observed in data associated with the current emission indication.
- Wind Speed (mph) – average wind speed during the time window associated with the current emission indication.
- CH_4 Peak Rise (ppm) – highest background subtracted methane concentration measured in data associated with the current emission indication.
- Baseline CH_4 (ppm) – average background methane concentration for data associated with the current emission indication.

...4 Using the System

Emission Indication Estimates

- Source Location – estimated location (latitude, longitude) of the source of the emission indication in decimal degrees.
- Source Direction (deg) – angle between the line pointing from south to north and the line pointing from the point of detection to the estimated source location.
- Distance (ft) – distance from the point of detection to the estimated source location.
- Search Area Size (ft²) – size of the search area for the current emission indication.
- Source Rate (SCFH) – estimated rate of methane emission from the source associated with the current emission indication, in standard cubic feet per hour (SCFH).

⚠ NOTE

This is an experimental feature currently turned off by default. It can be activated in the **PDF Report Settings** > **Report Emission Rates** menu option.

Emission Indication Map

Each aggregated emission indication in the PDF report is accompanied by a zoomed-in map of the area surrounding the current emission indication. (See Figure 103 for an example.)

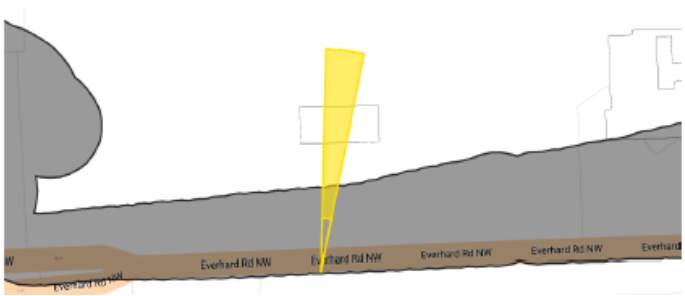


Figure 103 Emission Indication Map

PDF Report - Operator Notes

Contains geospatially tagged comments added during a drive. See Figure 104 for an example.

Notes

Operator Startup Notes:

Section 2A reported leaks from previous drive. Driving back to validate leak.

Operator Completion Notes:

Drive 2/4 in section 2A.

Figure 104 Operator Notes Example

KMZ Output

The /millhouse/ directory in the drive package produced by the MobileGuard™ software contains several output files in .kmz format. These files, defined in Table 5, contain the results of the drive and can be loaded into GIS software that supports .kmz or .kml data (for example, Google Earth). In addition, each KMZ output can be produced for SHP format if specified in the Millhouse profile.

Table 5 Millhouse Files

File Name	Description
/millhouse/millhouse.kmz	Complete results from the survey, partially divided into different layers for aggregated emission-indication survey areas only or full lists of emission-indication survey areas
/millhouse/millhouse_aggregated_child_leaks.kmz	Partial layer file containing the full unaggregated set of emission-indication survey areas
/millhouse/millhouse_aggregated_circles.kmz	Partial layer file containing circles with a 5 meter (16 foot) radius around the point of detection
/millhouse/millhouse_aggregated_leaks.kmz	Partial layer file containing only the aggregated emission-indication survey areas
/millhouse/millhouse_aggregated_pies.kmz	Partial layer file containing only the aggregated emission indications with survey areas replaced by icons that express the angular uncertainty of the emission origin estimate, but with a fixed distance estimate of 50 meters (164 feet)
/millhouse/millhouse_ch4_line.kmz	Partial layer file containing the breadcrumb trace with color representing the measured methane concentration
/millhouse/millhouse_surveyarea.kmz	Partial layer file containing the estimated survey area (defined in the millhouse profile)
/millhouse/millhouse_wind.kmz	Partial layer file containing arrows representing the measured wind speed and direction

...4 Using the System

KMZ/SHP File Embedded Drive Package Data

MobileGuard has embedded much of the .drive package data into the layers of the kmz/shp file. Figure 105 is an example of a millhouse_aggregated_emissions.shp file loaded into a GIS program. The highlighted emission is selected to view the information attached to that layer.

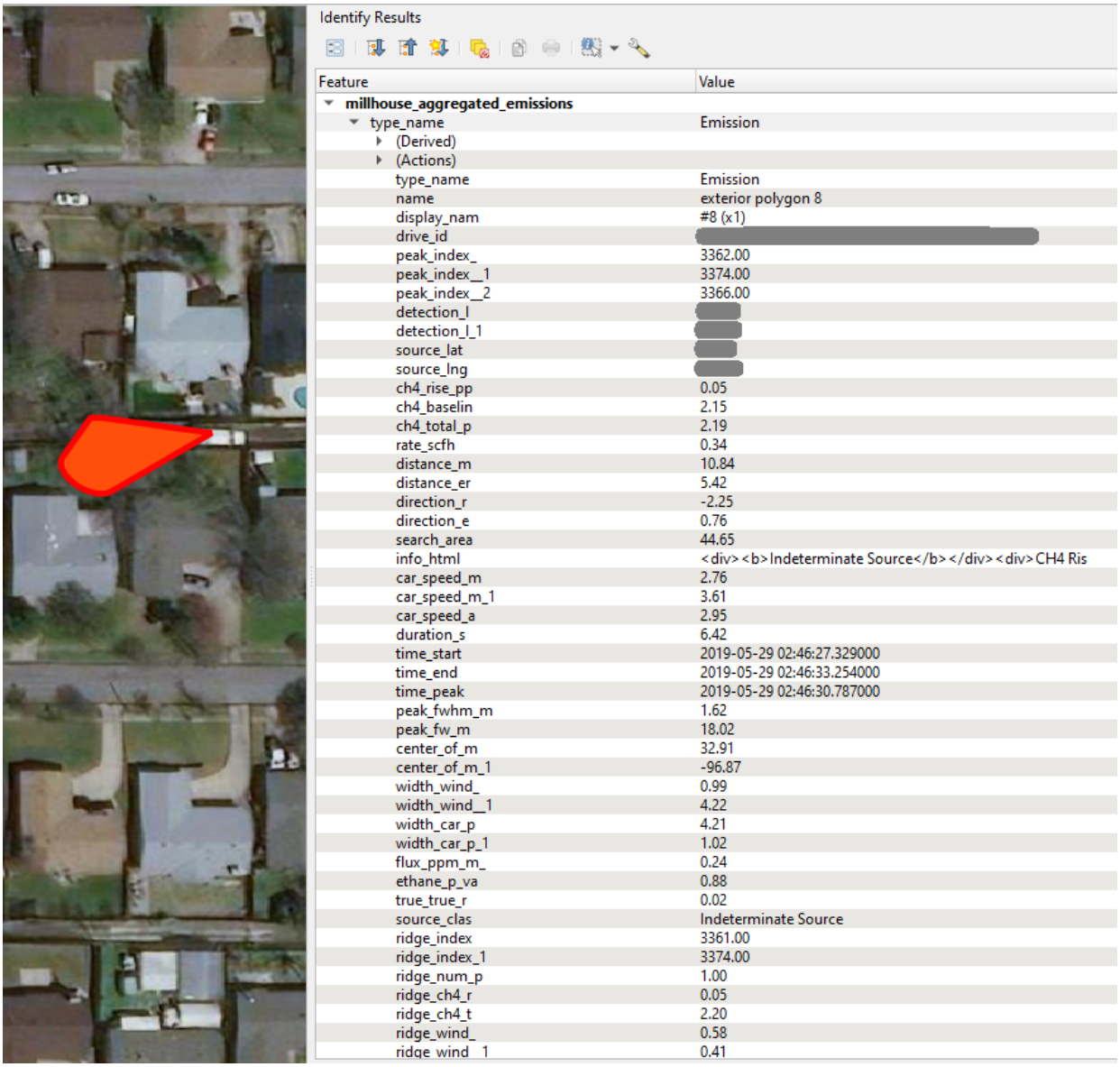


Figure 105 SHP Metadata

...4 Using the System

KMZ Output - Emission-Indication Search Areas

When the MobileGuard™ software identifies a likely gas emission, it represents that detection and the suggested search area as an emission indication. The displayed emission indication icon identifies the point where increased methane is detected along the drive path and an estimate of the emission source location within a bounded area. The shaded, bounded icon area is derived from the uncertainty in the angular and distance estimates. These representations contain a great deal of information, most importantly, the estimated location of the source, detection location, and type of gas. Practically, the emission indication icon provides a search area boundary where investigators are likely to find the source of the leaked gas.

The software offers the choice of two graphical representations for the Emission Indication Search Area (EISA): a simplified, truncated annular icon or an ellipsoidal icon. You may select the displayed type using the **Cones/Blobs** icon toggle located at the top of the *Emission & Packages* list shown on the left-hand side of the map display. KMZ (and optionally SHP) files of both icon types are automatically generated by the MobileGuard™ report generation process.

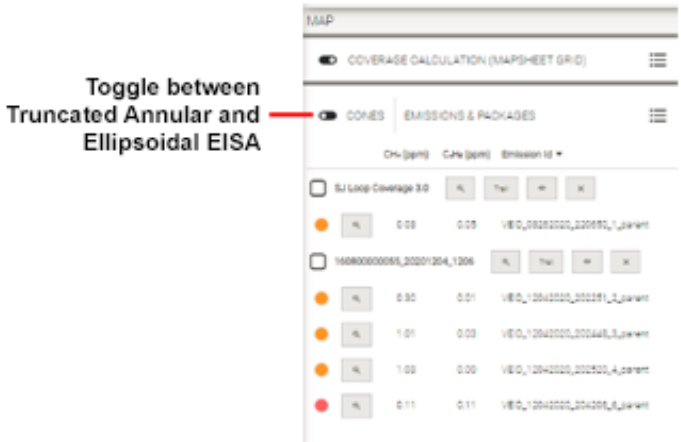


Figure 106 EISA Icon Type Toggle

The truncated annular icon is shown in Figure 107. The apex of the conical area is placed where the methane peak is detected along the drive path. The estimated source location is placed at the center of the shaded annular area – this dot is not explicitly plotted in the UI, but may be inferred from the shape of the shaded area. The angular extent of the annulus shows the angular position uncertainty, and the radial extent of the shaded area shows the distance uncertainty.

...4 Using the System

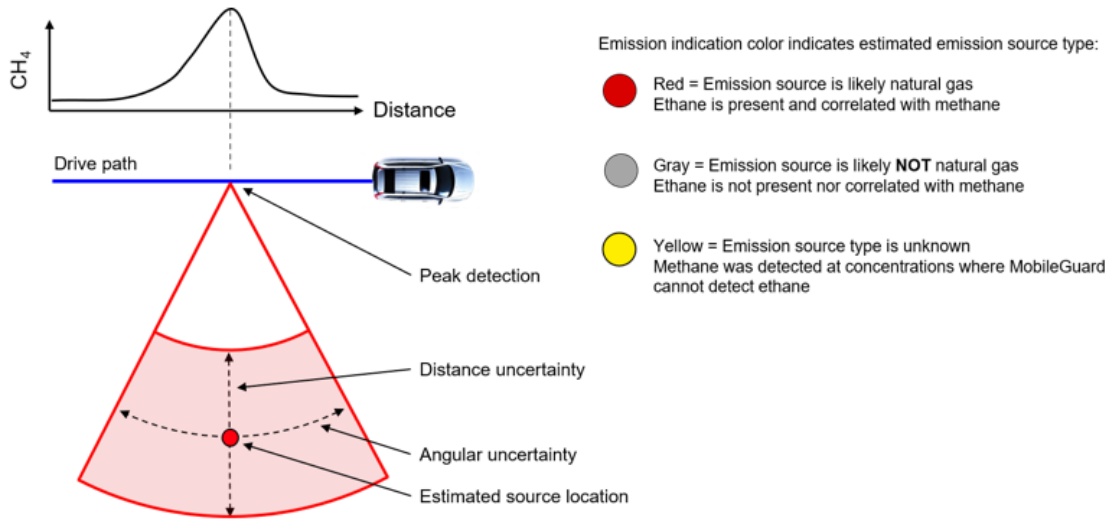


Figure 107 Truncated Annular EISA

The ellipsoidal icon is shown in Figure 108 and is composed of two primary areas. The first is the ellipse that represents the uncertainty in the location of the estimated emission source. The center of this ellipse is the estimated source location, while the major axes of the ellipse show the uncertainty in the location of the source position. The second portion of the EISA is the interstitial search area which is bounded by the section of the drive path where the measure methane exceeds 50% of the detected peak and the two lines that connect this drive path segment with the ellipse's angular uncertainty major axis.

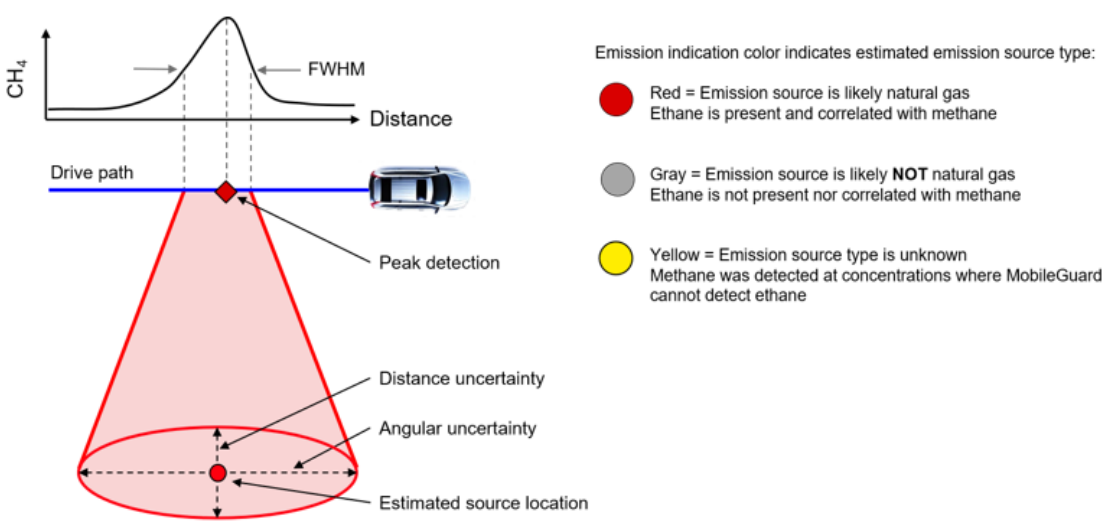


Figure 108 Ellipsoidal EISA

The emission indications are categorized by the estimated gas source type. A red indication suggests the source of the observed methane plume is natural gas emanating from a pipeline. In some locations, there are also natural sources of thermogenic gas that contain ethane: These sources are indistinguishable from pipeline sources. Gray suggests a biogenic source of methane. Common sources of biogenic gas are sewers, swamps, waste water treatment plants, landfills, and enteric fermentation (for example, cows). Yellow indicates a weak methane measurement that does not allow the system to distinguish between natural gas and biogenic methane. A yellow source is referred to by the MobileGuard™ software as an *indeterminate* source.

...4 Using the System

KMZ Output - Emission-Indication Survey-Area Information Box

Clicking on an **Emission-Indication Survey-Area** icon brings up a box containing additional information about the emission indication. Figure 109 is an example of an emission-indication survey-area information box.

Figure 109 Emission-Indication Survey-Area Information Box

The following describes the information contained in this box in more detail.

