Automated Work Pack (AWP) for Offshore and Onshore Operations

Contents

Product introduction

The Automated Work Pack (AWP) system is designed to empower non-CAD users with a user-friendly interface, offering access to approved parameters and the ability to modify them. This customization applies to site-specific procedures, parameters, and components, effectively reducing the workload on the Drawing Office for projects characterized by highly repetitive scopes.

AWP represents an innovative alternative to Heerema's existing standard Offshore Installation Manual (OIM), which necessitates the creation of 2D drawings. Through an agile digital application platform, AWP provides users with the same values as those found in original 2D drawings. This information is accessible via tablets or laptops, enabling non-CAD users to visualize each procedure. Additionally, updates can be easily implemented without the need to generate new drawing versions. AWP's framework enhances the auditing process compared to the current method of check prints. Utilizing built-in digital pipelines for debugging and testing, the project team's input during deployment helps identify and report failures to achieve agreed parameters. AWP excels at pinpointing instances where agreed-upon values and ranges have not been met.

Development of AWP follows the principles of Scrum. The designated 'Scrum Team,' comprised of a Product Owner, Scrum Master, and Development Team, is set to commence activities on September 1, 2023, with a 15-week budget allocated for the creation of the Minimum Viable Product (MVP). The target delivery date for the MVP is December 22, 2023. The 'Product Owner' is responsible for managing the Product Backlog and holds the authority to guide the direction of the Scrum Team's efforts throughout the 15-week duration. Progress will be marked by the completion of 'Increments' every 2-3 weeks. Stakeholder engagement will be ensured through 'Sprint Reviews,' assessing the current value of each increment and collecting feedback to inform subsequent directions. Post 'Sprint Review,' a 'Sprint Retrospective' will analyze and adapt achievements and areas for improvement in preparation for the next sprint. The subsequent workday will herald the beginning of the next sprint, wherein 'Sprint Planning' and the 'Sprint Goal' for the 2-3 week increment will be defined."

For the initial phase of MVP development, the AWP Scrum Team will adopt Project 'Empire Wind' as a pilot endeavor. The essential values guiding the MVP will stem from input provided by Project Teams, with a specific focus on the 138x Mono pile Lift-off from HTV and Upending to Final Position, just before commencing the MCGF Procedures.

The MVP itself will serve as a means to garner greater support from all stakeholders. Any potential improvements or enhancements will be addressed by the pre-allocated Scrum Team resources following the successful delivery of the MVP.

Should the need arise for an 'Enterprise' version of AWP, the decision will be assessed at that juncture. This evaluation will determine whether the task is to be undertaken internally or outsourced to a third-party entity. Throughout the MVP development process, the 'Product Owner' will evaluate alternative 3rd Party Suppliers for the 'Enterprise' platform. These options will be discussed in 'Sprint Reviews' and subsequently incorporated into the final 'MVP Report'.

Requirements

Device:

- Desktop
- Laptop with mouse
- Tablet with touch screen

Operating System:

- IOS / Android / Windows

Power:

- walk around battery
- battery limit …

Screen:

- not less than 1920 x 1080 (HD)
- landscape
- not less than 9''

Mode:

- night
- day

Browser:

- edge
- chrome

Navigation:

- left & right thumb
- zoom & pan
- tap (no double tap)

- touch pen or finger for writing

Specs:

- not less than 128MB
- processor ...

Getting started

Test Blue or Green

sprintname	sprint 2		sprint 3		sprint 4	
sprintweek	week 1	week 2	week 1	week 2	week 1	week 2
release color test	green	blue	green	blue	green	blue
release version	0.2.1	0.2.2	0.3.1	0.3.2	0.4.1	0.4.2

Document structure

For AWP to work it is necessary to load the project documents.

The app contains a file picker that allows you to navigate to the correct folder and load the associated documents.

These documents are collected in OneDrive. It is important that all documents are stored correctly in the OneDrive folder.

The folder you need has the name of the project. In any case, that folder contains:

- excel sheets (.xlsx)
- 3d models (.gltf)
- mex files (.mex)

The following documents may also be required:

- map (.svg)
- step files (.pex)

Excel sheet

The Excel sheet is the document from which AWP gets all its data. Consider the dimensions of the monopile, the location of the monopiles in the field and the HTV layout. [-- TODO: requirements of cells --]

Steps

In order to visualize the steps, we are trying to figure out whether the information in Excel is enough or whether we have to rely on information in .pex files.

3d models

Vessels

The 3D models used in AWP are also stored in OneDrive. The Transport Vessel (HTV) and HLV must be stored in glTF (WebGL Transmissions Format). For now a model created in 3dsMAX will be exported to glTF using Blender. There is no need to add textures to the model.

[-- TODO: UV coordiantes, 0 point --]

Mex files

The 3D models of the monopiles are generated from .mex files. These are converted to trimesh models in AWP. At this point, a mexfile must be available for each monopile.

Map

To be able to see where the project is on the world map, it is useful to have a black and white map with the coastal border.

User interface

The UI of the app was designed from the perspective of the offshore user. It works well on a tablet in landscape mode and the buttons are easy to reach with both thumbs. It is possible to change the control panels according to individual needs.
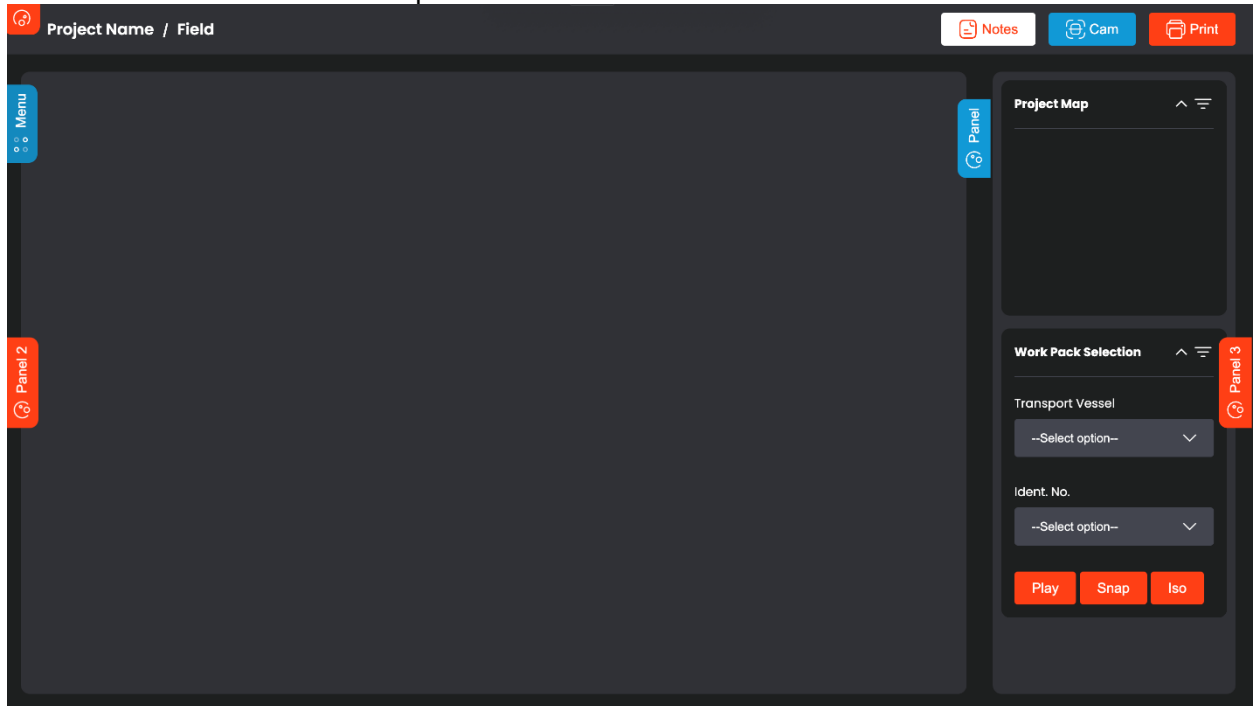
Naturally, the UI is responsive, so it can be used on most devices. Although portrait mode and smart phones have not been added yet.
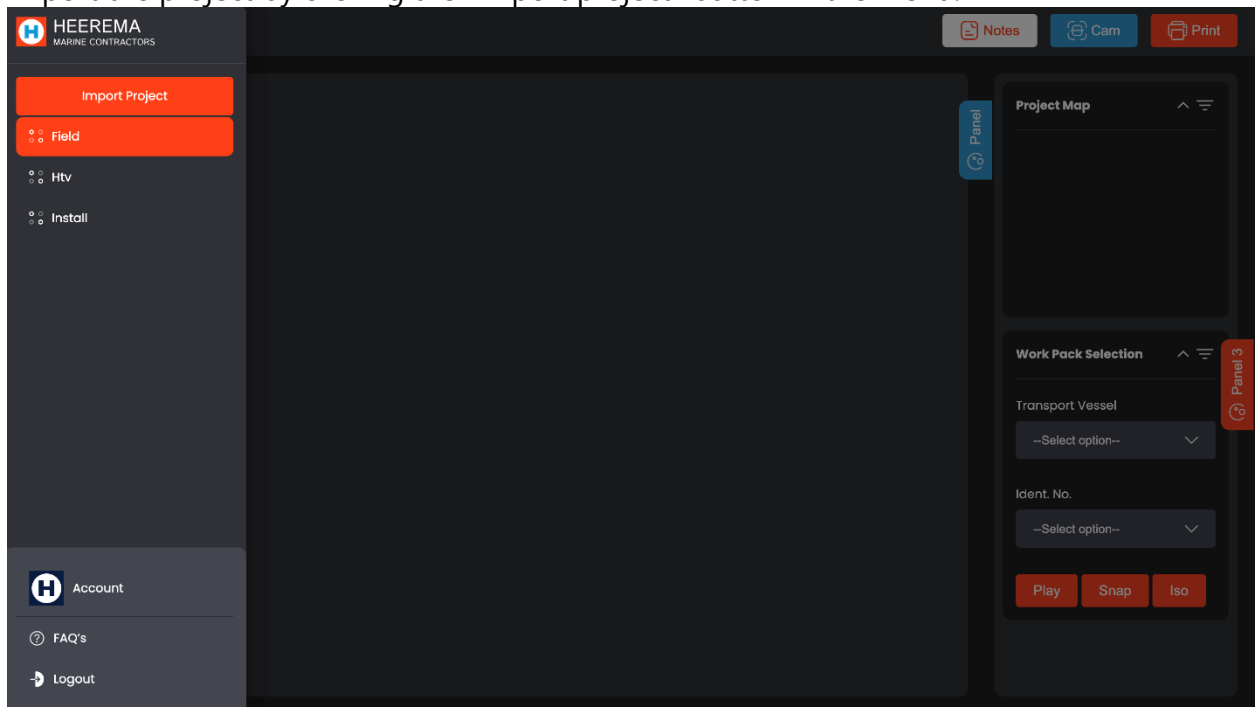
Import/Export flow diagram