Emission ID and Redundancy

The first line of the information box contains the emission ID number and the number of aggregated child emissions contained by this emission indication. In Figure 109, the emission ID is #11, and there is only one identified emission contributing to the displayed emission identification survey area.

Peak CH_4 Rise

This field provides the maximum observed methane concentration for the baseline subtracted-plume measurement that gave rise to the specific emission indication.

Rate

The model used to predict the source of observed methane emissions inherently includes an estimate of the emission rate (that is, the magnitude of the actual emission). The emission-indication survey-area box provides this estimated emission rate in SCFH. However, there may not be a high degree of accuracy for this value, so it is recommended to use it with extreme caution.

Peak Time

A timestamp corresponding to the given emission indication.

CSV Output

MobileGuard™ drive packages also contain several CSV formatted output files containing generated data associated with the current drive package. These files are described in Table 6.

⚠ NOTE

If there are other formats that would assist your particular workflow, ABB can create new output to meet your needs. Please contact ABB Support for more information.

Table 6 CSV Output

File Name	Description
<data_file-name>.csv	All raw data associated with the current drive package. Includes timestamps, data generated by the analyzer (for example, methane and ethane concentrations, pressure, temperature, ringdown times), GPS data, and anemometer data.
/millhouse/ concentrations.csv	Raw and background subtracted methane and ethane concentrations (this file is not generated by default – contact ABB Support for more information).
/millhouse/ emissionDigest.csv	Latitude and longitude data for the predicted source locations of all raw emission indications generated in the current drive package. Also, the peak methane concentration associated with each indication.
/millhouse/ emissionDigest_ aggregated.csv	Latitude and longitude data for the predicted source locations of aggregated emission indications generated in the current drive package. Also, the peak methane concentration associated with each aggregated indication.
/millhouse/ emissionIndicationDump. csv	Collection of detailed emission indication parameters for the current drive package.

...4 Using the System

Interpreting Survey Area

The MobileGuard™ software provides an estimated survey area in real-time collection, and both the PDF and KMZ reports. The survey area is computed from user-input parameters to the analysis routine (minimum methane threshold and survey area emission rate) along with the measured methane concertation profile, wind speed, and direction.

A proprietary method is used to calculate the survey area that incorporates all the measured data to provide the most accurate estimate of source location possible. However, the shaded area represents the region with greater than 50% probability for detecting an emission of the specified rate in a single pass under the current wind conditions with the user-specified methane threshold.

The default value for the minimum methane threshold is 50 ppb above background, and the default survey area emission rate is 1 SCFH. Increasing the survey area emission rate, or decreasing the methane threshold, yields an increased survey-area size.

Emission Indications Aggregation

In most cases, it is desirable to aggregate emission indications together based on certain criteria. For example, if a road with a single emission source is driven twice, the MobileGuard™ system generates two raw emission indications for that single emission source. To account for this situation, the MobileGuard™ software provides the user with the ability to aggregate raw emission indications into a single aggregated indication (via Millhouse settings), which represents the group of correlated raw indications. (See Figure 110, where VEID1 is Vehicle Emission Indication 1, and VEID2 is Vehicle Emission Indication 2).

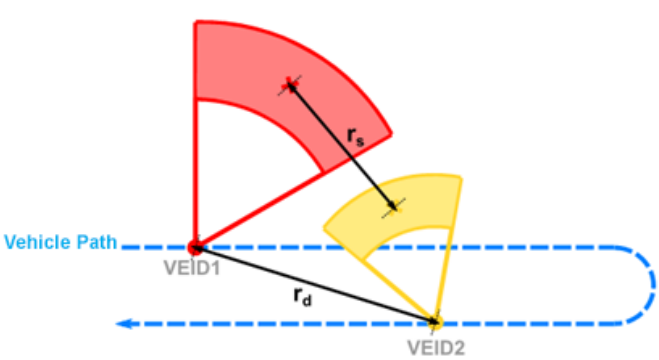


Figure 110 Emission Indications Aggregation

To do this, the MobileGuard™ software uses two user-defined radii for the aggregation process. The first aggregation radius is the distance between the points on the vehicle path where raw emission indications were measured (labeled *rd* in Figure 110). If the detection radius between two emission indications is less than the user-defined value for the detection aggregation radius (15 meters / 50 feet by default), the two raw indications are aggregated into a single aggregated indication. The second aggregation radius uses the distance between the estimated emission source location for raw indications (*rs* in Figure 110) and aggregates based on this value.

The appropriate values for *rd* and *rs* depend on the user requirements.

Calculate Survey Area Coverage

The survey-area coverage calculation is based on the survey area and the overlapping pipeline data presented on the map. Pipeline assets loaded into the MobileGuard™ application during investigation will be used to calculate the total survey coverage in feet and in percentage per each pipeline map (asset file).

1. Load the pipeline data you want to calculate the coverage for. Refer to “Assets List” and “Assets Import”.
2. Enable Survey Coverage Calculation:
   - **a** Select **PDF Report Settings** on the sidebar.
   - **b** Click the field next to **Enable Survey Area calculation**.
   - **c** Check the box next to **Enable Survey Area calculation**.
   - **d** Click **Save**.
3. Calculate the coverage of an asset file in one of the following two methods (see Figure 111):
   - Real-time coverage calculation: Proceed to Step 4.
   - Coverage calculation in PDF report: Skip to Step 5.

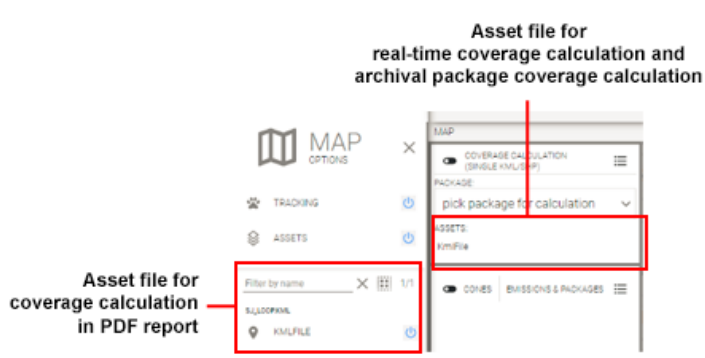


Figure 111 Coverage Calculation Methods

...4 Using the System

4 Real-time coverage calculation: From the *Map* screen, perform one of the following methods (Mapsheet Grid or Single KML/SHP) to perform the coverage calculation.

– *Mapsheet Grid*:

a Set the **Coverage Calculation** toggle in the right position – calculation based on the mapsheet grid.

b Click the **Coverage Calculation Mapsheet Grid** menu icon (Figure 14).

c Confirm the *Grids/Main/Service* asset files have been uploaded (Figure 15). Refer to “Assets Import”.

d The screen shown in Figure 16 appears: Select the checkbox to calculate coverage for that specific mapsheet.

e If you want the coverage in the PDF report, cropping is necessary: Click the **Scissors** icon and upload the newly created asset to Geoserver. You can now calculate based on the Single KML/SHP file method, described below, and activate that mapsheet for PDF Report calculation.

f Click **Confirm**.

– *Single KML/SHP*:

a Set the **Coverage Calculation** toggle in left position – calculation based on single asset file already uploaded.

b Click the Coverage Calculation Single KML/SHP menu icon (see Figure 112). The screen shown in Figure 113 appears.

c Select the asset file by checking the box.

d Click **Confirm**: The real-time or archival package coverage is displayed (see Figure 114).

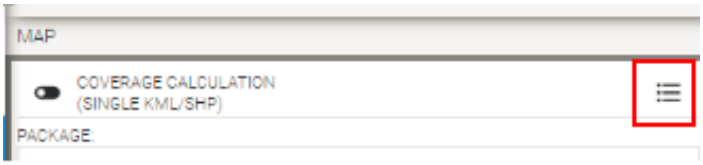


Figure 112 Coverage Calculation Single KML/SHP Menu Icon

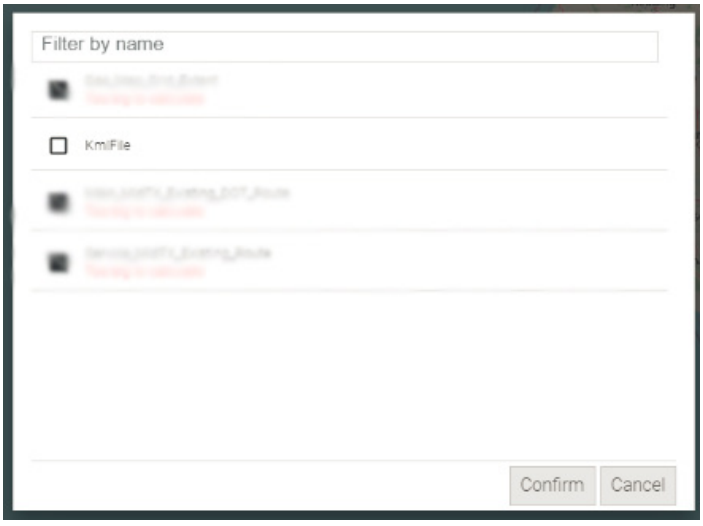


Figure 113 Coverage Calculation Selection

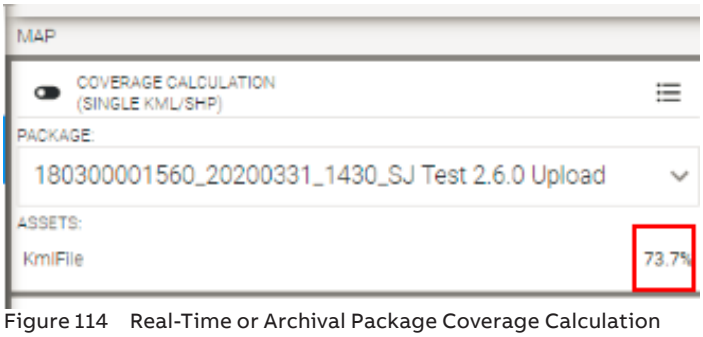


Figure 114 Real-Time or Archival Package Coverage Calculation

5 Coverage calculation in PDF report:

a Verify the asset has been uploaded.

b From the *Map* screen, select the **Map Options** icon (3 dots), then verify **Assets** is ON.

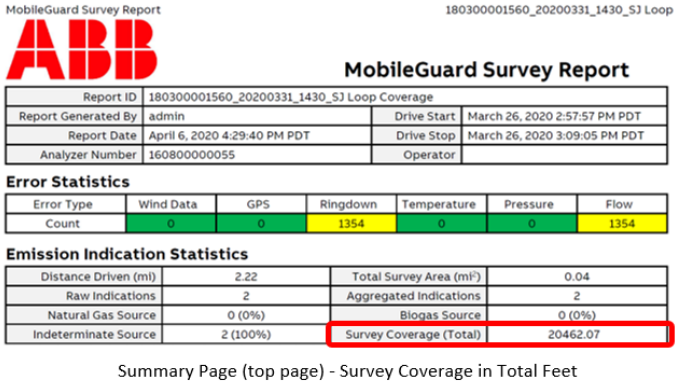
c Under *Assets*, turn on selected assets: Click the **Toggle** icon.

⚠ NOTE

Cropping is necessary if you want to have calculation in the PDF report.

6 Drive with *Survey Coverage Calculation* active. If real-time coverage was activated, the percentage covered will update with each Millhouse processing.

7 Once the drive is finished, see *Survey Coverage (Total)*, in total feet, in the summary and percentage on the last page for each asset loaded during the drive or reprocess.



MobileGuard Survey Report 180300001560_20200331_1430_SJ Loop

MobileGuard Survey Report

Report ID	180300001560_20200331_1430_SJ Loop Coverage		
Report Generated By	admin	Drive Start	March 26, 2020 2:57:57 PM PDT
Report Date	April 6, 2020 4:29:40 PM PDT	Drive Stop	March 26, 2020 3:09:05 PM PDT
Analyzer Number	160800000055	Operator	

Error Statistics

Error Type	Wind Data	GPS	Ringdown	Temperature	Pressure	Flow
Count	0	0	1354	0	0	1354

Emission Indication Statistics

Distance Driven (mi)	2.22	Total Survey Area (mi²)	0.04
Raw Indications	2	Aggregated Indications	2
Natural Gas Source	0 (0%)	Biogas Source	0 (0%)
Indeterminate Source	2 (100%)	Survey Coverage (Total)	20462.07

Summary Page (top page) - Survey Coverage in Total Feet

Figure 115 Summary Page (Top Page) - Survey Coverage in Total Feet

⚠ NOTE

Total Coverage Calculation combines the percentage of coverage for each asset into a total percentage. Total Coverage Calculation is appended to the coverage table in the PDF report.

...4 Using the System

⚠ WARNING!

Having assets loaded that are not covered during the survey will result in a 0 percent coverage, thus lowering the total coverage calculation.

Coverage calculation should be based on smaller asset sizes (less than 100,000 features) in the asset file.

MobileGuard Survey Report 18030001560_20200331_1430_SJ Loop

Survey Calculation

Asset Files	Survey Area Coverage (%)
KmlFile (SJ_Loop.kml)	89.79
Total (ft)	20462.07

Figure 116 Percentage of Survey Coverage for Each Asset File Loaded

You can also view the coverage calculation on archival packages as follows:

8 From the *Map* screen, perform one of the following methods (Mapsheet Grid or Single KML/SHP) to perform the coverage calculation.

– *Mapsheet Grid*:

a Set the **Coverage Calculation** toggle in the right position – calculation based on the mapsheet grid.

b Click the **Coverage Calculation Mapsheet Grid** menu icon (Figure 14).

c Confirm the *Grids/Main/Service* asset files have been uploaded (Figure 15). Refer to “Assets Import”.

d The screen shown in Figure 16 appears: Select the checkbox to calculate coverage for that specific mapsheet.

e If you want the coverage in the PDF report, cropping is necessary: Click the **Scissors** icon and upload the newly created asset to Geoserver. You can now calculate based on the Single KML/SHP file method, described below, and activate that mapsheet for PDF Report calculation.

f Click **Confirm**.

– *Single KML/SHP*:

a Set the **Coverage Calculation** toggle in left position – calculation based on single asset file already uploaded.

b Click the **Coverage Calculation Single KML/SHP** menu icon (see Figure 112).

c Select the asset file by checking the box.

d Click **Confirm**: The real-time or archival package coverage is displayed (see Figure 114).

9 Click the icon to the right of *Emissions and Packages*.

10 From the *Drive Packages* window, select the radio button to use a drive package for coverage calculation.

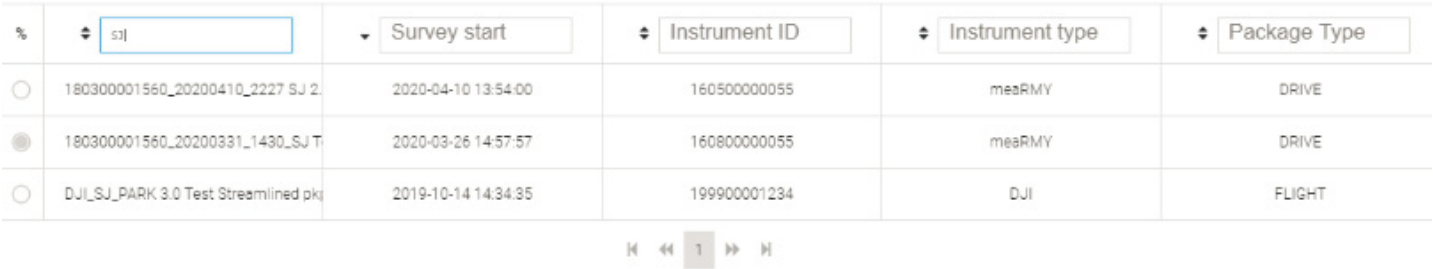


Figure 117 Select Archival Drive Package

...4 Using the System

Mapsheet Grid Highlight and Locating

During real-time coverage calculation, you can select which mapsheets to highlight when surveying.