oneDrive

3d models

excel

.mex

import

AWP

HTV

Field

Install

step 1

step 2

step 3

step 4

step 5

output

artifacts

notes

cam

print
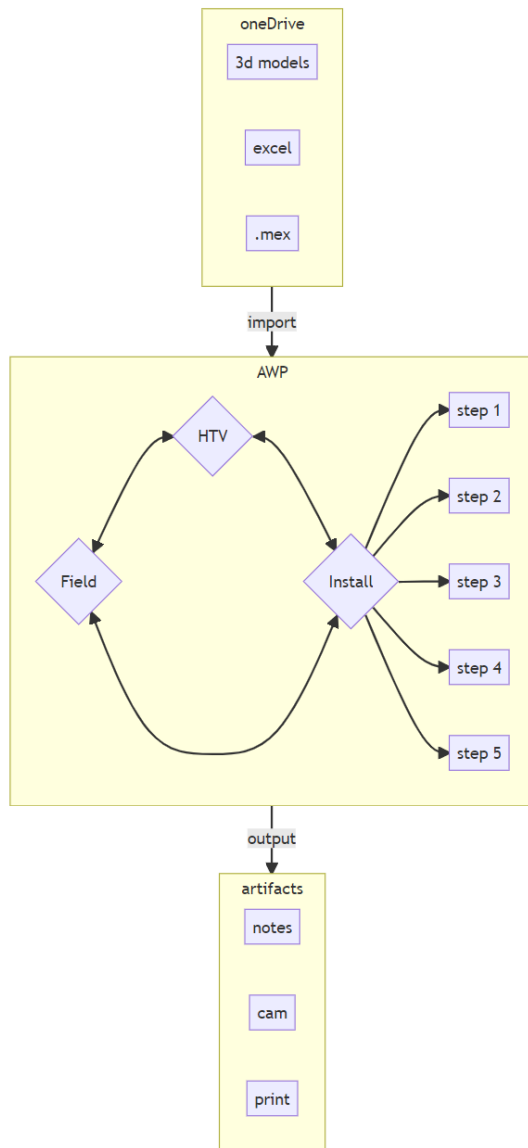
Steps for import/export and panel information

1. Click on the menu button to open the menu.

2. Import the project by clicking the "import project" button in the menu.

3. In the file picker window, select the project folder and click the "upload" button.
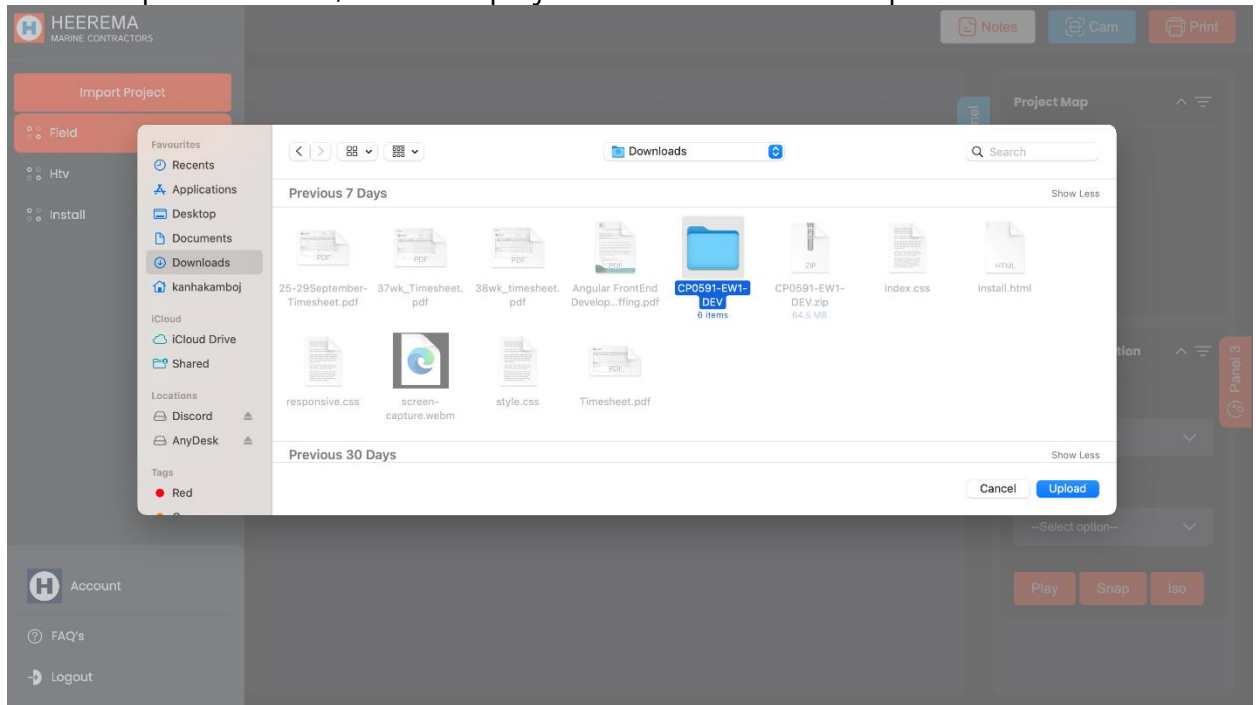
4. After clicking upload the loading screen will appear. This means files are being parsed into the application. Make sure during loading you don't refresh the page, otherwise the data shown might be incorrect or the application won't function correctly.
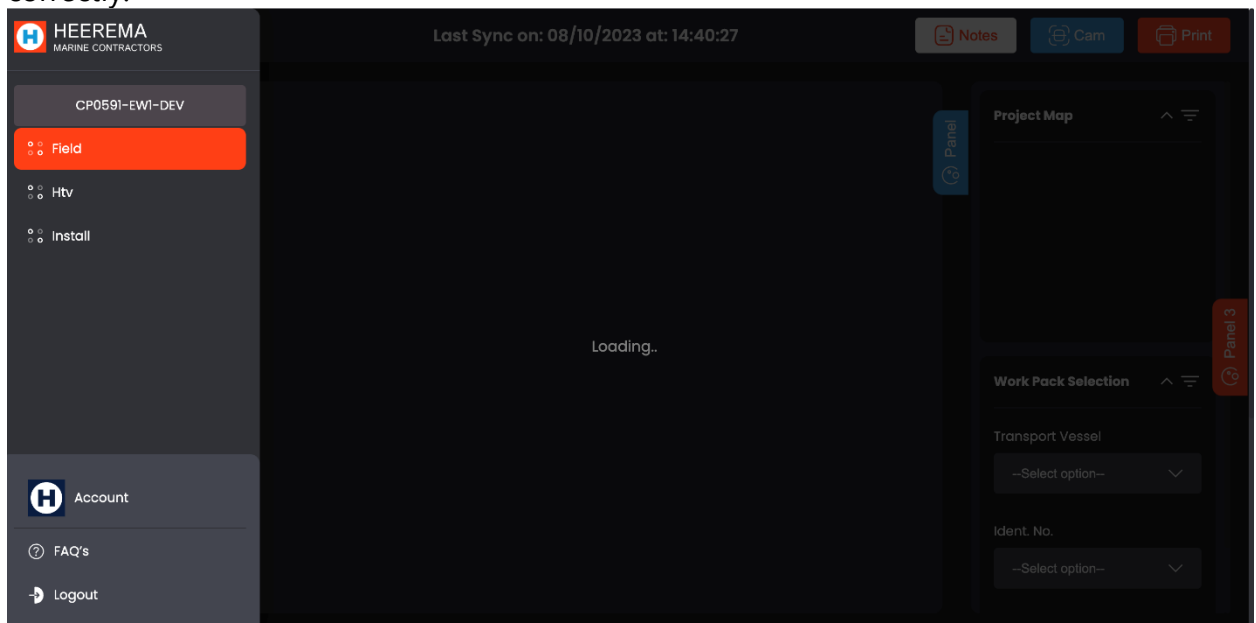
5. When the data is finished parsing you will see the data populated in the transport vessel dropdown. Select an item and then choose identification number. After this you will see the data in the 3D graph. Steps will be visible in the right bottom panel.
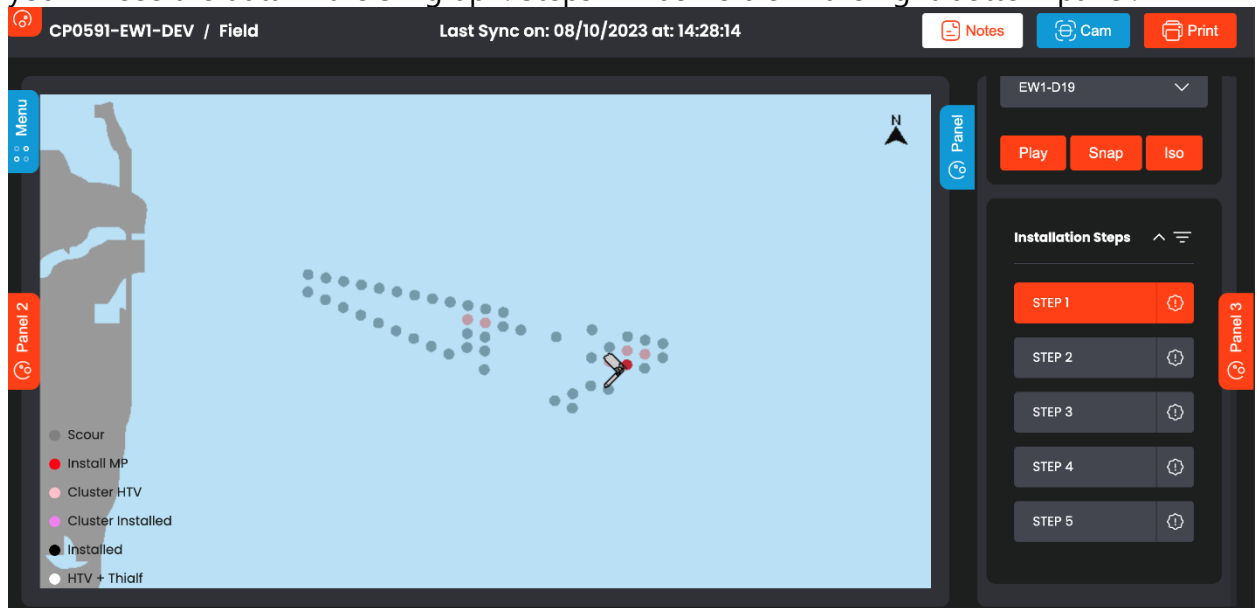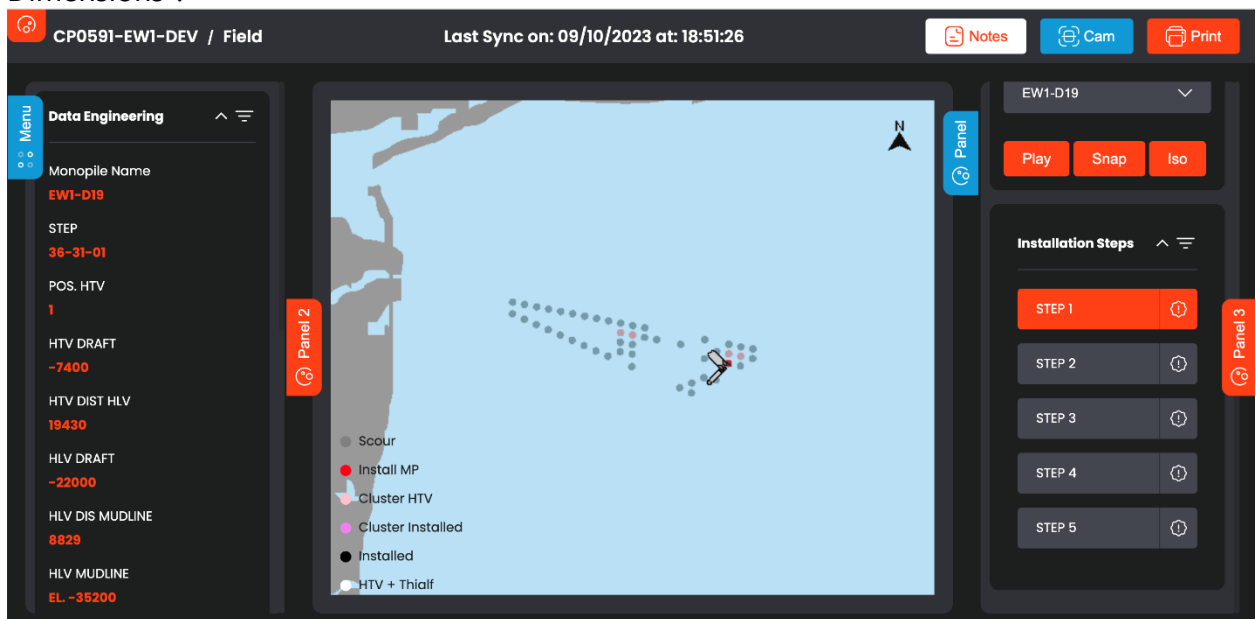