To load and highlight a specific mapsheet grid:

1 Select **Map** to access the *Map* screen.

2 Set the **Coverage Calculation** toggle in the right position – calculation based on the mapsheet grid. (See Figure 118.)

3 Confirm the *Grids/Main/Service* asset files have been uploaded (Figure 15). Refer to “Assets Import”.

4 The screen shown in Figure 16 appears: Select the checkbox to calculate coverage for that specific mapsheet.

5 Click **Confirm**.

6 Click the **location** icon to the left of the asset name to view. (See Figure 118.)

7 Click the asset name to highlight that grid.

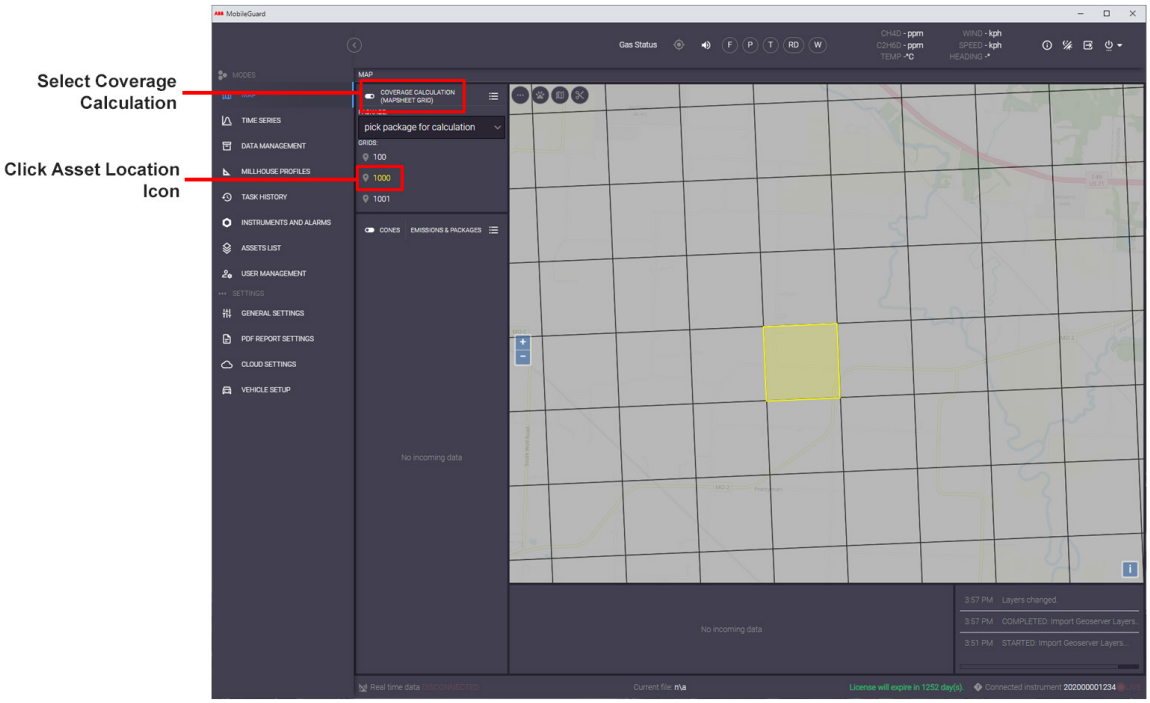


Figure 118 Mapsheet Grid Highlight

...4 Using the System

Report Generation - HoverGuard™

Data Transfer

1 Power on the analyzer: Press the power button on the connector panel to the On position. Refer to the *GLA133 Series UAV-Microportable User Manual* (document number 3KXG167006R4601).

2 On a computer that has the MobileGuard™ software installed, go to the WiFi symbol to access all available networks.

3 From the available network list, select the network (SSID) marked on the analyzer label. It should read: *RUT240_XXXX*, where *XXXX* varies from analyzer to analyzer. Once selected, enter the corresponding password from the same label for access. The password consists of eight characters (*XXXXXXXX*) that vary from analyzer to analyzer. (Figure 119)

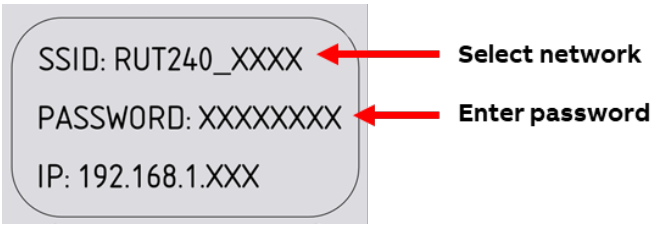


Figure 119 WiFi Access Parameters

4 Open the Windows File Explorer (not an internet browser) and type in the IP address from Figure 119 into the address bar. The address must in the form *\\192.168.1.XXX*, where *XXX* is a three digit number that varies from analyzer to analyzer. After pressing return, the computer has access to a shared data directory in the analyzer (*lgrdata*), as shown in Figure 120.

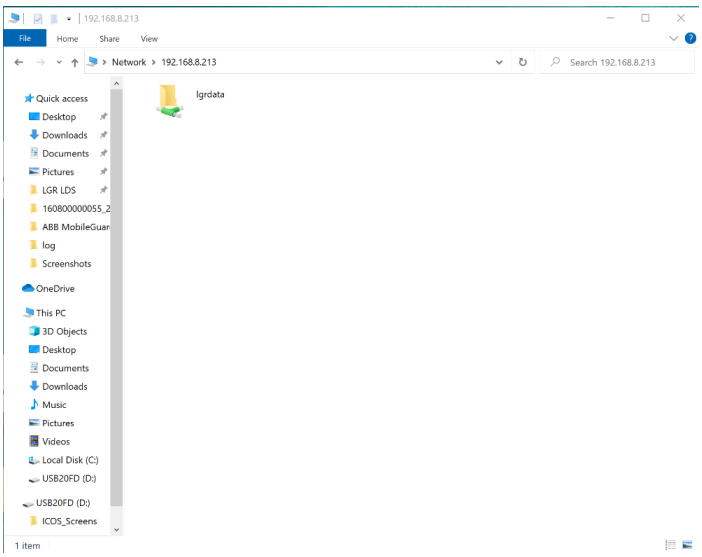


Figure 120 Windows File Explorer Window After Access Granted

5 Double-click the **lgrdata** folder to show the data folders (data grouped by date) as shown in Figure 121.

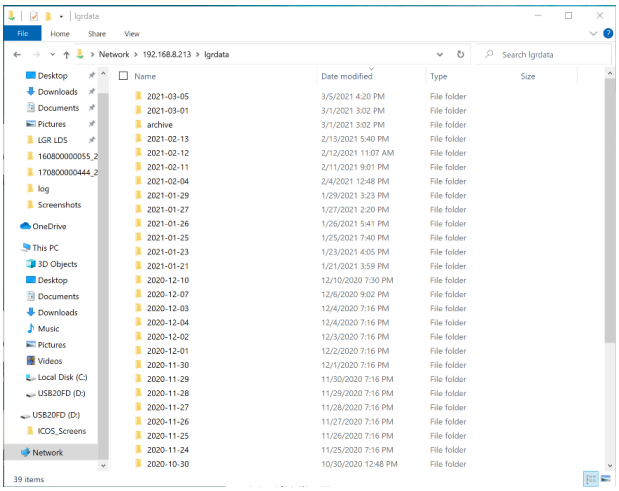


Figure 121 Windows File Explorer Window Showing Data Folders

6 Double-click on any of the folders to show the zipped data files (Figure 122).

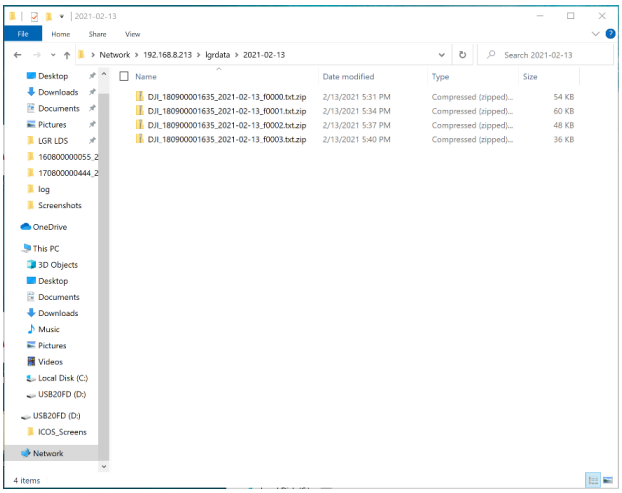


Figure 122 Windows File Explorer Window Showing Zipped Data Files

7 Copy the relevant data file(s) to the computer, then unzip the files.

...4 Using the System

Software Setup

1 Start the MobileGuard™ software and log in (refer to the “Access UI” section for details).

2 The MobileGuard™ software is pre-configured for the GLA133-GGA. If that analyzer is being used, this “Software Setup” section may be skipped. Otherwise, a new Instrument must be created: Proceed to Step 3.

3 In order to parse the analyzer data correctly, a new instrument type must be configured using the raw-data file headers. Select **Instruments and Alarms** to access the required screen (Figure 123).

4 Delete the existing DJI instrument type: Select **DJI**, then click the **trash can** icon.

Figure 123 Instruments and Alarms Screen

5 Create a new instrument and corresponding alarm parameters: Click **Create new**. The screen shown in Figure 124 appears.

6 Enter the instrument type (**DJI**).

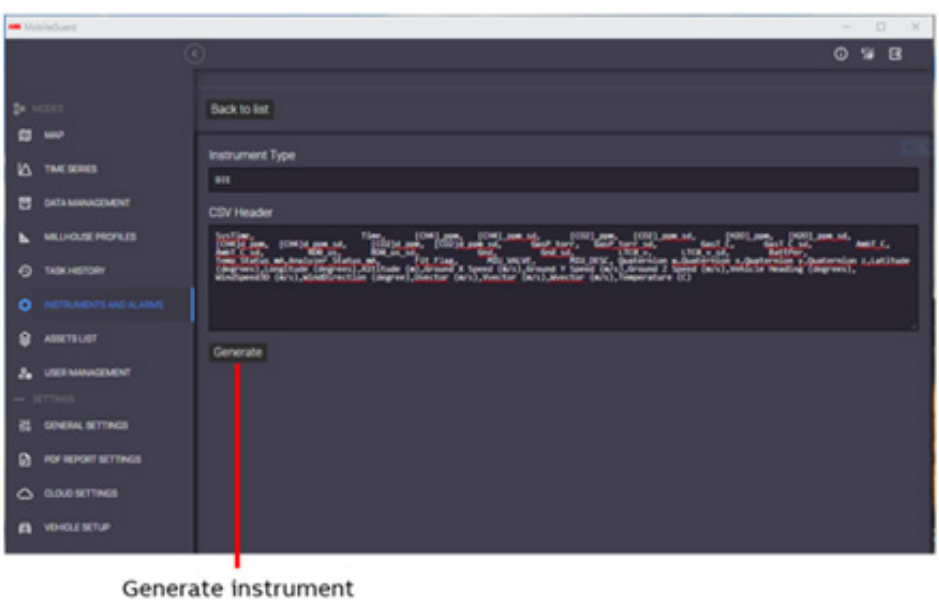


Figure 124 Create New Instrument and Alarm Parameters

7 Copy and paste the header line from the raw data file into the CSV header text box (that is, the column names separated by commas beginning with *SysTime*).

8 Click **Generate**.

9 The resulting window (Figure 125) shows the CSV names along with other data attributes. Click **Save** to save the newly created instrument type.

...4 Using the System

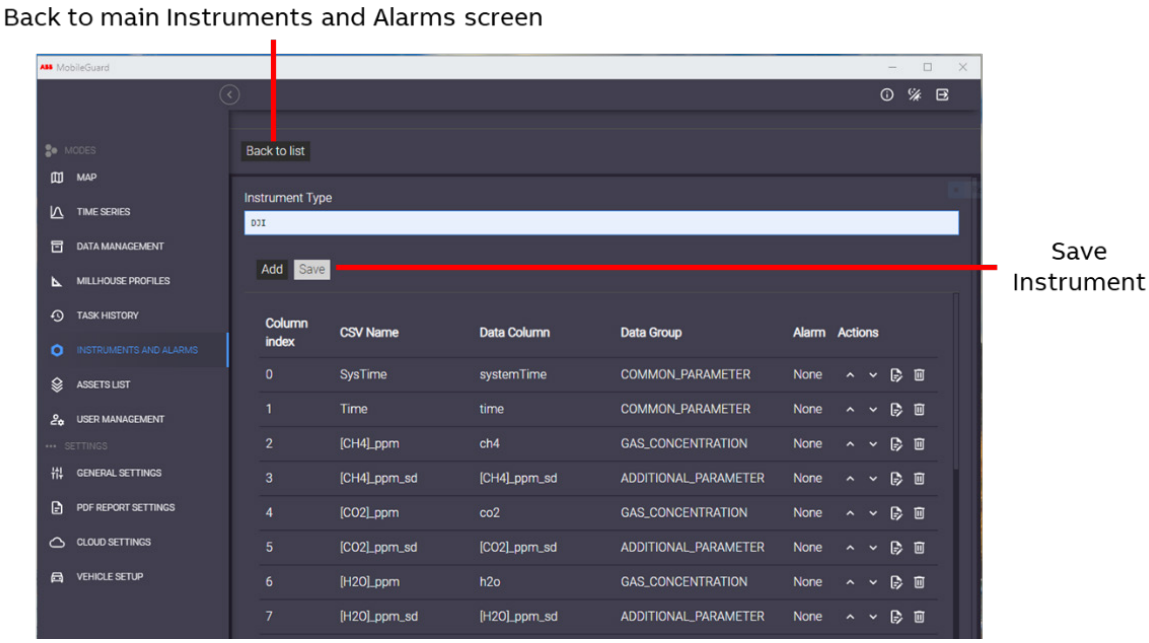


Figure 125 Instrument Parameters

10 Click **Back to list** to return to the *Instruments and Alarms* screen - the new entry appears in the list: *Instrument Type: DJI*. (Figure 126)

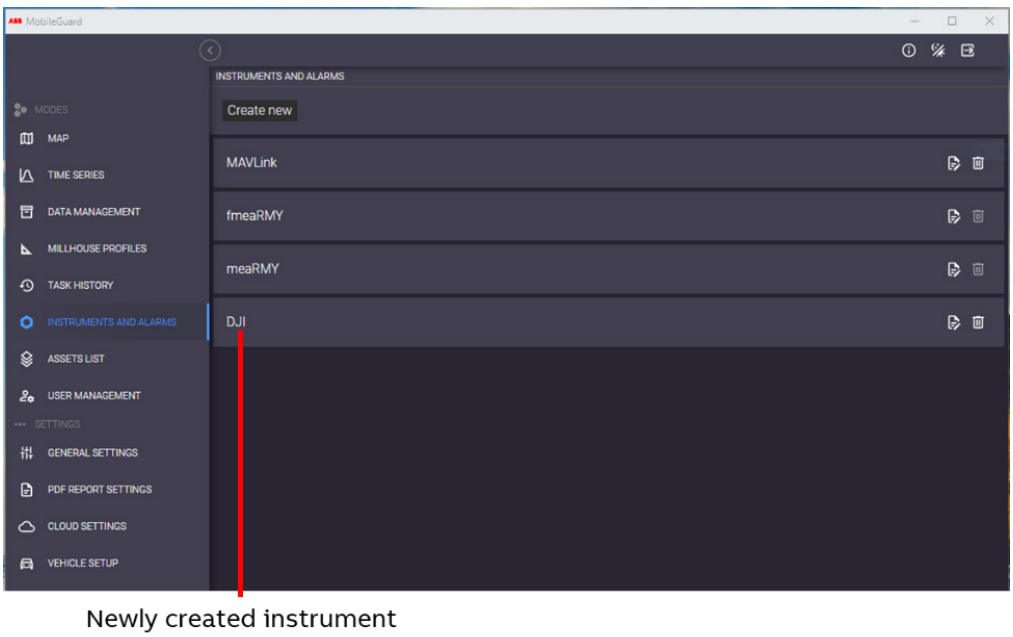


Figure 126 Newly Created DJI Instrument Type

...4 Using the System

11 Under **General Settings** > **Analyzer Settings**, specify the following (Figure 127):

a *Analyzer Type*: DJI (click **Save**).

b *Package Type*: flight (click **Save**).