6. You can collapse the side panels to have a full view of the 3D graph.
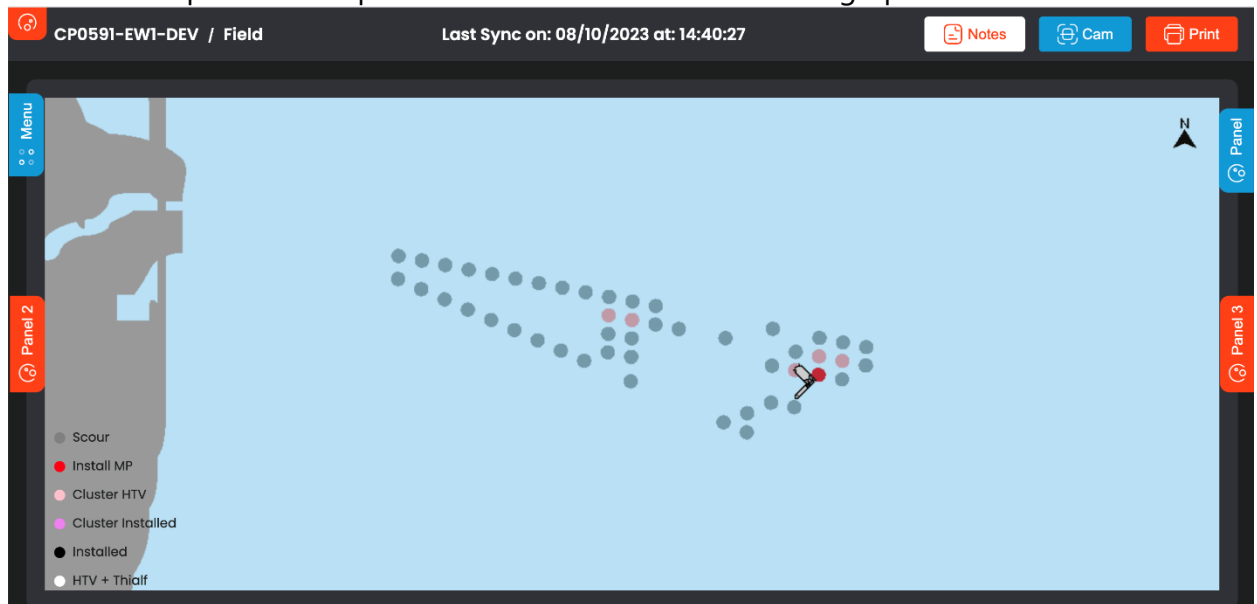
7. If you click on a "Panel" tab before uploading a workpack, the application will show an alert. Please select the options in the "Work Pack Selection" before opening other Panels.
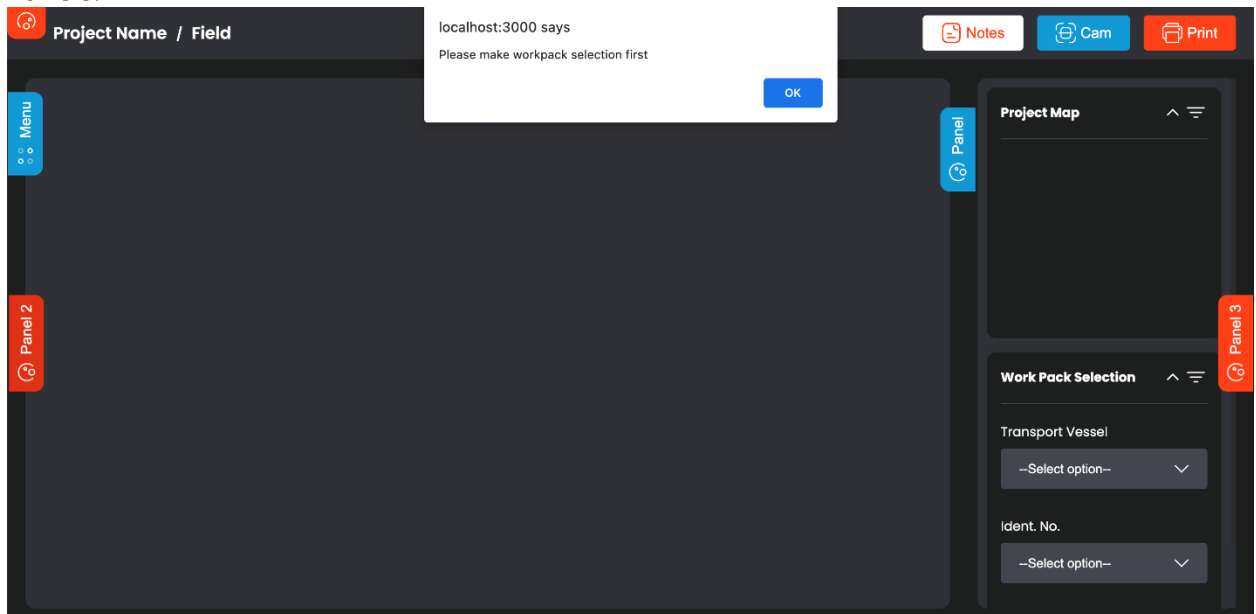

8. By clicking panel 2 you can open panel groups "Data Engineering" and "SB Crane Dimensions".

9. You can collapse and expand the panel groups by clicking on the up or down arrow on the upper side of the panel group.
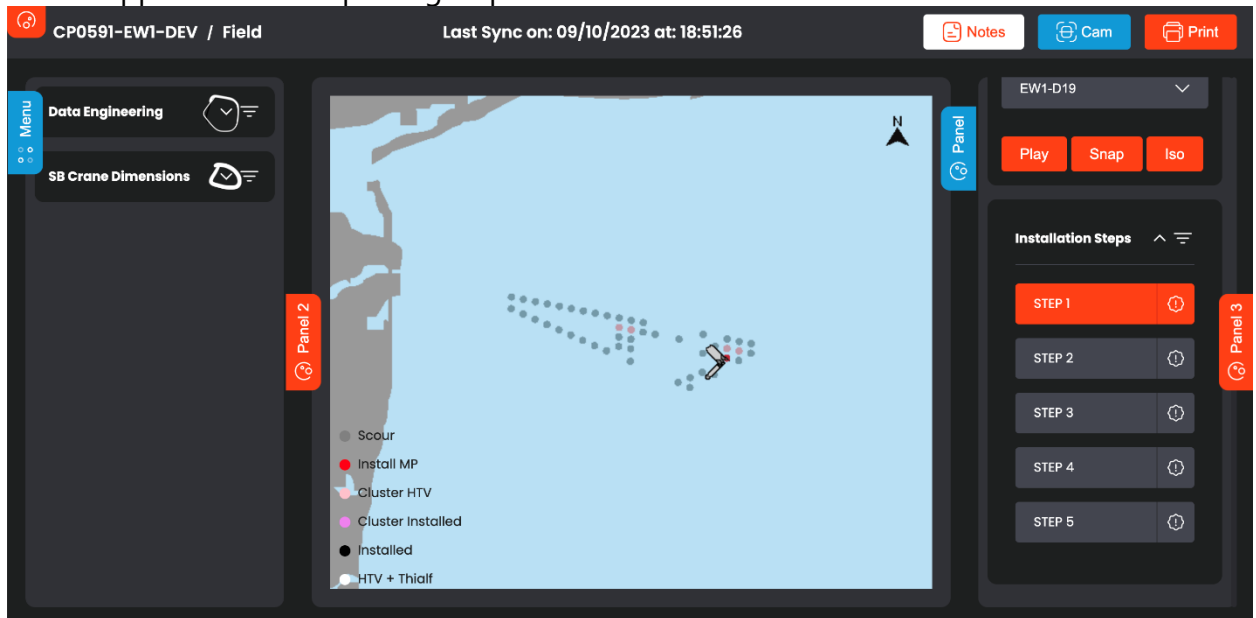

10. You can filter panel groups data by clicking the upside down pyramid icon on the upper side of the panel group. A popup will appear with checkboxes. You can select or deselect as per choice and modify the presented data in the panels.
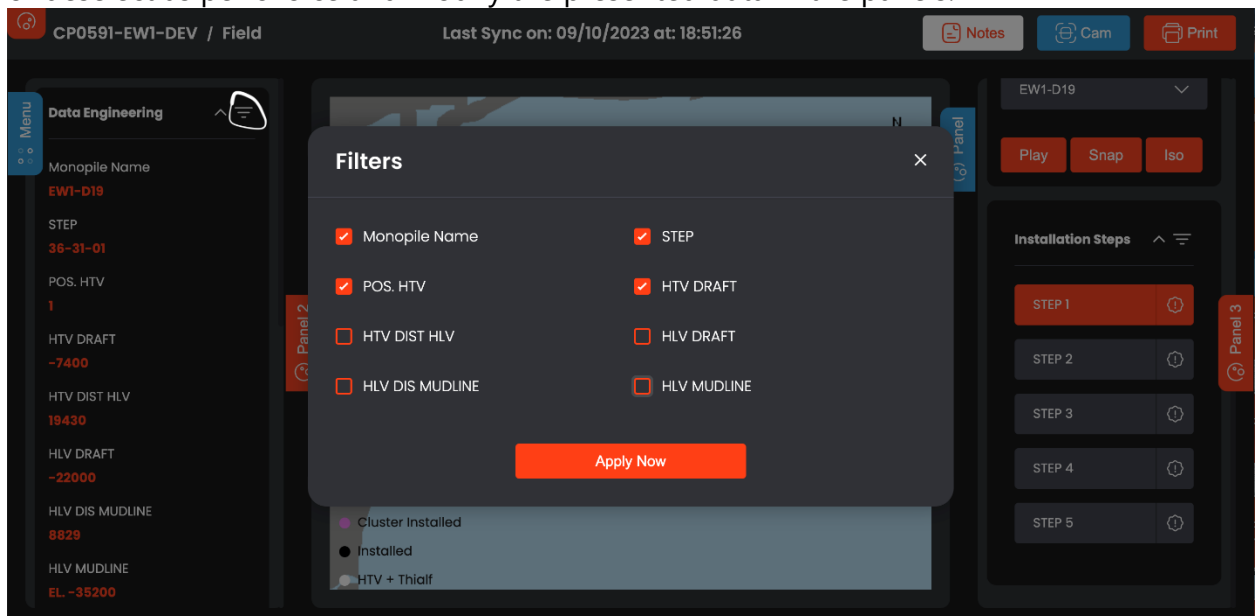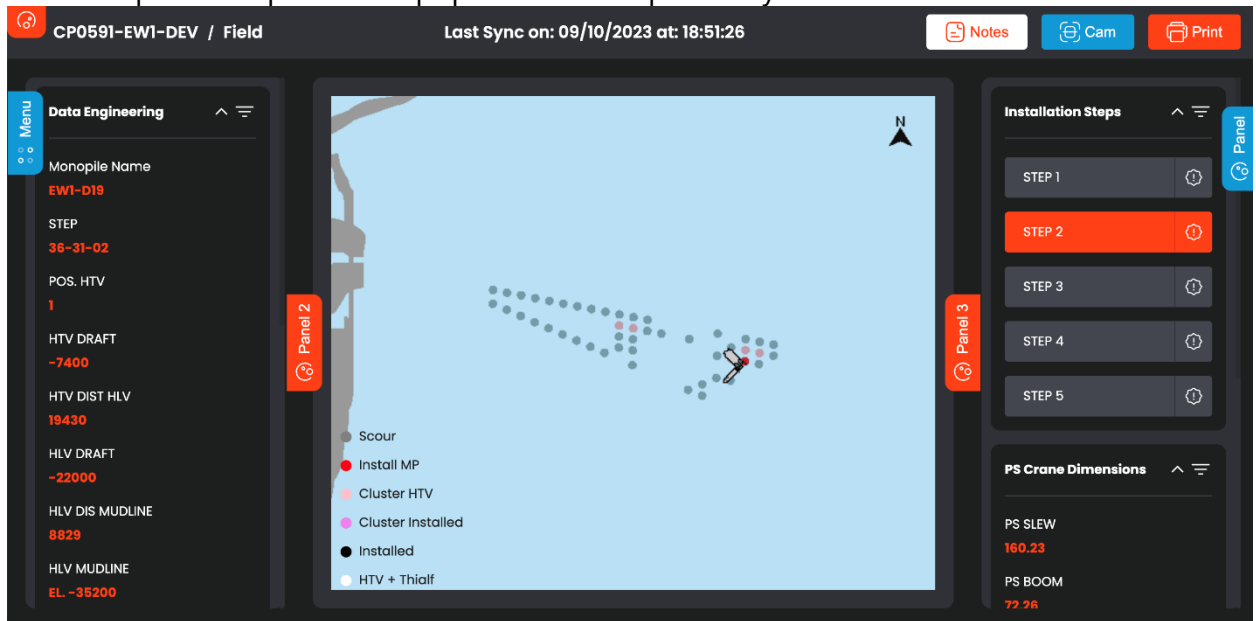
11. After clicking apply you will see the selected data in the corresponding panel group.
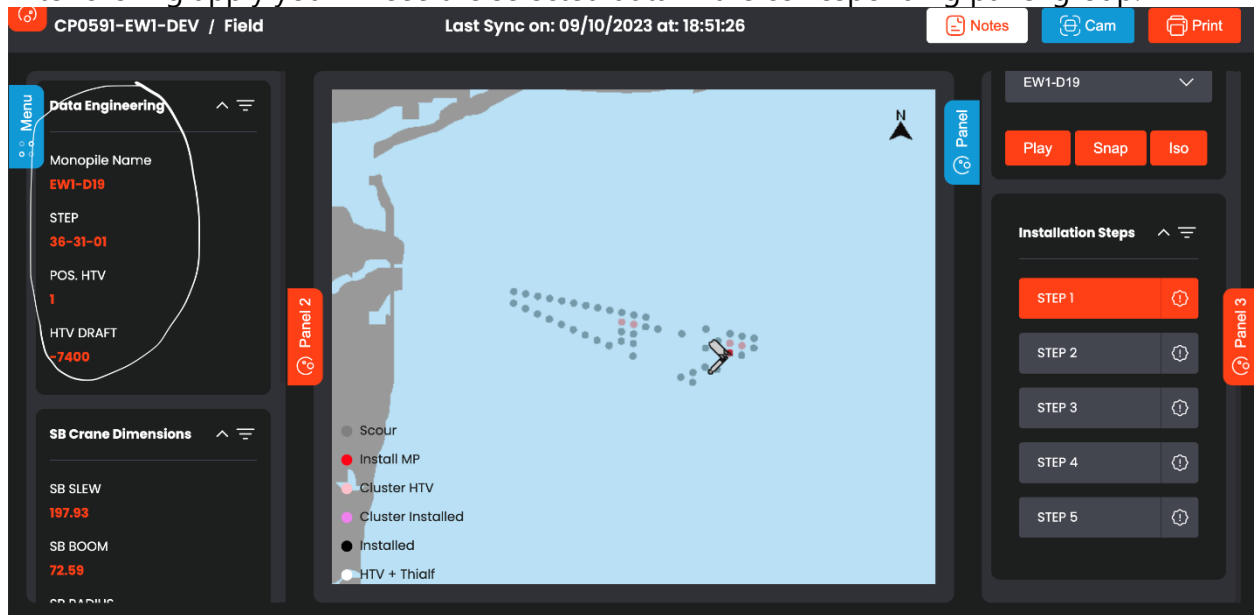