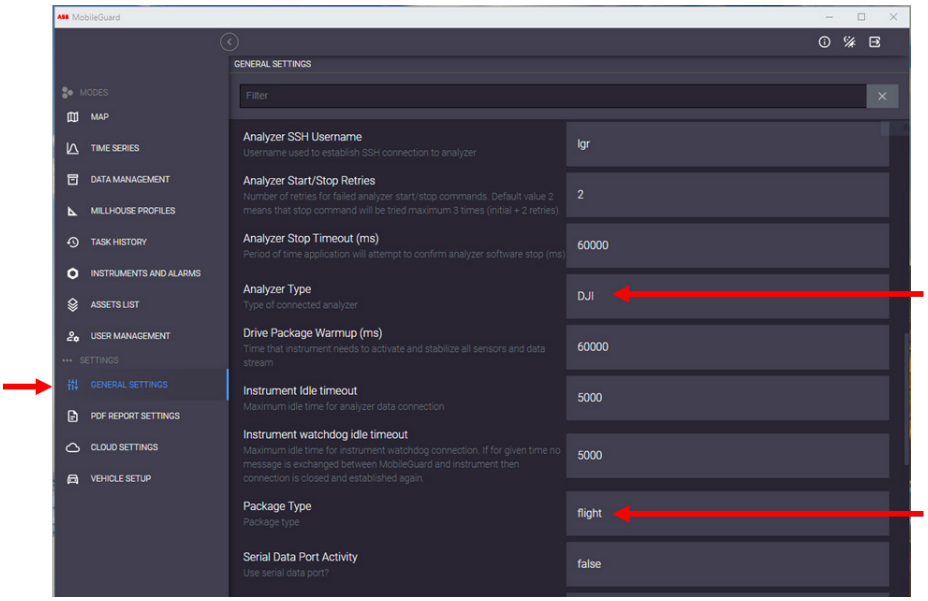


Figure 127 Analyzer Settings

12 By default, the report will be saved to the folder **/data/LGR LDS**. To change this folder, go to **General Settings** > **Local Directory Settings**, then modify *Local Drive Package Directory* to the desired the folder. Ensure that there are no quotations surrounding the path. (Figure 128)

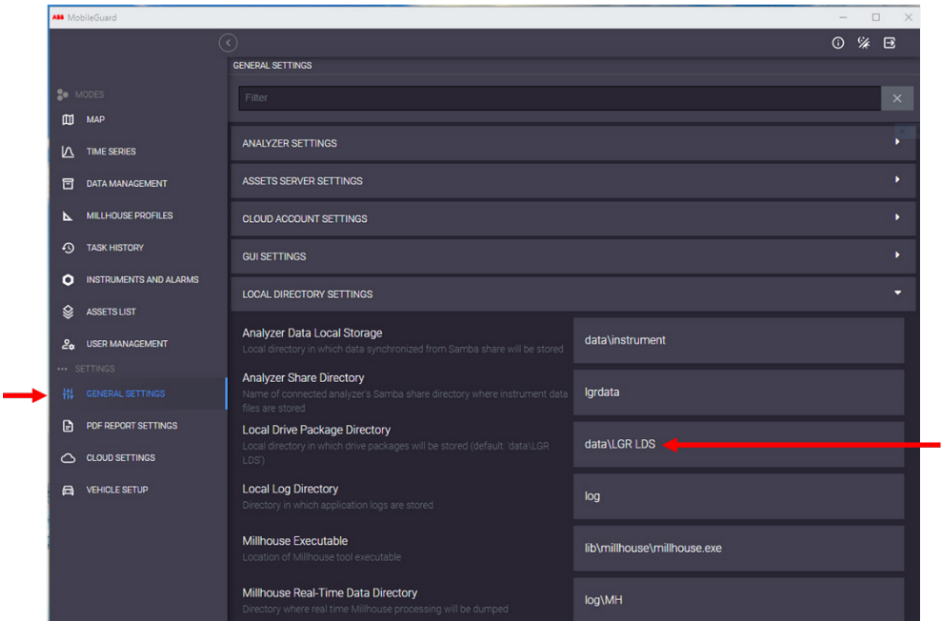


Figure 128 Report Folder

...4 Using the System

13 Create a new millhouse profile: Click **Millhouse Profiles** and then the **copy** button on the **[Predefined]default_uav** line (Figure 129).

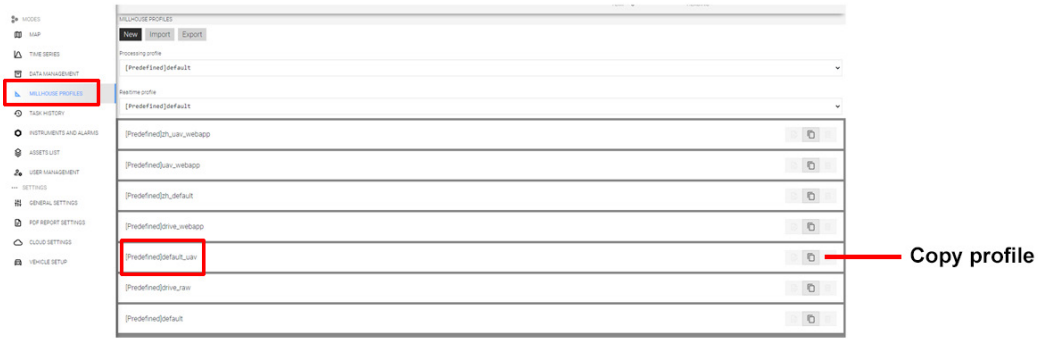


Figure 129 Copy Pre-defined Profile

14 Change the Profile name to **default_uav (user)** (Figure 130).

15 Change the argument name from **--fitter_algorithm=multigaussian** to **--fitter_algorithm=regression** (Figure 130).

16 Click **Save** to save the profile (Figure 130).

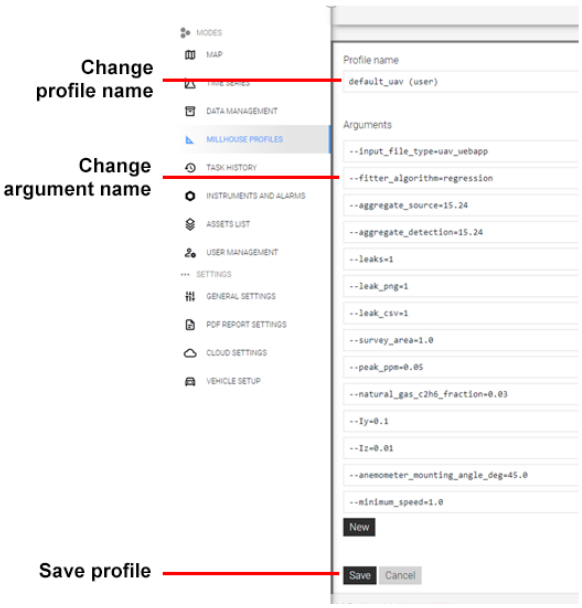


Figure 130 Create New Millhouse Profile

17 Update the *Processing profile* and *Realtime profile* to **[User] default_uav (user)** (Figure 131): Use the drop-down menu to select the profiles.

...4 Using the System

Figure 131 Update Processing and Realtime Profiles

18 Ensure that the sampling delay time is set to 500 ms for HoverGuard™: Click **General Settings**, then **Vehicle Calibration Settings** and ensure that the value is set to **500**, then click **Save**, if changing the value. (Figure 132)

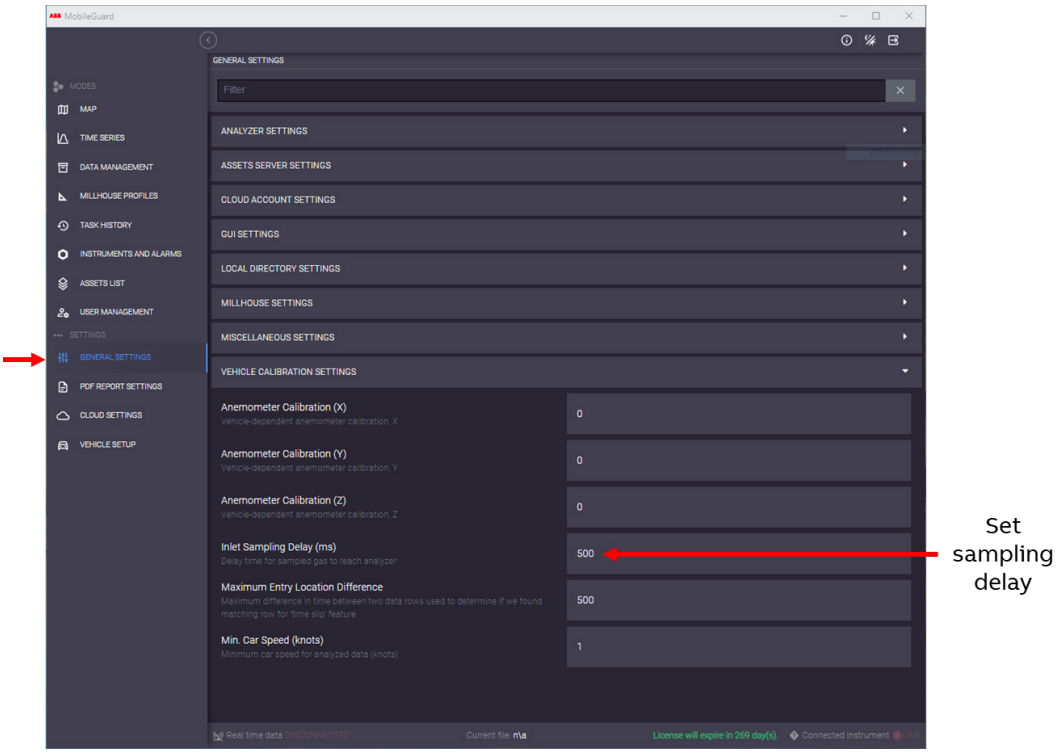


Figure 132 Change Sampling Delay Time Setting

...4 Using the System

Import and Process Data

1 Import the raw data file. Ensure that the filename is of the format: <INSTRUM_TYPE>_<SERIAL_NUMBER>_<DATE>_<FILE_INDEX>.txt

- Example: DJI_180500001234_2022-10-25_f0000.txt
- *INSTRUM_TYPE* must match the name given in Step 6 above (in the “Software Setup” section).

2 On the MobileGuard™ application, click the **Data Management** button.

3 Click **Import**. (Figure 133)

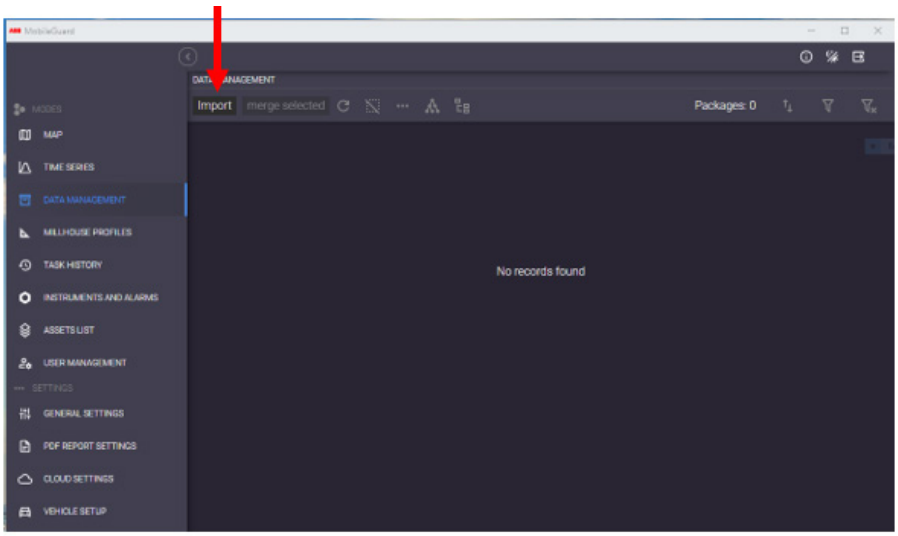


Figure 133 Click Import

4 Set the report properties (Figure 134):

a Navigate to the relevant raw-data file and select it.

b Rename the report filename, if desired (this will be the flight package name).

c Select **Package Type: Flight**.

d Select the desired Millhouse Processing profile: **[User]uav_webapp_anemometer**.

e Click **Submit**. The flight file will be processed and saved to the folder specified in Step 12 above (“Software Setup” section).