12. Click on panel 3 to open the right side panel with two panel groups called "Installation Steps" and "PS Crane Dimensions".
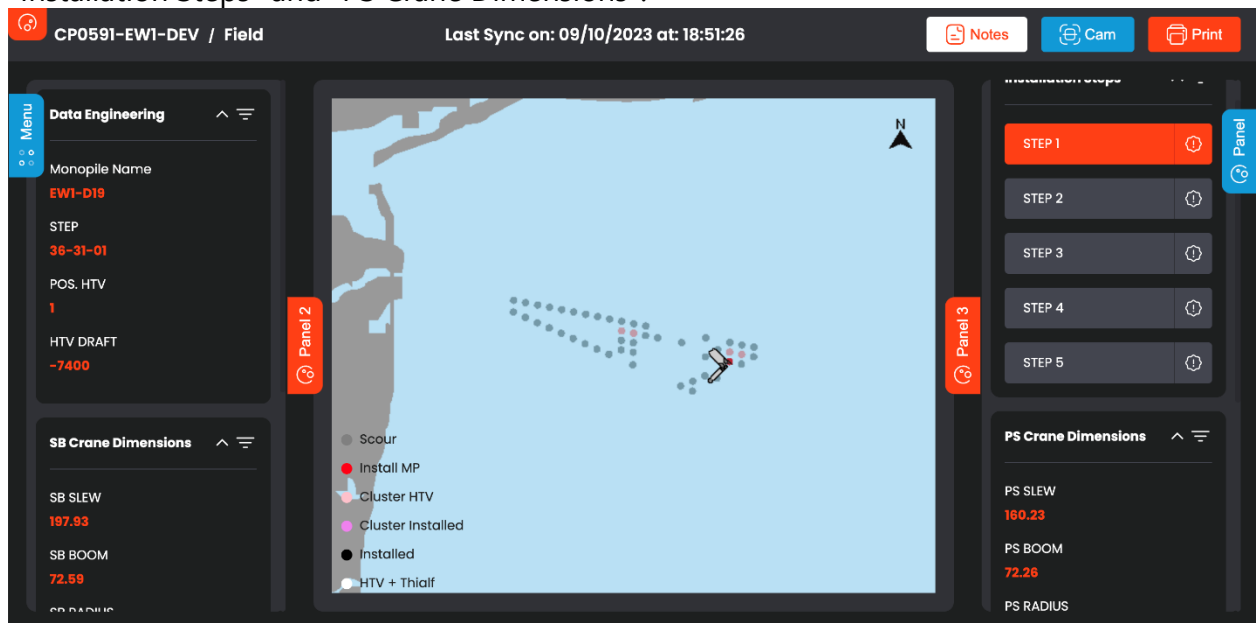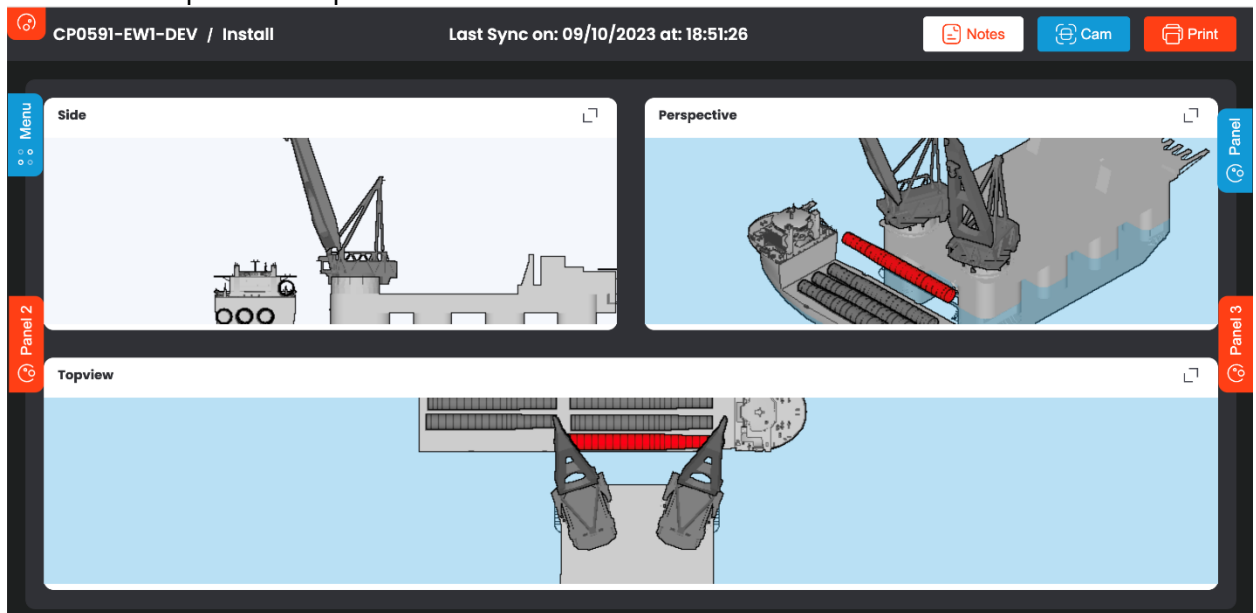
13. Users can select steps and see the data in the data panels per step using the step selection panel. Step 1 data is populated in the panels by default.
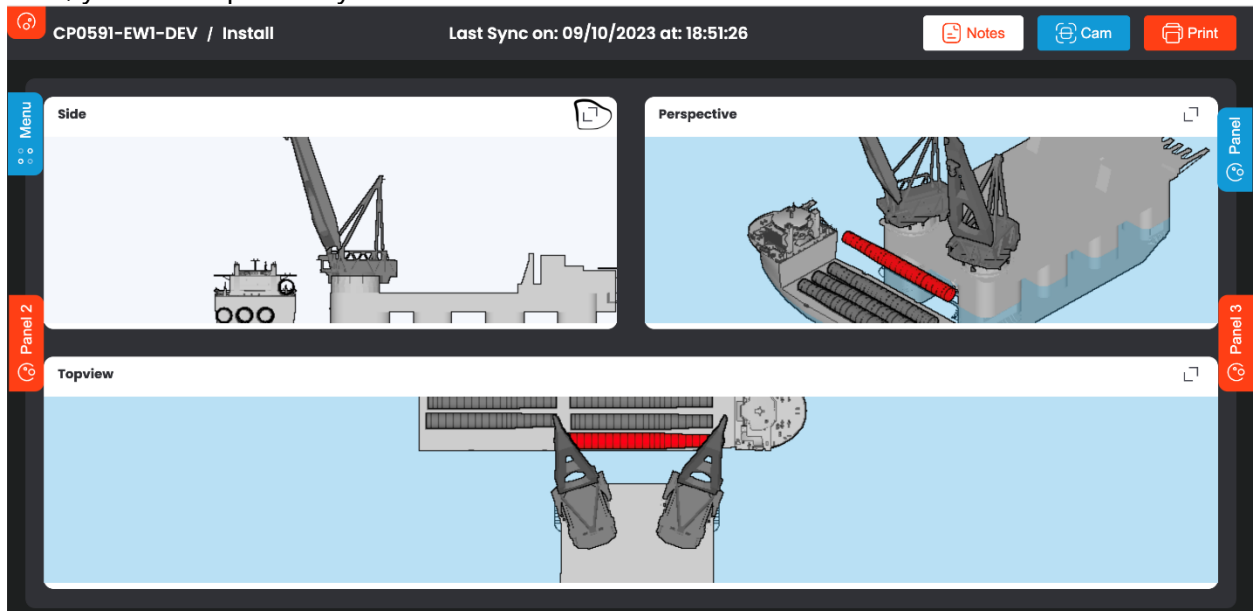