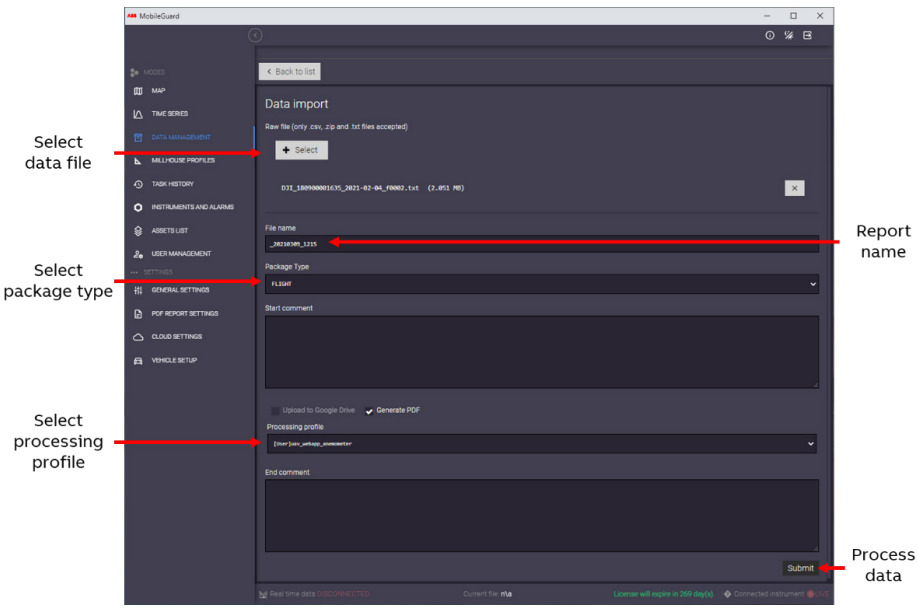


Figure 134 Report Processing Parameters

...4 Using the System

5 The resulting archive filename will have a name like *_2022305_2247.flight*. Extract this file using a file extractor, such as 7-Zip. Archived reports can also be reviewed directly with the MobileGuard™ software by navigating back to the *Data Management* screen and clicking the desired **pdf report** icon (Figure 135).

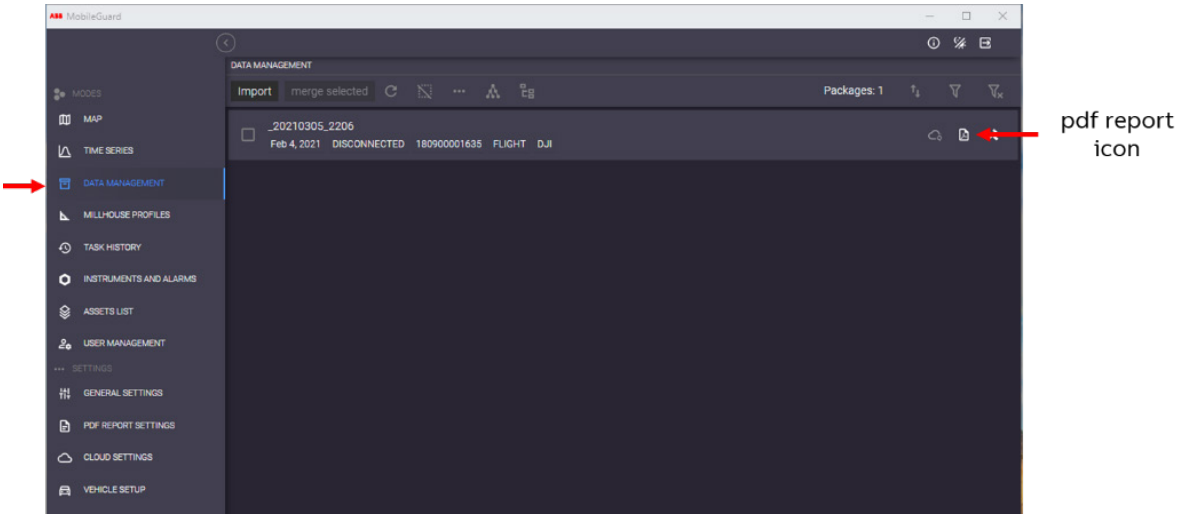


Figure 135 View Archival Reports

...4 Using the System

Report Properties

Flight packages are zipped archives that contain several different files, the most important of which are described in Table 7.

Table 7 Flight Package Filenames

File Name	Description
drive.pdf	Report containing a summary of the results from the data contained within the flight package. In addition, statistics are provided for each individual emission indication.
<flight_filename>.csv	Raw data (eg, concentrations, wind conditions, GPS) for the flight package.
drive.xml	Collection of metadata for the flight.
/millhouse/	Folder containing analyzed results divided into various .kmz and .shp files.

PDF Report

A PDF report, drive.pdf is generated for each flight package and is located in the top directory of the .flight archive. This report contains a summary of the flight package, including important statistics and details for each emission indication. This section briefly describes the data contained in each of these reports.

PDF Report - Flight Package Overview

Report Header

The first table of the PDF report (Figure 136) provides the following general information about the flight package.

Survey Report for _20210305_2247

Report ID	_20210305_2247		
Report Generated By	admin	Survey Start	February 4, 2021 6:50:00 AM PST
Report Date	March 5, 2021 10:48:49 PM PST	Survey Stop	February 4, 2021 7:02:19 AM PST
Analyzer Serial Number	180900001635	Operator	
Analyzer Calibration Date			

Figure 136 Report Header Example

- Report ID – name of the flight package that contains this PDF report.
- Report Generated By – ID of the user that generated the report.
- Report Date – timestamp for generation of the current flight package.
- Analyzer Serial Number – ID of the analyzer used to generate the flight package.
- Analyzer Calibration Date – date the analyzer was last calibrated.
- Survey Start – timestamp for the earliest data point used in the flight package.
- Survey Stop – timestamp for the latest data point used in the flight package.
- Operator – user ID for the operator(s) that collected data used in the flight package.

Emission Indication Statistics

This table contains basic statistics about the survey area and emission indications contained in the current flight package.

Emission Indication Statistics

Total No. of Detected Sources	34	No. of Sources After Aggregation	2
No. of Natural Gas Sources (% of Total)	0 (0%)	No. of Biogas Sources (% of Total)	0 (0%)
No. of Indeterminate Sources (% of Total)	2 (100%)	Total Survey Area (sq. mi.)	0.00
Distance Surveyed (mi)	1.38		

Figure 137 Emission Indication Statistics Example

- Total No. of Detected Sources – total number of raw emission indications generated from data in the current flight package.
- No. of Sources After Aggregation – total number of emission indications from data in the current flight package.
- No. of Natural Gas Sources (% of Total) – percent of aggregated emission indications that arise from a natural gas source.
- No. of Biogas Sources (% of Total) – percent of aggregated emission indications that arise from biogas sources.
- No. of Indeterminate Sources (% of Total) – percent of aggregated emission indications that have an unidentified source.
- Total Survey Area (mi²) – total area surveyed in the current flight package.

⚠ NOTE

This value depends on the *survey_area* parameter, which may be adjusted in the *Millhouse Profiles* screen.

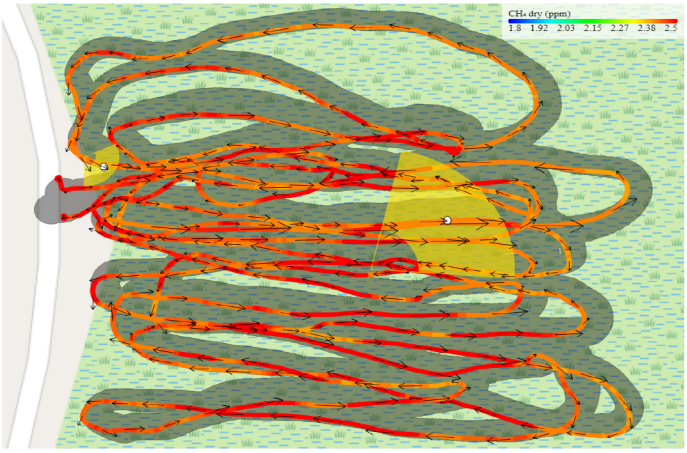
- Distance Surveyed (mi) – total distance traveled for data in the current flight package.

...4 Using the System

Complete Survey Route

Map segment which depicts the entire survey area for the flight package. Aggregated emission-indication survey areas from the flight package are overlaid on this map. (Figure 138)

Complete Survey Route



-- Flight Path Detection Area
Emission Detection (Apex) with Predicted Location
Probable Detection Site

Figure 138 Flight Package Complete Survey Route

Measurement Statistics

This table contains basic statistics about raw measurement values obtained by the MobileGuard™ system. For each measurement type, the minimum, maximum, and/or mean recorded values are reported.

Measurement Statistics

	Min	Max	Mean
CH_4 (ppm)	2.38	11.53	2.63
C_2H_6 (ppm)	null	null	null
Outside Temp. (°C)			8.43
Wind Speed (mph)			19.10
Survey Speed (mph)		21.56	

Warning, see manual for details

Figure 139 Measurement Statistics Example

- CH_4 (ppm) – raw measured methane concentration (not baseline subtracted).
- C_2H_6 (ppm) – raw measured ethane concentration (not measured).
- Outside Temperature (°C) – exterior temperature measured by the anemometer.
- Wind Speed (mph) – wind speed measured by the anemometer after correction for UAV speed.
- Survey Speed (mph) – UAV speed measured by GPS.

Notes

Comments entered by the user at the beginning or end of a flight.

- Operator startup notes
- Operator completion notes

PDF Report - Individual Emission Indication Reports

After the *Flight Package Overview* section, the MobileGuard™ PDF report contains additional pages with information about individual aggregated emission indications for the current flight package.

Emission Indication Measured Values

This table contains several entries that contain statistics tabulated for individual aggregated emission indications.

Emission Indication Measured

Detection Location	38.XXXXXXX, -121.XXXXXXX		
Source Type	Indeterminate	Child Emission	2
Indication Start	February 4, 2021 6:51:50 AM PST	Indication Stop	February 4, 2021 6:51:55 AM
Indication Length (ft)	1.11	Indication Duration	4.76
Survey Speed at Detection (mph)	0.06	Survey Altitude at Detection	4.83
Wind Speed (mph)	8.35	Baseline CH_4 (ppm)	2.52
CH_4 Peak Rise (ppm)	0.18	C_2H_6 Peak Rise (ppm)	null

Warning, see manual for details

Figure 140 Individual Aggregated Emission Indications

The values in the table are:

- Detection Location – GPS coordinates corresponding to location of emission detection.
- Source Type – natural gas, biogas, or indeterminate.
- Child Emission Count – number of raw emission indications aggregated together for the current emission indication.
- Indication Start – start time of elevated methane concentration for the current emission indication.
- Indication Stop – stop time of elevated methane concentration for the current emission indication.
- Indication Length (ft) – distance traveled by the UAV during the time window associated with the current emission indication.
- Indication Duration (sec) – length of time over which the elevated methane concentration for the current emission indication persisted.
- Survey Speed at Detection (mph) – UAV speed during the time window associated with measurement of the current emission indication.
- Survey Altitude at Detection (ft) – UAV altitude during the time window associated with measurement of the current emission indication.
- Wind Speed (mph) – average wind speed during the time window associated with the current emission indication.
- Baseline CH_4 (ppm) – average background methane concentration for data associated with the current emission indication.
- CH_4 Peak Rise (ppm) – highest background subtracted methane concentration measured in data associated with the current emission indication.
- C_2H_6 Peak Rise (ppm) – average background ethane concentration for data associated with the current emission indication (not measured).

...4 Using the System

Emission Indication Estimates

This table shows an example of emission indication estimates.

Emission Indication Estimates

Source Location	38.XXXXXX, -121.XXXXXX		
Source Direction (deg)	122.56 +/- 116.84	Distance (ft)	13.38 +/- 6.69
Search Area Size (ft²)	182.56		

Figure 141 Emission Indication Estimates

- Source Location – estimated location (latitude, longitude) of the source of the emission indication in decimal degrees.
- Source Direction (deg) – angle between the line pointing from south to north and the line pointing from the point of detection to the estimated source location.
- Distance (ft) – distance from the point of detection to the estimated source location.
- Search Area Size (ft²) – size of the search area for the current emission indication.

Emission Indication Map

Each aggregated emission indication in the PDF report is accompanied by a zoomed-in map of the area surrounding the current emission indication. (See Figure 142 for an example.)

Emission Indication Map

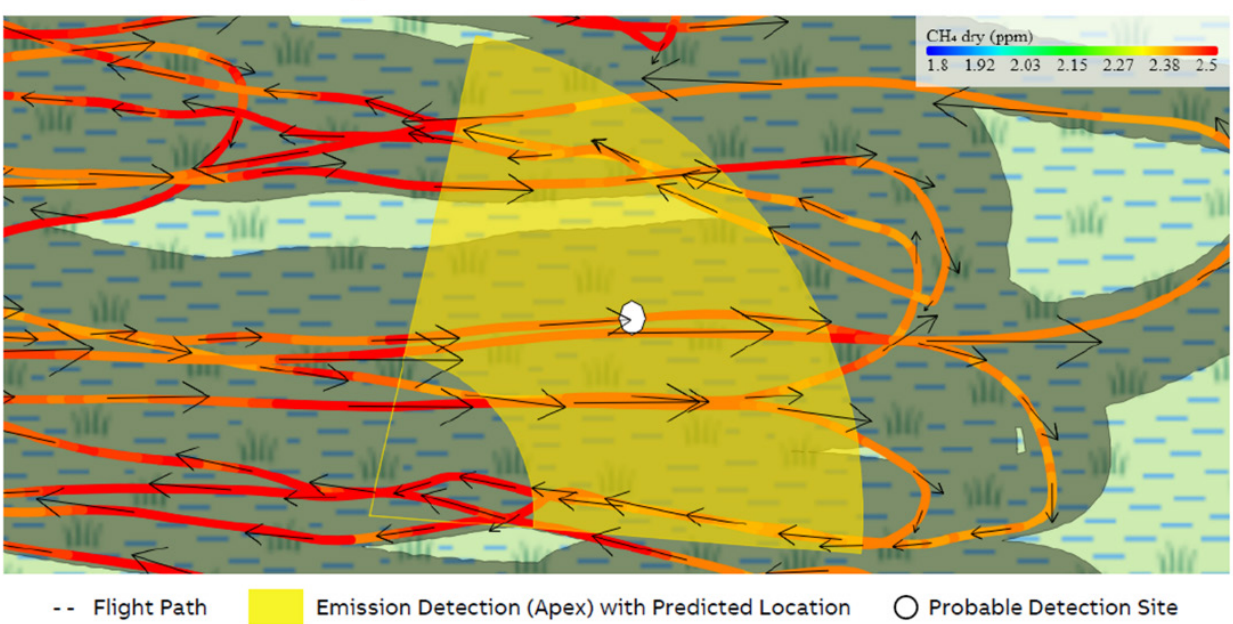


Figure 142 Emission Indication Map (HoverGuard™)

...4 Using the System

PDF Report - Leak Trace

Each aggregated emission indication in the PDF report is accompanied by a leak trace – that is, a zoomed-in view of the methane concentration corresponding to the current emission indication. (See Figure 143 for an example.)