14. When you click on "Install" in the left menu, you will have a new screen showing multiple perspectives. Panel 2 and panel 3 will open by default.
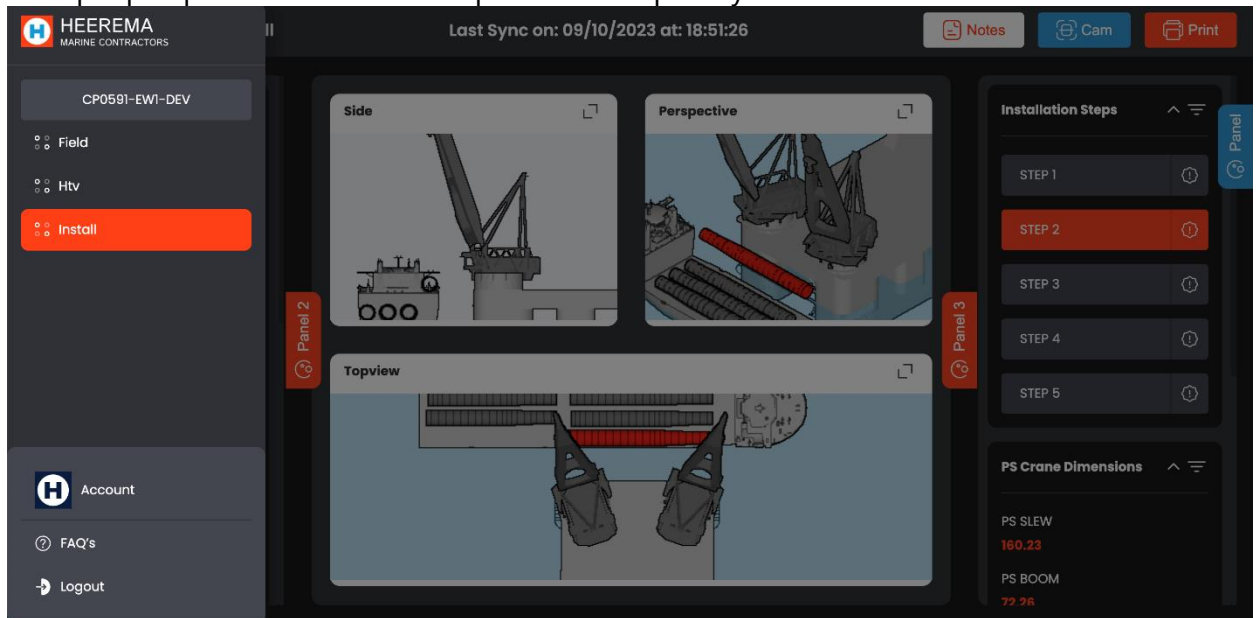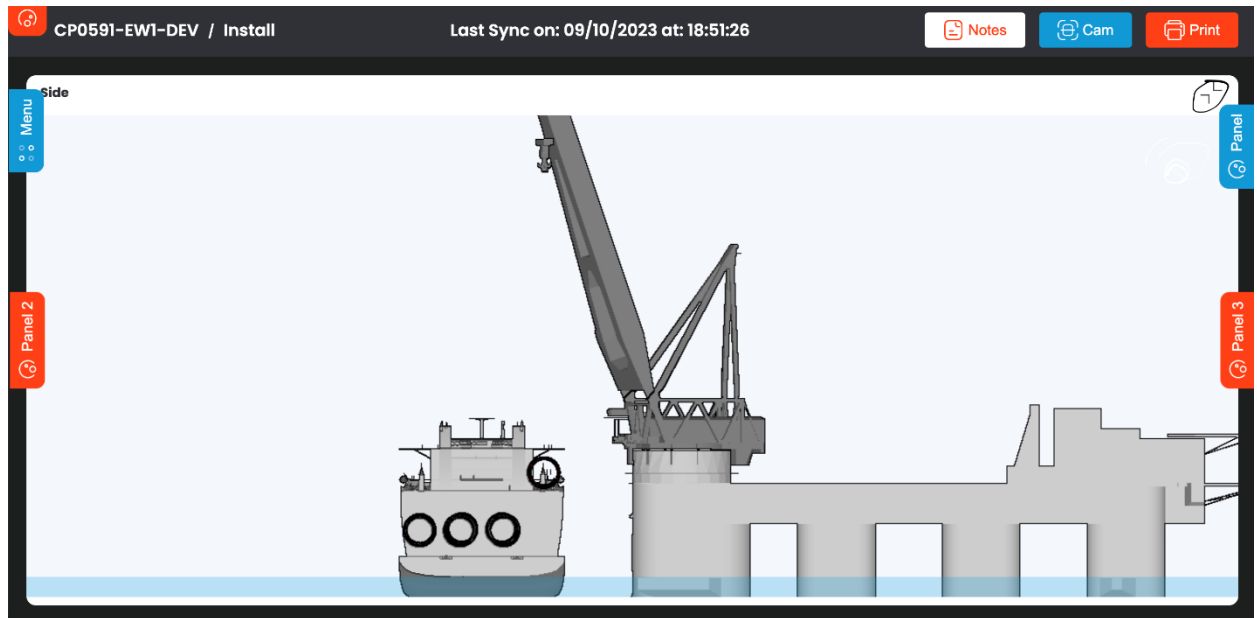
15. You can collapse all the panels and see the full view.

16. By clicking on the expand icon that is located on the right corner of each perspective view, you can expand any of the views.

17. By clicking on the shrink icon that is located on the right corner of the view, you can shrink the view.
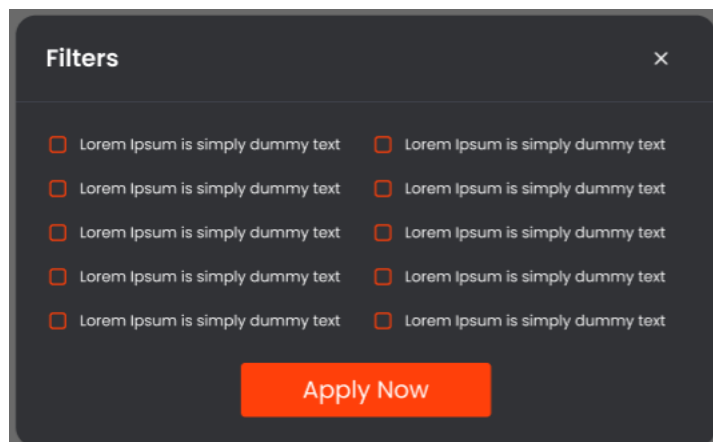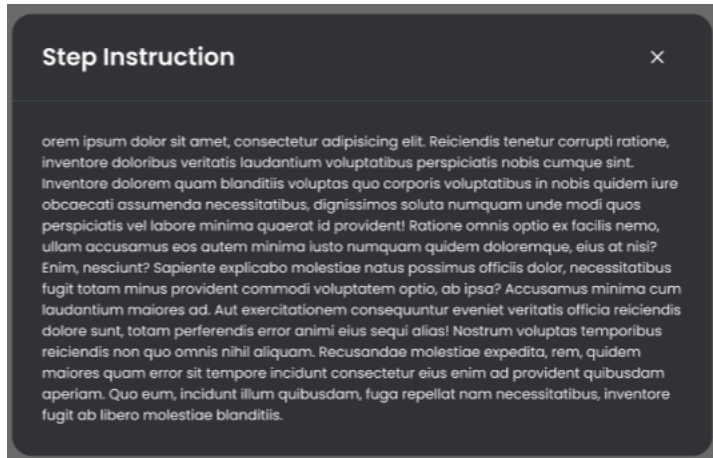

Pop-ups

Filter menu pop-up
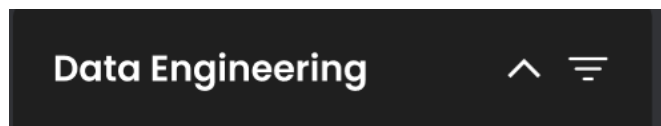
You can open the filter menu pop-up by clicking on the filter icon. Here you can find all available panels and change your sidebar menus yourself.
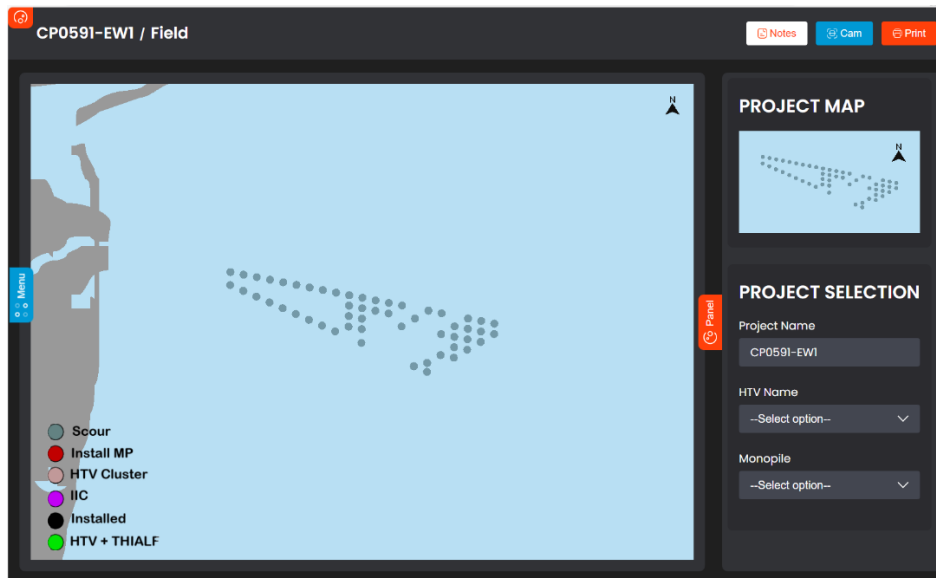
Steps pop-up

You can open the steps pop-up by clicking on the i icon. The pop-up contains text that is imported from the Excel document.

Field page

Navigation

Zoom

scroll wheel or hold scroll wheel + drag minimum zoom level: ? maximum zoom level: ?

Orbit

hold left mouse + drag

Pan

hold right mouse + drag

Legend

You can see what status the monopile has by looking at the colors in the legend. Sometimes the transport vessel en de HLV are also added to te legend.

The legend is loaded from an excel sheet in the project folder. Three columns are read with the names 'Shape', 'ColorIcon' and 'Title'.