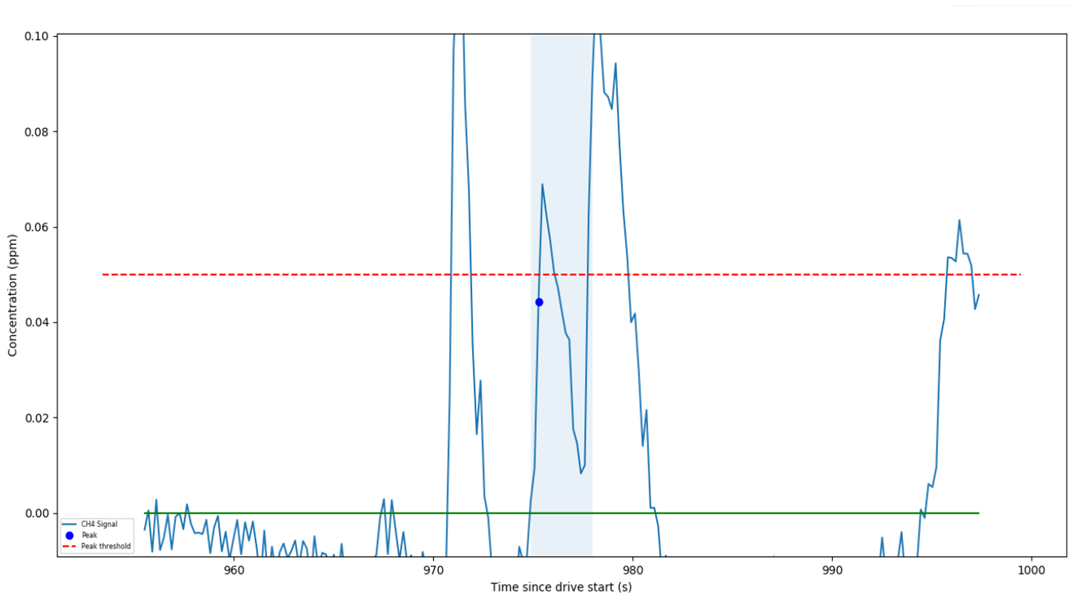


Figure 143 Emission Indication Map – Leak Trace

...4 Using the System

PDF Report - Measured Time Traces

A set of time-dependent data is shown in a graph for each individual data set used in the current flight package (see Figure 144 for an example).

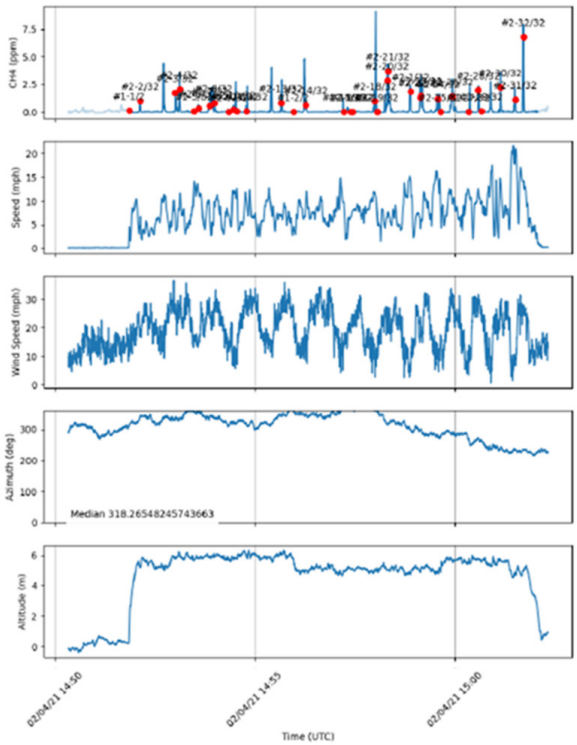


Figure 144 Measured Time Traces (HoverGuard™)

- CH_4 – background subtracted methane concentration. The dark blue region corresponds to times when the UAV was in flight.
- Speed – UAV speed.
- Wind Speed – measured wind speed after correction for the speed of the UAV.
- Azimuth – azimuthal (in-plane) angle of the wind direction (see Figure 145 and Figure 146).

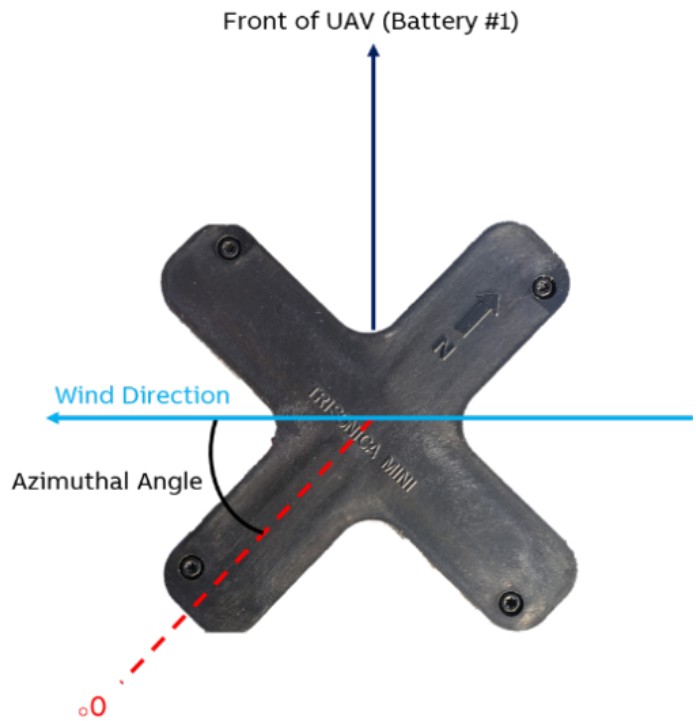


Figure 145 Azimuth Angle Definition for a Given Wind Direction

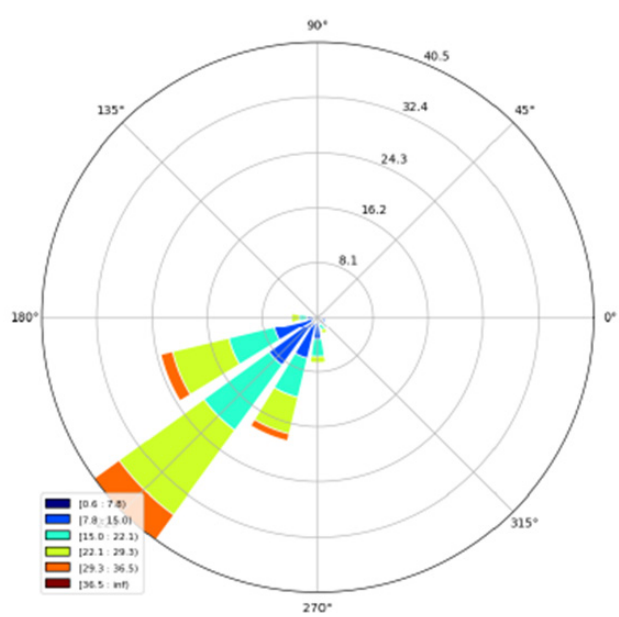


Figure 146 Wind Rose

- Elevation – elevation angle of the wind direction. The elevation angle is positive if the wind direction is pointing upward and negative for a downward wind direction.

...4 Using the System

PDF Report - Wind Properties

Figure 146 illustrates a wind rose showing the distribution of wind velocities (corrected for UAV velocity) during the flight package collection time.

PDF Report - Survey Detection Statistics

Two histograms of the peak CH_4 concentration associated with aggregated emission indications in the current flight package are provided. The left plot is a histogram spanning 0 to 1 ppm, and the right plot is a histogram for emissions with larger associated concentrations. (See Figure 147 for an example.) The right plot auto-scales the X axis and separates the available emission indication data into ten successive bins.

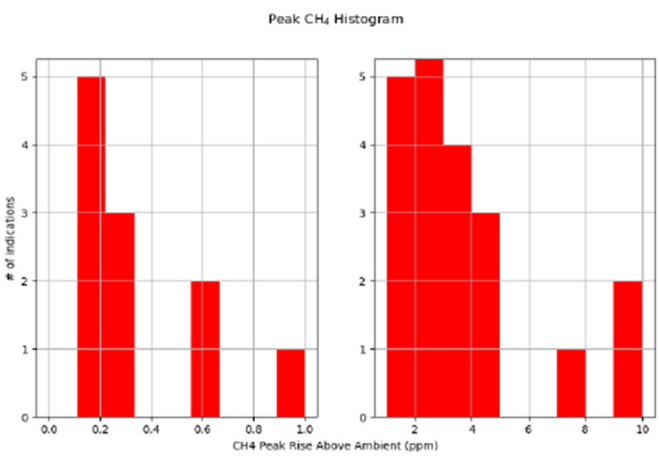


Figure 147 Survey Detection Statistics (HoverGuard™)

KMZ Output

The /millhouse/ directory in the flight package produced by the MobileGuard™ software contains several output files in .kmz format. These files, defined in Table 8, contain the results of the flight and can be loaded into GIS software that supports .kmz or .kml data (for example, Google Earth). In addition, each KMZ output can be produced for SHP format if specified in the Millhouse profile.

Table 8 Millhouse Files (HoverGuard™)

File Name	Description
/millhouse/millhouse.kmz	Complete results from the survey, partially divided into different layers for aggregated emission-indication survey areas only or full lists of emission-indication survey areas
/millhouse/millhouse_aggregated_child_leaks.kmz	Partial layer file containing the full unaggregated set of emission-indication survey areas
/millhouse/millhouse_aggregated_circles.kmz	Partial layer file containing circles with a 5 meter (16 foot) radius around the point of detection
/millhouse/millhouse_aggregated_leaks.kmz	Partial layer file containing only the aggregated emission-indication survey areas
/millhouse/millhouse_aggregated_pies.kmz	Partial layer file containing only the aggregated emission indications with survey areas replaced by icons that express the angular uncertainty of the emission origin estimate, but with a fixed distance estimate of 50 meters (164 feet)
/millhouse/millhouse_ch4_line.kmz	Partial layer file containing the breadcrumb trace with color representing the measured methane concentration
/millhouse/millhouse_surveyarea.kmz	Partial layer file containing the estimated survey area (defined in the millhouse profile)
/millhouse/millhouse_wind.kmz	Partial layer file containing arrows representing the measured wind speed and direction

KMZ/SHP File Embedded Flight Package Data

MobileGuard has embedded much of the .flight package data into the layers of the kmz/shp file. Figure 105 is an example of a millhouse_aggregated_emissions.shp file loaded into a GIS program. The highlighted emission is selected to view the information attached to that layer.

...4 Using the System

CSV Output

MobileGuard™ flight packages also contain several CSV formatted output files containing generated data associated with the current flight package. These files are described in Table 9.

⚠ NOTE

If there are other formats that would assist your particular workflow, ABB can create new output to meet your needs. Please contact ABB Support for more information.

Table 9 CSV Output (HoverGuard™)

File Name	Description
<data_filename>.csv	All raw data associated with the current flight package. Includes timestamps, data generated by the analyzer (for example, methane concentrations, pressure, temperature, ringdown times), GPS data, and anemometer data.
/millhouse/ concentrations.csv	Raw and background subtracted methane concentrations (this file is not generated by default – contact ABB Support for more information).
/millhouse/ emissionDigest.csv	Latitude and longitude data for the predicted source locations of all raw emission indications generated in the current flight package. Also, the peak methane concentration associated with each indication.
/millhouse/ emissionDigest_ aggregated.csv	Latitude and longitude data for the predicted source locations of aggregated emission indications generated in the current flight package. Also, the peak methane concentration associated with each aggregated indication.
/millhouse/ emissionIndicationDump. csv	Collection of detailed emission indication parameters for the current flight package.

...4 Using the System

Data Storage - MobileGuard™

There are two types of storage accounts:
- Azure - to create an Azure account, refer to “Azure Account Configuration”.
- Google Drive - to create a Google Drive account, refer to “Google Drive Account Configuration”.

Azure Account Configuration

This section describes configuring an Azure storage account.

1 From the *Cloud Settings* screen click **Connect to Azure**.

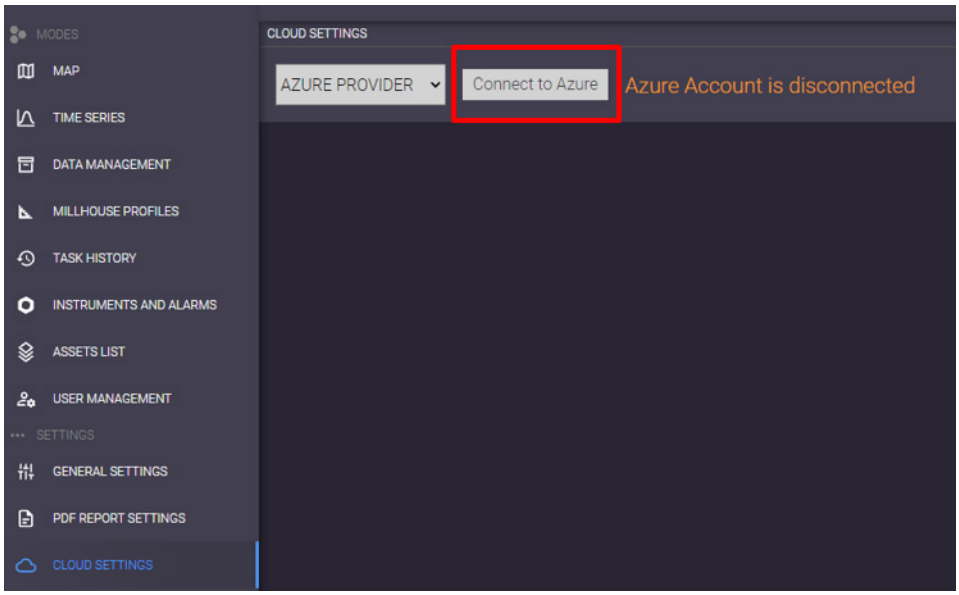


Figure 148 Connect to Azure

2 Enter the email address and password emailed to you during the commissioning step. If you have not received the email address and password, contact icos.support@ca.abb.com to set up an Azure Storage account.

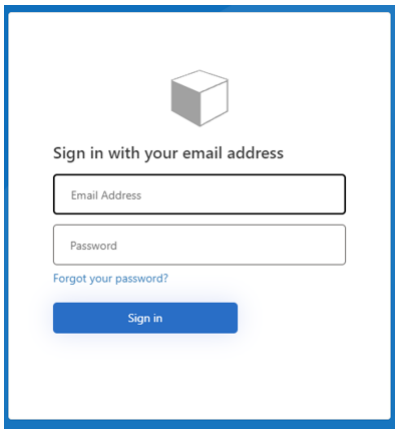


Figure 149 Enter Azure Account Email Address and Password

3 Click **Sign in**.

...4 Using the System

MobileGuard™ initiates the connection to Azure (Figure 150), then you are connected to your Azure storage account (Figure 151).

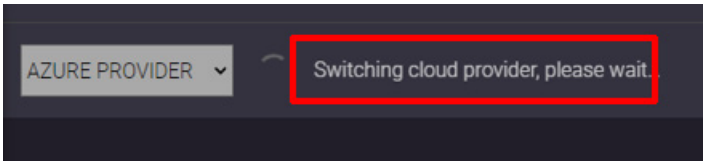


Figure 150 Connecting to Azure

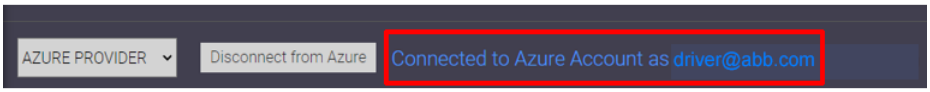


Figure 151 Connected to Azure

Change Azure Password

When a new user is added to the Azure Storage, a randomly generated password is sent via email to that user. To change the password, follow the sequence below:

1 On the sidebar, select **Cloud Settings** (see Figure 8) to access the *Cloud Settings* screen (Figure 71).

2 Click **Connect to Azure** (see Figure 148).

3 The screen shown in Figure 152 appears: Click **Forgot your password**.

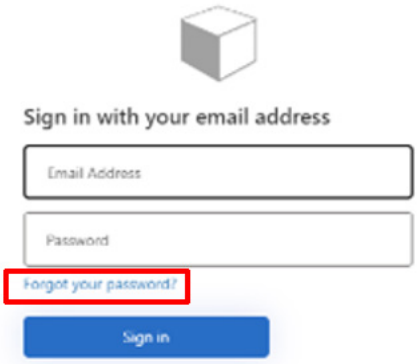


Figure 152 Click Forgot your password

...4 Using the System

4 The screen shown in Figure 153 appears requesting the registered email address: Enter the registered email address.

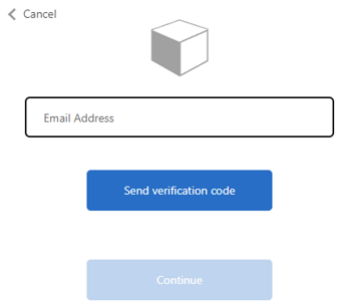


Figure 153 Send Verification Code

5 Click **Send Verification Code**.

An email will be sent with a code (see example below). The email will come from: msonlineservicesteam@microsoftonline.com on behalf of MobileGuard™.

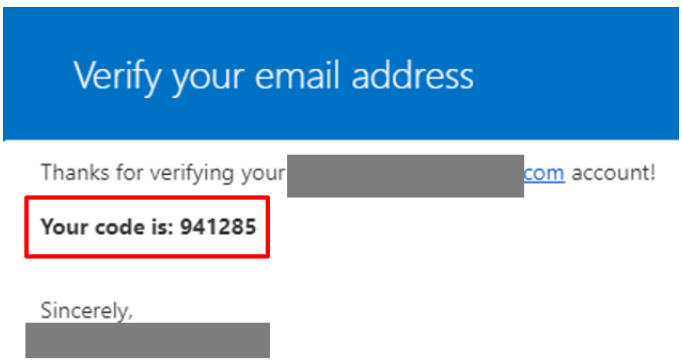


Figure 154 Azure Forgot Password Email Code

6 Enter the code from the email, then click **Verify code**.

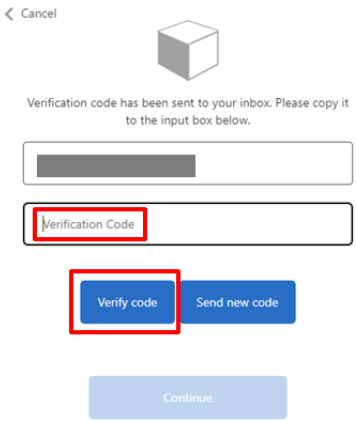


Figure 155 Enter Verification Code

...4 Using the System

7 When the screen displays the email address is verified, click **Continue**.

Figure 156 Email Address Verified

8 Enter and confirm your new password.

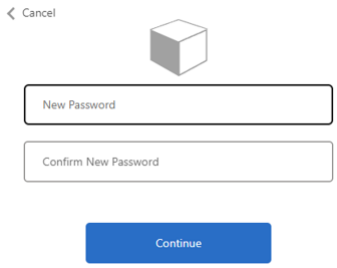


Figure 157 Enter New Azure Password.

9 Click **Continue** to return to the *Cloud Settings* screen.

⚠ NOTE

Password complexity is set to minimum 8 characters and maximum 64 characters in length, and requires 3 of 4 character classes: uppercase, lowercase, number, symbol.

...4 Using the System

Google Drive Account Configuration

This section describes configuring a Google drive account which requires setting up a drive package repository: This requires the following:

- Configuring a Google account
- Generating OAuth client IDs
- Linking MobileGuard™ application to Google JSON file

To set up a drive package repository, perform the steps which follow:

Configure Google Account

1 After creating a Google account, log into the Google Developer Console (http://console.developers.google.com).

2 Click **Select a project** in the upper-left part of the screen (Figure 158).

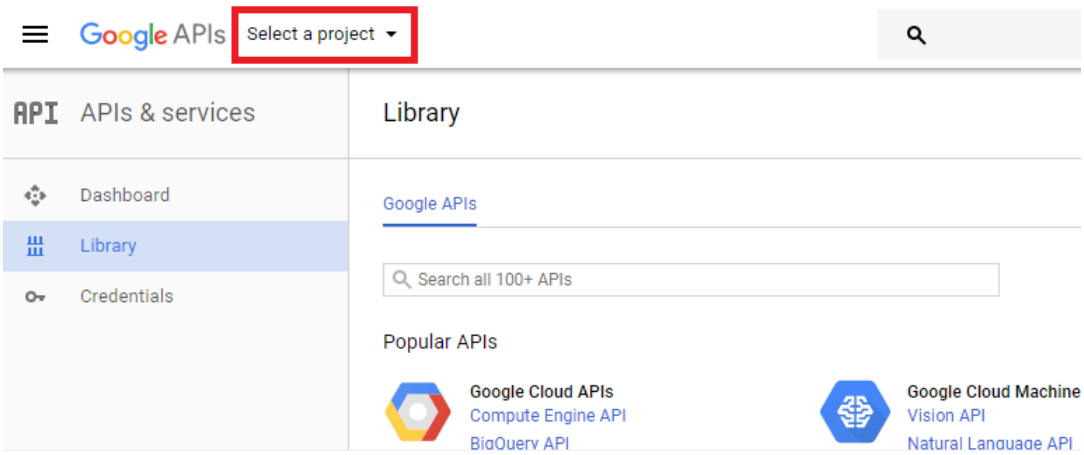


Figure 158 Google Developer Console Drop-Down Menu

3 In the new window, click the **+** sign to *Create project*. (Figure 159).

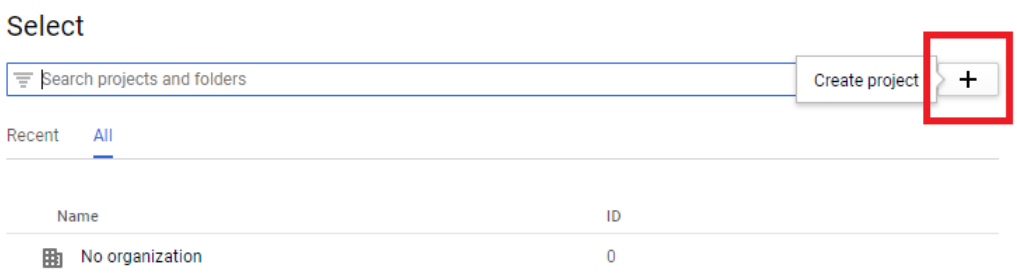


Figure 159 Google Developer Console Create Project Prompt

...4 Using the System

4 On the next screen (Figure 160):

a Type **Leak Detection Application** in the *Project Name* field.

b Choose **No**, then **Yes**, in the subsequent fields.

c Click **Create**.

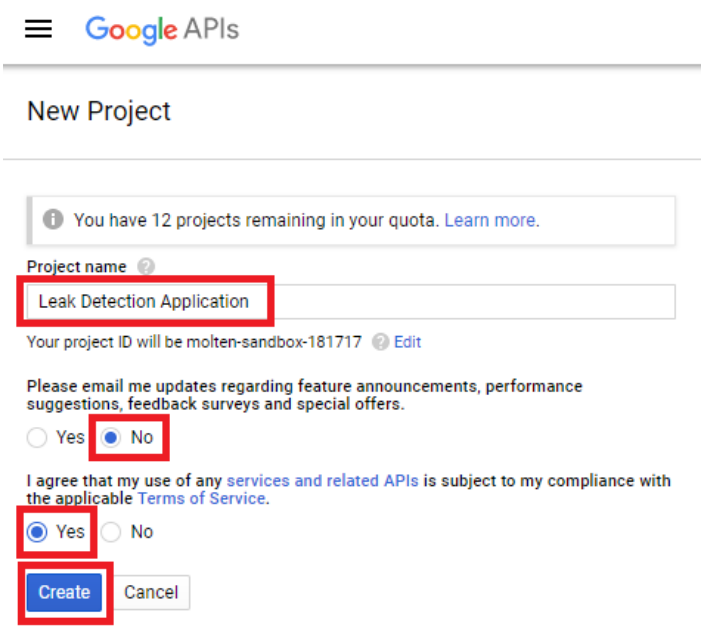


Figure 160 New Project Screen

5 Wait for the project to be created. (It may take a few minutes – you can track progress in the Notifications area).

6 Click the **Select a project** menu (see Figure 158), then click the **Leak Detection Application** project (see Figure 161).

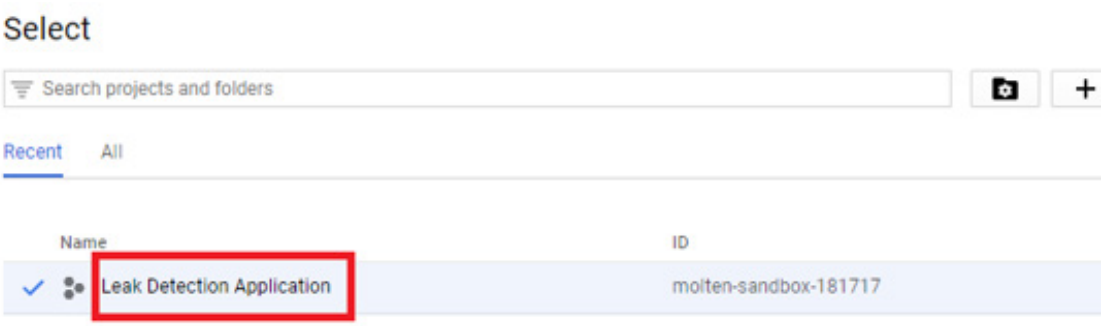


Figure 161 Select Leak Detection Application

7 Make sure that the new project is selected – the toolbar should look like Figure 162.

Figure 162 Ensure New Project Selected

...4 Using the System

8 Click the **Credentials** menu on the left, then click the **OAuth consent screen** tab.

9 Fill out the form in the *OAuth consent* screen, then click **Save** (Figure 163).

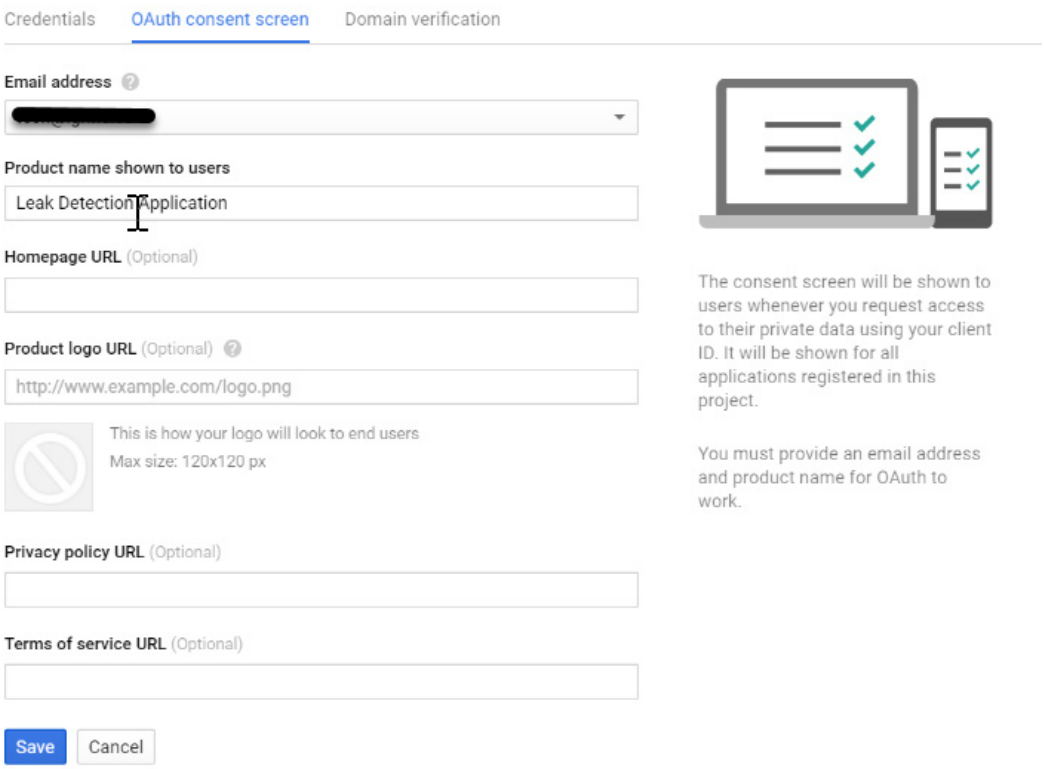


Figure 163 Google Developer Console OAuth Consent Screen

10 On the next screen, click the **Create credentials** drop-down menu, then click **OAuth client ID** (Figure 164).

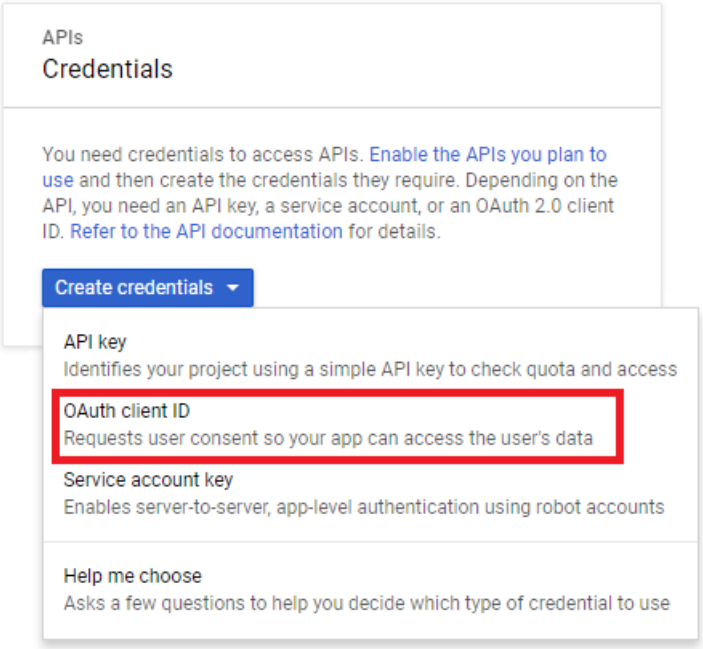


Figure 164 Click OAuth Client ID

...4 Using the System

11 Choose **Other** for the *Application type*, type a name in the *Name* field (the default option, *Other client 1*, may be used), then click **Create**. (Figure 165)