	A	B	C	D
1	Shape	ColorIcon	Title	
2	Circle	Grey	Scour	
3	Circle	Red	Install MP	
4	Circle	Pink	Cluster HTV	
5	Circle	Blue	Cluster Installed	
6	Circle	Black	Installed	
7	Circle	White	HTV + Thialf	
8				

Install page
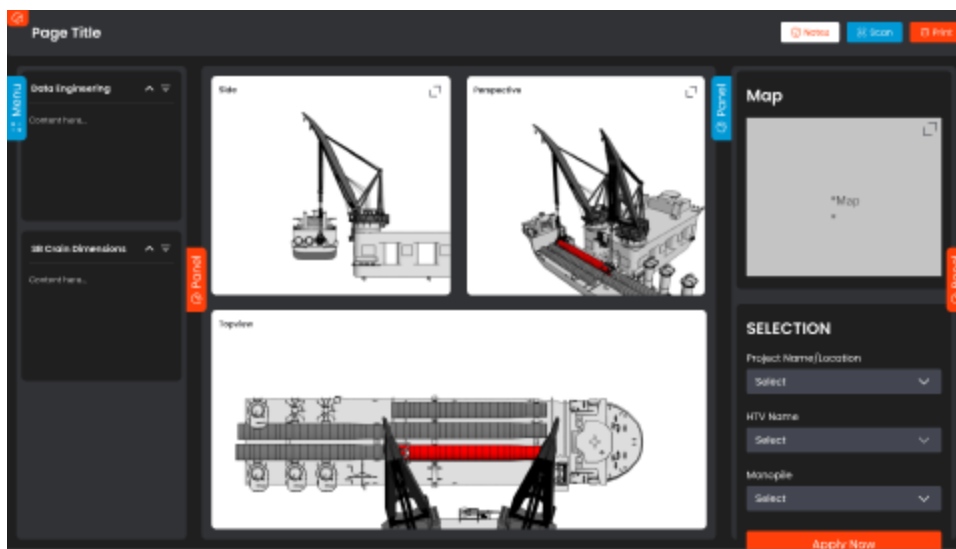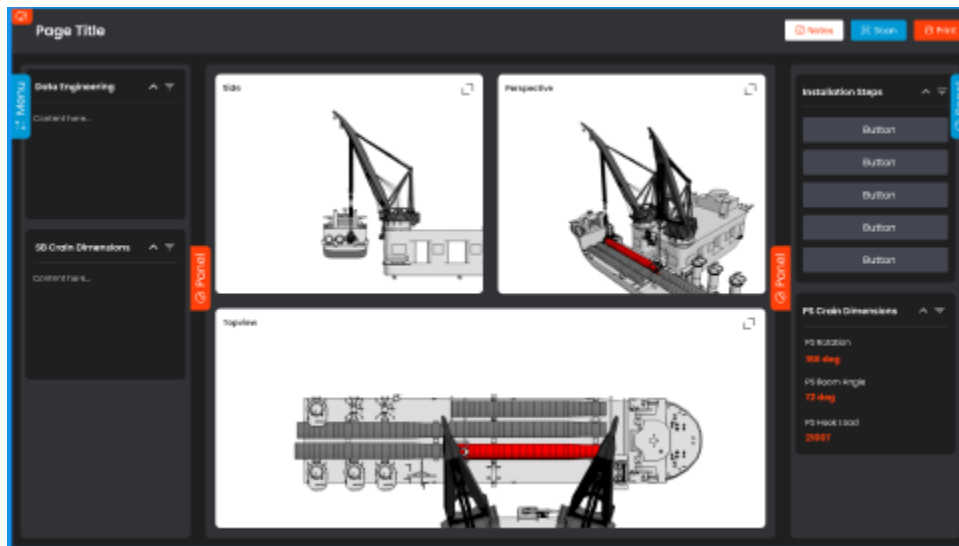
Artifacts

The buttons 'Notes', 'Cam' and 'Print' are located at the top right of the fold-out menu bar.
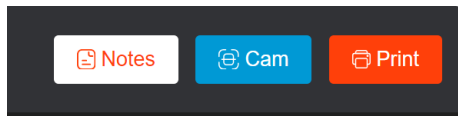
Notes

Creating notes should be possible by clicking on the notes button. In the current version of AWP an empty pop-up will appear, which will contain the functionality.

It should be possible to take screenshots and add handwritten text. These notes will then be saved, where it is possible to filter by time, current monopile name (at the moment the artifact was made), and user name.

Another way we are exploring is to manage notes in OneNote. This can be done using the Microsoft Graph API.

Camera

Making photo's should be possible by clicking on the cam button. In the current version of AWP an empty pop-up will appear, which will contain the functionality. These photo's will then be saved, where it is possible to filter by time, current monopile name (at the moment the artifact was made), and user name.

Another way we are exploring is to manage photo's in OneNote.

Print

Saving and print pages should be possible by clicking on the print button.

The best option to print a page is by making a custom pdf design. We still have to investigate how the GLTF models appear in the 2D print.
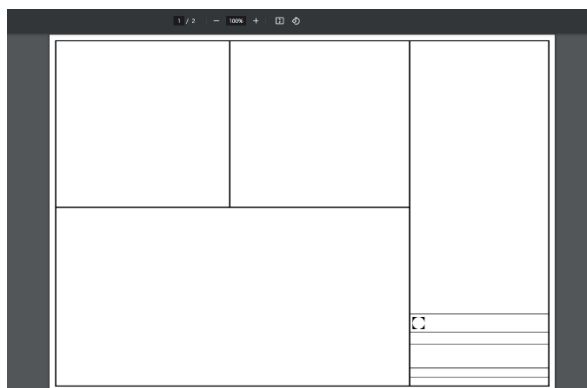
Flowchart

Flowchart AWP after MVP

Input for AWP

- excel htv
- .mex — make monopiles more accurate.
- .pex — add the steps in install process

excel output

AWP PWA with edit function

Artifacts from AWP
- print / drawing pdf
- pictures from camera jpg
- handwritten or typed notes

AWP artifact filesystem

Flowchart AWP for MVP

Input for AWP in OneDrive folder

- excel htv
- .mex — make monopiles more accurate.
- .pex — add the steps in install process
- models gltf — trimesh models of HTV and HLV

AWP PWA

Artifacts from AWP
- print / drawing pdf
- pictures from camera jpg
- handwritten or typed notes

Technical information

Font

font-name font-size... font-color

[-- TODO: add fontname --]

Colors

background: sidebar-background: panel-background:

button-background: button-hover: button-click: button-text:

menu-button-background: menu-button-hover: menu-button-click: menu-button-text:

toggle-sidebar-button-background: toggle-sidebar-button-hover: toggle-sidebar-button-click: toggle-sidebar-button-text:

[-- TODO: add colors --]

Data validation

The data is validated at two entry points. Namely:

When a project is loaded in, the files are parsed and a `storeData` object is built. This object represents the contents of all the project files in a certain structure. This `storeData` is then validated through the validator for structural errors and missing fields. If this validation is passed, the `storeData` is stored into memory. Otherwise, the errors found are logged in the text area.

When the application is started, the `storeData` object from internal memory is validated. If there are errors present, the internal memory will be thrown out.

Currently, the validator checks for the following:

- The presence of `Deck_Layout_HTV01.xlsx` containing a sheet called `Sheet1` containing the following column headers with data: `'HTV_DL_X', 'HTV_DL_Y', 'HTV_DL_Z', 'HTV_DL_QX', 'HTV_DL_QY', 'HTV_DL_QZ', 'HTV_DL_QW'`

- An excel document for each transport should be present with each sheet corresponding with a `.mex` file of the same name. These sheets should contain in each row, the following columns: `'HTV_X', 'HTV_Y', 'HTV_Z', 'HTV_QX', 'HTV_QY', 'HTV_QZ', 'HTV_QW', 'HLV_X', 'HLV_Y', 'HLV_Z', 'HLV_QX', 'HLV_QY', 'HLV_QZ', 'HLV_QW'`

- the .mex file should be of the following structure containing at least:

  - properties
    - name: string
    - seaLevel: number
    - fieldPosition:
      - easting: number
      - northing: number
  - geometry
    - shapes. each shape
      - name: string
      - position: { x, y, z }: numbers. z is mandatory
      - shapeProperties
        - height: number
        - radius1: number
        - radius2: number
        - thickness: number