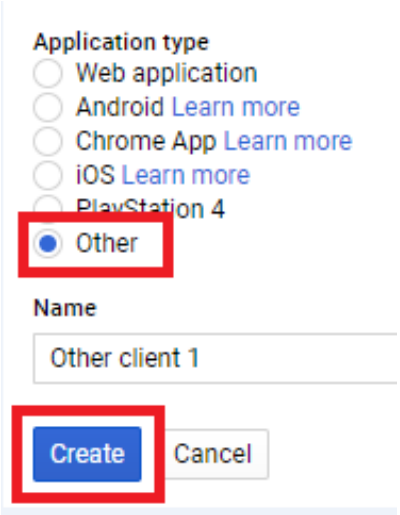


Figure 165 Create Application

12 A screen displaying your client ID and client secret appears: Click **OK** (Figure 166).

Figure 166 Client ID and Secret

13 Click the **Google APIs** button (Figure 167) to return to the *Overview* screen (Figure 168).

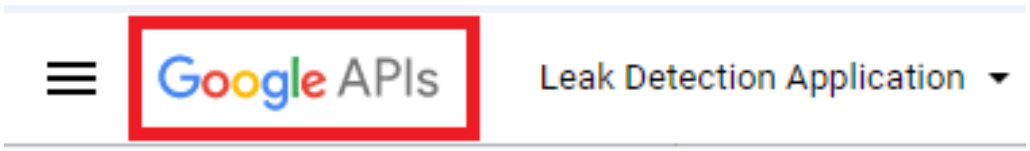


Figure 167 Click Google APIs

...4 Using the System

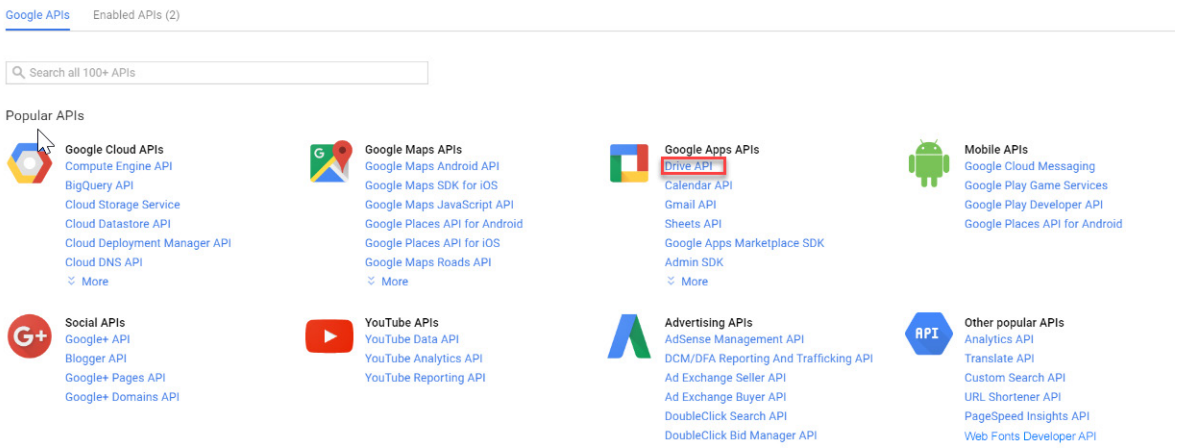


Figure 168 Overview Screen – Activate Drive API

14 Enable the **Drive API** (Figure 168) by clicking this option on the *Overview* screen, then the **Enable** button on the following screen.

Once an API is enabled, click the **Library** button from the left menu to return to the *Overview* screen to select other API options.

Generate OAuth Client IDs

1 In the Google Developer Console, click **Credentials** > **Create Credentials** > **OAuth Client ID**.

2 Select **Application Type** > **Other**, then enter any name.

3 Click **Create**, then close the pop-up window.

4 A list of created credentials is displayed – click the newly created credential name to display its details.

5 Click the **Download JSON** button, then save the downloaded file. This file will be loaded into the MobileGuard™ software (refer to the section which follows (“Link MobileGuard™ Application to Google JSON File”).

Link MobileGuard™ Application to Google JSON File

1 On the sidebar, select **Cloud Settings**. If there is no connected Google account, the configuration screen looks like Figure 169.

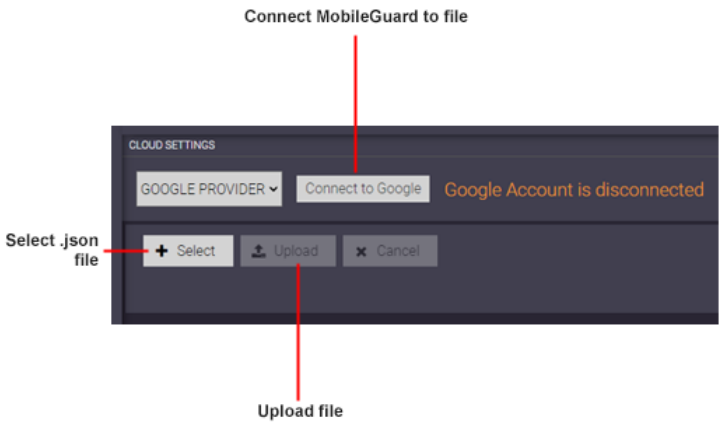


Figure 169 MobileGuard™ Cloud Settings Screen

...4 Using the System

2 Click **Select**: The window shown in Figure 170 appears.

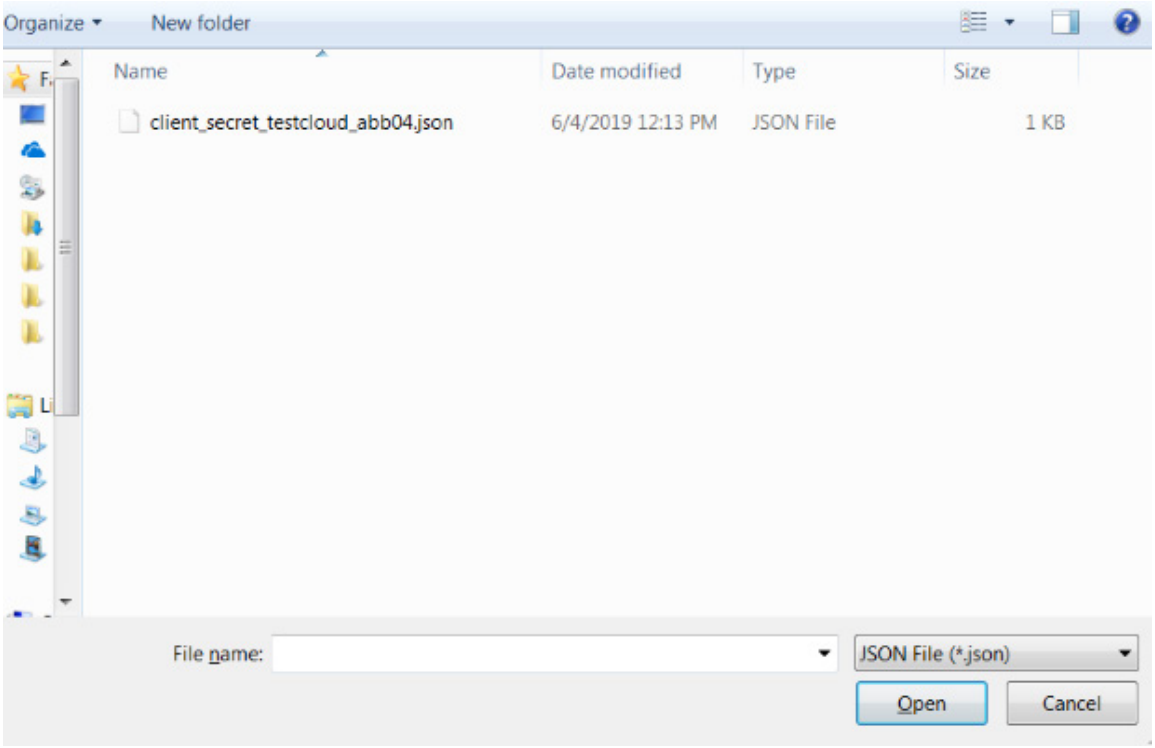


Figure 170 JSON File Selection Window

3 Select the desired .json file from the list displayed, then click **Open**: The file appears in the *MobileGuard Cloud Settings* screen.

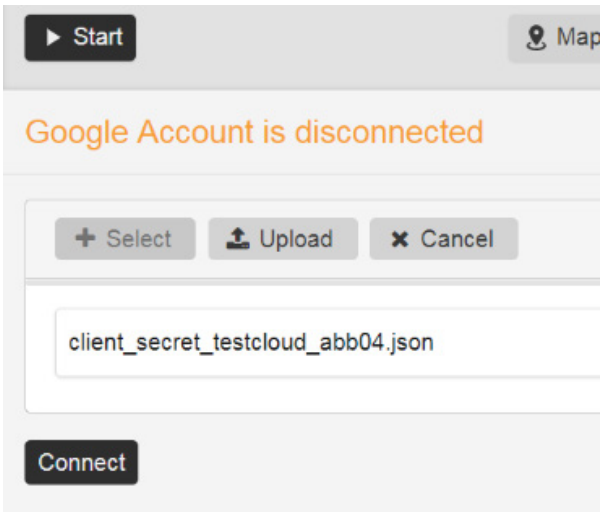


Figure 171 MobileGuard™ Cloud Settings Screen with .json File

4 Click **Upload**.

5 Click **Connect** to link the MobileGuard™ application to the .json file.

6 Enter the credentials for Google Drive.

7 Select **Allow** to give MobileGuard™ permission to sync with Google Drive.

...4 Using the System

CSV Data Definitions

This section contains a brief definition of the various column data in .csv files generated by the MobileGuard™ system.

<data_filename>.csv

<data_filename>.csv is generated in the top directory of a drive package and contains the raw data collected by the analyzer, sonic anemometer, and GPS receiver.

Table 10 <data_filename>.csv Data Definitions

Column	Units	Description
System Time (local)	Month/Day/ Year Hr:Min:Sec	UDT time at which complete analyzer + GPS + anemometer data was acquired
Time	Month/Day/ Year Hr:Min:Sec	UDT time at which analyzer data was acquired
[CH4]_ppm	ppm	Methane concentration
[CH4]_ppm_sd	n/a	n/a
[H2O]_ppm	ppm	Water concentration
[H2O]_ppm_sd	n/a	n/a
[C2H6]_ppm	ppm	Ethane concentration
[C2H6]_ppm_ sd	n/a	n/a
[CH2H6]d_ppm	ppm	Dry ethane concentration
[C2H6]d_ppm_ sd	n/a	n/a
Flow_slm	SLM	Flow rate of gas through inlet system
Flow_slm_sd	n/a	n/a
GasP_torr	Torr	Pressure inside of optical cell
GasP_torr_sd	n/a	n/a
GasT_C	°C	Temperature inside of optical cell
GasT_C_sd	n/a	n/a
AmbT_C	° C	Temperature inside of analyzer
AmbT_C_sd	n/a	n/a
RD0_us	µs	Ringdown time of laser 0 (methane measurement)
RD0_us_sd	n/a	n/a
RD1_us	µs	Ringdown time of laser 1 (ethane and water measurement)
RD1_us_sd	n/a	n/a
Fit_Flag	n/a	n/a
MIU_VALVE	n/a	n/a
MIU_DESC	n/a	n/a
GPS Time Stamp	Month/Day/ Year Hr:Min:Sec	UDT time at which GPS data was acquired
Latitude (deg)	Degrees	GPS latitude
Longitude (deg)	Degrees	GPS longitude
Speed (knots)	Knots	Vehicle speed
Course (deg)	Degrees	Course determined from current waypoint and previous waypoint
GPS Fix Status	n/a	A = valid data, V = invalid data
Wind Speed (m/s)	m/s	Total measured wind speed
Azimuth (deg)	Degrees	Azimuthal (in-plane) angle describing wind vector
Elevation (deg)	Degrees	Elevation (vertical) angle describing wind vector
Speed-of-Sound (m/s)	m/s	Local speed of sound measured by sonic anemometer
Temperature (C)	° C	Local temperature measured by sonic anemometer

...4 Using the System

Data Storage - HoverGuard™

CSV Data Definitions

This section contains a brief definition of the various column data in .csv files generated by the MobileGuard™ system.

A <data_filename>.csv file is generated in the top directory of a flight package and contains the raw data collected by the analyzer, sonic anemometer, and GPS receiver.

Table 11 <data_filename>.csv Data Definitions for a GLA133-GPC

Column	Units	Description
System Time (local)	Month/Day/Year Hr:Min:Sec	UDT time at which complete analyzer + GPS + anemometer data was acquired
Time	Month/Day/Year Hr:Min:Sec	UDT time at which analyzer data was acquired
[CH4]_ppm	ppm	Methane concentration in parts per million
[CH4]_ppm_sd	n/a	n/a
[CO2]_ppm	ppm	Carbon dioxide concentration in parts per million
[CO2]_ppm_sd	n/a	n/a
[H2O]_ppm	ppm	Water concentration in parts per million
[H2O]_ppm_sd	n/a	n/a
[CH4]d_ppm	ppm	Dry methane concentration in parts per million
[CH4]d_ppm_sd	n/a	n/a
[CO2]d_ppm	ppm	Dry carbon dioxide concentration in parts per million
[CO2]d_ppm_sd	n/a	n/a
Flow_slm	SLM	Flow rate of gas through inlet system
Flow_slm_sd	n/a	n/a
GasP_torr	Torr	Pressure inside of optical cell
GasP_torr_sd	n/a	n/a
GasT_C	°C	Temperature inside of optical cell
GasT_C_sd	n/a	n/a
AmbT_C	°C	Temperature inside of analyzer
AmbT_C_sd	n/a	n/a
RD0_us	µs	Ringdown time of laser 0 (methane measurement)
RD0_us_sd	n/a	n/a
Gnd	Volts	Detector voltage with no light present
Gnd_sd	n/a	n/a
LTCO_v	Volts	Linelock voltage for laser 0
LTCO_v_sd	n/a	n/a
Temp_Status_mA	n/a	n/a
Analyzer_Status_mA	n/a	n/a
BattPer	%	Battery percentage
Fit_Flag	n/a	n/a
MIU_VALVE	n/a	n/a
MIU_DESC	n/a	n/a
Quaternion w	n/a	Quaternion constant
Quaternion x	n/a	X component of quaternion vector
Quaternion y	n/a	Y component of quaternion vector
Quaternion z	n/a	Z component of quaternion vector
Latitude (deg)	Degrees	GPS latitude
Longitude (deg)	Degrees	GPS longitude
Ground X Speed (m/s)	m/s	Ground speed along UAV X-axis (constant latitude)
Ground Y Speed (m/s)	m/s	Ground speed along UAV Y-axis (constant longitude)
Ground Z Speed (m/s)	m/s	Ground speed along UAV Z-axis (vertical speed)
Vehicle Heading (degrees)	Degrees	Vehicle heading with 0 degrees corresponding to True North
Wind Speed 3D (m/s)	m/s	Total measured wind speed
Wind Direction (degree)	Degrees	Azimuthal (in-plane) angle describing wind vector
Uvector (m/s)	m/s	Wind speed along the anemometer U-vector
Vvector (m/s)	m/s	Wind speed along the anemometer V-vector
Wvector (m/s)	m/s	Wind speed along the anemometer W-vector
Temperature (C)	°C	Local temperature measured by sonic anemometer

...4 Using the System

System Shutdown

For the MobileGuard™ system shutdown, refer to the *MobileGuard™ System Manual*.

For the HoverGuard™ system shutdown, refer to the *HoverGuard™ Solution Manual*.

—
ABB Inc.
Measurements and Analytics
3400, Rue Pierre-Ardouin
Québec (Québec) G1P 0B2
Canada
Tel: +1 800 858-3847 (North America)
Tel: +1 418 877-2944 (other countries)
Fax: +1 418 877-2834

abb.com/analytical

3KXG167007R4601

UM/ICOS FastScanner-EN Rev.D 10.2023